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# THE SECOND INTERNATIONAL CONFERENCE

## ON ECONOMICS AND BUSINESS IN THE DIGITAL ERA - iCEBD 2025




Nhà xuất bản Tài chính

**HO CHI MINH CITY UNIVERSITY OF ECONOMICS AND FINANCE**
**SOUTHERN AFFAIRS DEPARTMENT – MINISTRY OF SCIENCE AND TECHNOLOGY**
**HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY**
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# INTERNATIONAL SCIENTIFIC CONFERENCE

# The Second International Conference on Economics and Business in the Digital Era

# iCEBD 2025

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**2025**

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| Marketing: Strategic approaches to digital marketing, branding, and market engagement with a focus on green and sustainable initiatives. | Dr. Phan Bao Giang<br>Assoc.Prof. Swati Bisht |
| Business Management: Digital financial innovations, accounting advancements and policies, and their role in fostering sustainability. | Dr. Huynh Nhut Nghia<br>Dr. Piotr Antoni Binkowski |
| Finance and Accounting: Innovations in digital finance and the pivotal role of accounting policies in advancing SDG implementation. | Dr. Ha Thi Thuy |
| Tourism and Environmental Management: Emerging trends and innovations in sustainable tourism development; key factors shaping public awareness and responsibility toward green living and environmental stewardship. | Prof. Eric Jose Olmedo Panal<br>MA. Nguyen Vuong Hoai Thao |
| International Integration: The role of advanced technologies in driving production innovation in both domestic and international enterprises; the significance of international economic integration in promoting sustainable urban development aligned with the SDGs. | Dr. Nguyen Quang Dung<br>Dr. Justin Matthew Pang |

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# FOREWORD

To contribute to achieving these strategic goals, the Ho Chi Minh City University of Economics and Finance (UEF), in collaboration with the Southern Affairs Department – Ministry of Science and Technology and the Ho Chi Minh City University of Technology (HUTECH), is proud to organize the 2nd International Conference on Economics and Business in the Digital Era (iCEBD 2025). This year's theme, "Development and Integration in the Digital Era: Innovation for Sustainability", reflects our commitment to fostering innovation and sustainable development in an era of rapid digital transformation.

The conference serves as a global platform for scientists, experts, policymakers, and business leaders to exchange knowledge and collaborate across key domains, including economics, finance, accounting, business management, trade, marketing, and cutting-edge digital technologies. Particular emphasis is placed on interdisciplinary innovation and its role in driving economic sustainability and social well-being.

For iCEBD 2025, the organizing committee has received high-quality research contributions from scholars and practitioners worldwide. Selected papers will undergo a rigorous peer-review process and be published in the conference proceedings with an international ISBN and indexed journals, ensuring academic integrity and impact.

We are honored to welcome distinguished keynote speakers and contributors who will share their insights and expertise in digital transformation, sustainable business models, and global economic integration. Their contributions will undoubtedly enrich discussions and inspire future research and policy development.

On behalf of the organizing committee, we extend our sincere appreciation to all scholars, researchers, and practitioners participating in iCEBD 2025. We also express our deep gratitude to our keynote speakers, panelists, and sponsors for their invaluable support.

We hope that iCEBD 2025 will provide all participants with meaningful insights, fruitful discussions, and valuable networking opportunities to advance the sustainable development of digital economies.

Wishing you a successful and inspiring conference.

Sincerely,

**ON BEHALF OF THE**
**ORGANIZING COMMITTEE**
**CHAIRMAN**



**Dr. Ngô Minh Hải**

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# SESION 1: ECONOMICS

# CORPORATE SOCIAL RESPONSIBILITY AND CORPORATE SUSTAINABILITY

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**ABSTRACT**

The relationship between corporate social responsibility (CSR) and corporate sustainability is a significant topic of investigation and discussion. This study evaluates the impact of CSR on corporate sustainability in Vietnam using the Feasible Generalized Least Squares (FGLS) method. Data were collected from the annual reports and financial statements of companies recognized in the annual list of the 100 sustainable enterprises published by the Vietnam Chamber of Commerce and Industry (VCCI). Our findings reveal that CSR positively influences corporate sustainability in terms of legal responsibilities. However, it has a negative effect when viewed through the lens of economic, philanthropic, and ethical responsibilities. This indicates that companies can improve their sustainability outcomes by focusing on legal CSR initiatives while working to enhance the effectiveness of their efforts in economic, philanthropic, and ethical responsibilities to reduce any detrimental effects on corporate sustainability.

*Keywords:* “corporate social responsibility”, “corporate sustainability”, “csr”, “fgls”, “vcci”

## I. INTRODUCTION

Corporate social responsibility (CSR) has emerged as a pivotal topic of discussion among organizations and scholars in recent years. The fundamental concept behind CSR encompasses the expectation that corporations, companies, and organizations uphold specific standards and practices in social and environmental performance while simultaneously fulfilling their financial and legal obligations (Ashrafi et al., 2018). As societal demands for responsible corporate behavior intensify, organizations find themselves under increasing pressure to address their environmental impacts proactively. CSR effectively serves as a response mechanism for organizations striving to meet these expectations and sustain their operations responsibly. In an era where market dynamics are marked by heightened awareness of social and environmental issues, companies must embrace CSR to maintain their competitive edge and foster public trust. The growing consciousness among consumers regarding socially responsible investments necessitates that companies exhibit a commitment to the environment in which they operate. This trend is particularly relevant for next-generation organizations that aim to align their operations with societal values while ensuring sustainable development. While the roots of CSR can be traced back to the mid-20th century, many managers still encounter challenges when it comes to understanding its practical implementation and implications (Saxena & Hussain, 2015).

The discourse surrounding the impact of effective CSR practices on corporate sustainability is well-documented in the literature. Numerous studies substantiate the correlation between CSR engagement and corporate sustainability, revealing that companies that actively participate in socially responsible activities tend to perform better in the long run. However, the degree of this impact remains a topic of debate. The literature highlights ongoing discussions regarding whether shareholder interests align with those of other stakeholders. The inconsistent findings in research may stem from varying perspectives on CSR’s role within corporations. Two dominant views permeate the CSR literature. The first viewpoint posits that CSR initiatives can be aligned with shareholder wealth maximization. Influential studies suggest that responsible business practices not only benefit society but also contribute positively to a company’s financial performance (Deng et al., 2013; Servaes & Tamayo, 2013). In contrast, the opposing perspective asserts that the singular social responsibility of corporations is to generate profit, indicating that CSR initiatives can sometimes detract from corporate assets and shareholder value (Aupperle et al., 1985; Krüger, 2015). In light of the considerable attention surrounding CSR, a crucial question remains unanswered: Does corporate social responsibility play a significant role in enabling companies in Vietnam to achieve sustainability? This study seeks to enhance the understanding of CSR's impact on the sustainability of Vietnamese companies. Specifically, we will analyze how CSR

initiatives influence the sustainability of firms listed in the annual ranking of sustainable companies published by the Vietnam Chamber of Commerce and Industry (VCCI). The originality of this study lies in its focus on sustainable companies, which provides a unique opportunity to explore whether CSR contributes to their sustainable practices.

In conclusion, as the dialogue surrounding CSR continues to evolve, it remains essential for organizations in Vietnam to evaluate the effectiveness and implications of their CSR strategies. By doing so, companies can better navigate the complexities of social responsibility, potentially leading to improved sustainability outcomes and enhanced stakeholder relations. This study aims to contribute to the body of knowledge on CSR and its significance in fostering sustainable development within the context of Vietnamese enterprises.

## II. LITERATURE OVERVIEW

The concept of corporate social responsibility (CSR) has evolved significantly since its emergence in the twentieth century, particularly from the early 1950s to the present (Diemont et al., 2016). Initial discussions surrounding CSR have given rise to various related topics, including public responsibility, corporate social responsiveness, sustainability, corporate social performance, corporate citizenship, global responsibility, social entrepreneurship, and corporate accountability (Ghobadian et al., 2015). The growing prominence of CSR has attracted the attention of businesses and individuals alike since the 1960s. Despite the extensive discourse on CSR, a definitive consensus on its definition remains elusive, with varying interpretations arising from different perspectives on the subject (De George, 2011). A pivotal contribution to the understanding of CSR was made by Carroll (1991), who expanded the concept beyond traditional economic and legal responsibilities to include ethical and philanthropic dimensions. His framework reflects the increasing societal concerns regarding ethical business practices. CSR is often utilized as an umbrella term to encompass various aspects of corporate responsibilities, including economic, legal, ethical, and voluntary expectations from the community (Ghobadian et al., 2015). Economic and legal responsibilities denote a company's commitment to maximizing profits while adhering to the regulations set forth by governing bodies (Balqiah et al., 2017). Conversely, ethical and voluntary responsibilities encompass the ethical standards and discretionary expectations that stakeholders hold for corporations (Nastiti et al., 2017). Despite numerous scholars proposing distinct criteria for assessing CSR, Carroll's (1991) framework remains the most widely adopted measure. The notion of "sustainability" initially centered around resource conservation and gained widespread recognition following the Earth Summit, convened by the World Commission on Environment and Development (WCED) in 1987. Notably, the definition of sustainability and sustainable corporate practices remains varied and inconsistent across different countries and contexts. Elkington (1997) examined over 100 definitions of sustainability and introduced the "Triple Bottom Line" model, which consists of three interconnected pillars: economic profitability, social responsibility, and environmental stewardship. Prugh and Assadourian (2003) suggested that many companies perceive sustainability merely as a standalone concept related to responsible environmental and labor management. This is often demonstrated through "Corporate Sustainability Reports" that focus narrowly on indicators like energy consumption, waste production, and employee health and safety.

In Vietnam, the criteria for evaluating sustainable enterprises have been developed since 2016, with the Vietnam Chamber of Commerce and Industry (VCCI) scoring and announcing the "100 Sustainable Enterprises" list annually. This initiative aligns with the guidance from the Vietnamese government as outlined in Notice No. 398/TB-VPCP dated December 15, 2016. The evaluation process employs the Corporate Sustainability Index (CSI), which includes 130 criteria aimed at assessing the sustainability of enterprises across several dimensions: economic efficiency, corporate governance, environmental impact, labor rights, and social contributions. This study will evaluate sustainable enterprises using the CSI 2024 index as established by VCCI. The relationship between corporate social responsibility (CSR) and corporate sustainability has been a longstanding area of interest for researchers. A multitude of influential studies suggests that CSR initiatives can often align with shareholder wealth maximization (Deng et al., 2013; Edmans, 2011; Flammer, 2013; Servaes and Tamayo, 2013). In contrast, the opposing view is rooted in Friedman's (1970) famous assertion that the primary social responsibility of firms is profit generation. This perspective posits that CSR initiatives can prove detrimental to corporate assets (Aupperle et al., 1985; Bénabou and Tirole, 2010; Krüger, 2015). Empirical research results regarding the connection between CSR and corporate performance often yield mixed conclusions. For instance, Okafor et al. (2021) and Cheung et al. (2010) have illustrated that although active involvement in CSR might not yield immediate profit increases, it can significantly mitigate risks to brand valuation

over time. Furthermore, Lin et al. (2009) highlighted that companies engaging in CSR benefit not only from enhanced business reputations but also by improving the quality of life for their employees and the communities they serve. Such efforts not only fortify brand image and engender customer trust but also enhance competitiveness in the marketplace. By committing to social initiatives, businesses can generate lasting value for both the community and society at large, therefore contributing to holistic sustainable development. Samaibekova et al. (2021) found that the integration of corporate social responsibility into business practices is critical for establishing corporate sustainability and fostering growth. Conversely, Saxena and Hussain (2015) argued that while it may seem logical to suggest that only sustainable organizations adopt socially responsible practices, empirical results indicated that the impact of CSR on corporate sustainability was minimal. One potential explanation for this lack of significant correlation is that a company's CSR activities often lack tangible connections to its core operations.

The literature review illustrates that the influence of CSR on corporate performance and sustainability is a topic fraught with debate. While some scholars argue that CSR initiatives lead to positive outcomes, others suggest the opposite, asserting that CSR may not yield significant benefits. The majority of literature, however, tends to agree that implementing CSR in a thoughtful and effective manner can contribute to sustainable corporate development. The discrepancies between study findings frequently arise from varying factors, such as the selection of data, the specific industries examined, the scope of the studies, and the methodologies employed. This study seeks to investigate the causal relationship between CSR and corporate sustainability in Vietnam by employing an analytical framework based on Carroll's (1991) CSR model. The research will utilize the Corporate Sustainability Index (CSI) 2024, as published by the Vietnam Chamber of Commerce and Industry (VCCI), to measure corporate sustainability outcomes. The hypothesis driving this research posits that CSR activities will have both positive and negative implications for corporate sustainability within the Vietnamese context. The framework of corporate social responsibility proposed by Carroll provides a comprehensive lens through which to analyze the various facets of corporate accountability. The four domains of responsibility outlined in Carroll's model—economic, legal, ethical, and philanthropic—serve as critical indicators for evaluating corporate performance. Economic responsibilities demand that companies efficiently pursue profits, thereby ensuring their financial viability and the welfare of their employees. Legal responsibilities reinforce the importance of adhering to applicable laws and regulations, ensuring that companies operate within the boundaries dictated by societal rules. Ethical responsibilities delve deeper into the moral obligations of businesses, pushing them to cultivate fair practices, transparency, and integrity in their dealings. This facet of CSR often addresses the expectations of stakeholders beyond mere compliance, encouraging corporations to engage in practices that are inherently "right" and beneficial to society. Finally, philanthropic responsibilities extend beyond compliance and ethics, inviting companies to contribute to societal welfare through charitable actions, community involvement, and supporting social causes. When it comes to assessing corporate sustainability, the CSI index plays a pivotal role by providing a multifaceted evaluation of corporate performance. The CSI includes criteria that capture various aspects of sustainability—economic efficiency, effective governance, environmental stewardship, treatment of labor, and social responsibility—ensuring that a comprehensive view of corporate sustainability is obtained. By employing this index, we will be able to analyze how well companies demonstrate their commitment to sustainability in alignment with their CSR activities, offering insights into the relationship between being socially responsible and being sustainable. The empirical phase of this research will involve the collection and analysis of data from Vietnamese companies recognized on the VCCI's list of sustainable enterprises. By examining how these companies practice CSR and the subsequent impact of these practices on their sustainability performance, we aim to generate actionable insights that will benefit both academia and practitioners.

In summary, while there remains a lack of consensus on the relationship between CSR and corporate sustainability, this study intends to contribute to our understanding of how CSR efforts can influence sustainability outcomes in Vietnam. Through the lens of Carroll's CSR framework and utilizing the CSI index for measurement, we will explore the complexities of this relationship. Ultimately, we believe that a nuanced exploration of the interplay between CSR and corporate sustainability will illuminate pathways for Vietnamese firms in their pursuit of both social responsibility and sustainable development. This research not only highlights the potential for CSR initiatives to enhance corporate sustainability but also aims to inform better practices and policies that can foster a harmonious relationship between

businesses and the communities they serve.

## III. METHODS AND DATA

### 3.1 Econometric model

To assess the impact of corporate social responsibility on corporate sustainability in Vietnam. To achieve the research objectives and based on theory and related studies, we build the research model as follows:

$$CS_{it} = \beta_0 + \beta_1 ESR_{it} + \beta_2 LSR_{it} + \beta_3 PSR_{it} + \beta_4 SIZE_{it} + \beta_5 PRF_{it} + \beta_6 OPE_{it} + \beta_7 LARit + U_{it}$$

Where t and i are the year and company, respectively, $\beta_0$ is the constant term/intercept, $\beta_1 - \beta_7$ are the regression coefficients and $U_{it}$ is the disturbance term. The dependent variable CS (corporate sustainability). The explanatory variables representing CSR include: ESR (Economic responsibility), LSR (Legal responsibility), PRS (Philanthropic and ethical responsibility). The control variables include: SIZE (Total assets), PRF (Profit after tax), OPE (Total operating expenses), LAR (Total employees). Details of the variables are described in Table 1.

The literature presents a variety of variables for measuring corporate social responsibility (CSR). However, the most widely adopted method of assessing CSR is based on the factors proposed by Carroll. In this article, the authors evaluate CSR using the following dimensions: ESR (Economic Responsibility), LSR (Legal Responsibility), and PSR (Philanthropic and Ethical Responsibilities) as defined by Carroll (1991). Additionally, the authors incorporate control variables such as total assets (SIZE), total operating expenses (OPE), and total employees (LAR), which are regarded as indicators of business size. Larger companies typically enjoy higher profits and enhanced growth opportunities (Pratheepan, 2014; Ahmed & Nicholls, 1994). Improved business performance can lead to increased profitability, thus impacting profit after tax (PRF) and overall business development (Abor, 2005).

The impact of corporate social responsibility on corporate sustainability is assessed through the regression coefficients (β1 – β3) within the model. Specifically, if these coefficients are positive and statistically significant, it indicates that CSR positively influences corporate sustainability. Conversely, if the coefficients are negative and statistically significant, this suggests that CSR has a detrimental effect on corporate sustainability. If the regression coefficients do not show statistical significance, it implies that CSR has no effect on corporate sustainability.

**Table 1 - Description of the variables and data source**

| Variable | Symbol | Measure | Data source |
|---|---|---|---|
| | | ***Dependent variable*** | |
| Corporate sustainability | CS | Corporate sustainability index (CSI 2024) | Firms financial statements/Annual report |
| | | ***Explanatory variables*** (***Corporate social responsibility)*** | |
| Economic responsibility | ESR | Return on sales | Firms financial statements/Annual report |
| Legal responsibility | LSR | Pay to state budget/Revenue | Firms financial statements/Annual report |
| Philanthropic and ethical responsibilities | PSR | Total Charity/Profit | Firms financial statements/Annual report |
| | | ***Control variables*** | |
| Total Assets | SIZE | Total assets of the enterprise | Firms financial statements/Annual report |
| Profit After Tax | PRF | Profit of the enterprise | Firms financial statements/Annual report |
| Total Operating Expenses | OPE | Total Operating Expenses of the enterprise | Firms financial statements/Annual report |
| Total Employees | LAR | Total Employees of the enterprise | Firms financial statements/Annual report |

### 3.2 Hypothesis

The literature review reveals that corporate social responsibility (CSR) significantly influences the sustainability of business operations, with varying impacts from each factor. There is a shared aspiration among society, businesses, and governments that CSR will serve as a catalyst for enhancing the sustainability of business practices. In this study, the authors propose the following hypotheses:

*$H_1$ - Economic responsibility has a positive impact on corporate sustainability.*

*$H_2$ - Legal responsibility has a positive impact on corporate sustainability.*

*$H_3$ - Philanthropic and ethical responsibility has a positive impact on corporate sustainability.*

In this study, the estimation and testing methods are carried out as follows: First, the models are estimated using three approaches: ordinary least squares (OLS), fixed effects model (FEM), and random effects model (REM). Subsequently, the F-test and Hausman test are employed to determine the most suitable method. Next, the authors assess the presence of heteroskedasticity and autocorrelation using the Modified Wald test and the Wooldridge test. Following this, the Feasible Generalized Least Squares (FGLS) estimation method is applied to address these identified issues. The detailed results of the model estimation and tests are presented in Tables 4 and 5.

### 3.3 Samples and data

The population examined in this study consists of sustainable enterprises recognized and ranked annually by the Vietnam Chamber of Commerce and Industry (VCCI). The sample was selected based on specific criteria: only those companies that have appeared on the list of 100 sustainable enterprises for a minimum of five consecutive years and have published financial statements or annual reports were included. Ultimately, a total of 19 enterprises met these criteria. Data were gathered from the companies' financial statements, annual reports, and consolidated reports from the Vietnam Statistical Office.

**Table 2 - Descriptive statistics of variables**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| PBV | 95 | 859.3368 | 15.7193 | 825 | 899 |
| ESR | 95 | 13.9214 | 10.5653 | -10.85 | 49 |
| LSR | 95 | 9.1260 | 7.3193 | 0.0050 | 38.3659 |
| PSR | 73 | 2.7513 | 7.3847 | -0.9764 | 60 |
| SIZE | 95 | 24.4863 | 49.0679 | 0.338 | 221.102 |
| PRF | 95 | 1.6085 | 5.6710 | -1.529 | 51.79 |
| OPE | 95 | 10.0792 | 15.1491 | 0.2532 | 52.53 |
| LAR | 95 | 4.8609 | 13.4027 | 0.172 | 128 |

*Source: Authors' calculations with stata 14 software*

Data presented in Table 2 illustrates the average values of the variables within the research model. Most variables have 95 observations; however, the PSR variable (Philanthropic and Ethical Responsibility) contains only 73 observations. This discrepancy arises because some companies have not disclosed data regarding their charitable activities for certain years. Fortunately, this limitation is not deemed significant and does not impact the results of the model estimation.

The minimum value of the LSR variable (Legal Responsibility) is -0.9764. This occurs because, during the Covid-19 pandemic, some companies incurred expenses for charitable activities that exceeded their profits to support the community. The average score for the CS index (Corporate Sustainability) is approximately 859, with a standard deviation of 15.7, indicating that there is not a substantial variability in the corporate sustainability scores among the businesses. Additionally, some companies lack historical data, which results in their scores not meeting the specific average value of 825.

The average value of the ESR variable (Economic Responsibility) stands at 13.9. This ratio can fluctuate annually based on the operational activities of the businesses, with most companies in the research group reporting above-average figures. These fluctuations are influenced by significant events, such as the Covid-19 pandemic, which

adversely affected profit after tax (PRF), resulting in a minimum value of -1.529 and a decrease in overall business activities.

Lastly, the average index for the PSR variable (Budget Payment/Revenue) is 9.12. Some companies report lower values due to poor overall performance, while others fall into special tax categories that exempt them from certain tax obligations.

## IV. RESULTS AND DISCUSSION

First, we assess multicollinearity within the model. The correlation between the variables is illustrated in the correlation coefficient matrix presented in Table 3. The correlation coefficient quantifies the extent of the linear relationship between the variables. Analysis of the correlation coefficient matrix reveals that all correlations among pairs of independent variables in the model are below 0.8. Franke (2010) notes that correlation coefficients exceeding 0.8 can indicate multicollinearity issues in the model. Consequently, this finding indicates that all independent variables exhibit low correlation with one another, thereby ensuring that multicollinearity does not impact the results of the regression model.

**Table 3 - Correlation matrix**

| | **PBV** | **ESR** | **LSR** | **PSR** | **SIZE** | **PRF** | **OPE** | **LAR** |
|---|---|---|---|---|---|---|---|---|
| **PBV** | 1.0000 | -0.3125 | 0.0379 | 0.0274 | -0.2838 | -0.1265 | -0.2474 | -0.2360 |
| **ESR** | -0.3125 | 1.0000 | 0.2696 | -0.2009 | -0.2617 | 0.1680 | 0.4707 | 0.0386 |
| **LSR** | 0.0379 | 0.2696 | 1.0000 | 0.0372 | -0.2625 | 0.2402 | 0.3524 | 0.0675 |
| **PSR** | 0.0274 | -0.2009 | 0.0372 | 1.0000 | -0.1167 | -0.0846 | 0.0591 | -0.0626 |
| **SIZE** | -0.2838 | -0.2617 | -0.2625 | -0.1167 | 1.0000 | -0.3874 | 0.0091 | 0.4444 |
| **PRF** | -0.1265 | 0.1680 | 0.2402 | -0.0846 | -0.3874 | 1.0000 | -0.0039 | -0.0921 |
| **OPE** | -0.2474 | 0.4707 | 0.3524 | 0.0591 | 0.0091 | -0.0039 | 1.0000 | 0.3012 |
| **LAR** | -0.2360 | 0.0386 | 0.0675 | -0.0626 | 0.4444 | -0.0921 | 0.3012 | 1.0000 |

*Source: Authors' calculations with stata 14 software*

Next, we estimate the research model using three methods: Ordinary Least Squares (OLS), Random Effects Model (REM), and Fixed Effects Model (FEM) to identify the most appropriate model. Simultaneously, we examine the presence of heteroskedasticity and autocorrelation within the selected model. The results of the estimations are detailed in Table 4.

**Table 4 - Model estimation results using OLS, FEM, REM methods**

| **Variables** | **OLS** | **FEM** | **REM** |
|---|---|---|---|
| | Coef/p-value | Coef/p-value | Coef/p-value |
| ESR | -0.9189/0.002 | -0.3438/0.013 | -0.3616/0.004 |
| LSR | 0.3106/0.269 | -0.0487/0.563 | -0.0404/0.614 |
| PSR | -0.3114/0216 | -0.0698/0.292 | -0.0743/0.236 |
| SIZE | -0.0871/0.001 | -0.0161/0.490 | -0.0217/0.270 |
| PRF | -0.0209/0.015 | -0.0015/0.660 | -0.0019/0.574 |
| OPE | -0.0049/0.547 | 0.0004/0.873 | 0.0000/0.926 |
| LAR | -0.0028/0.797 | -0.0089/0.045 | -0.0089/0.029 |
| Constant | 879.7121/0.000 | 867.3881/0.000 | 867.7766 /0.000 |
| F test | | 0.0000 | |
| Hausman test | | 0.9980 | |
| Wooldridge test | | 0.0133 | |
| Breusch and Pagan LM test | | 0.0000 | |

*Source: Authors' calculations with stata 14 software*

The results presented in Table 4 indicate that the F-test for the model using the Fixed Effects Model (FEM) method yields a value of 0.000, suggesting that this model is more appropriate than the Ordinary Least Squares (OLS) method.

The Hausman test results reveal a p-value greater than the 5% significance level, indicating that the Fixed Effects estimation method (FEM) is more suitable than the Random Effects Model (REM).

Furthermore, the Breusch and Pagan LM test serves to assess the appropriateness of both the REM and OLS models while also checking for heteroskedasticity within the REM model. With a significance level (Prob>chibar2 = 0.0000) well below 0.05, the REM model is confirmed as the most suitable option, and the test results reveal the presence of heteroskedasticity. Additionally, the Wooldridge test indicates an autocorrelation phenomenon between the observed variables, as evidenced by a significance level (Prob>F = 0.0133) below 0.05.

To address the issues of autocorrelation and heteroskedasticity, we employ the Feasible Generalized Least Squares (FGLS) regression method, which allows us to obtain the most reliable estimation results by mitigating these two phenomena.

**Table 5 - Cross-sectional time-series FGLS regression results**

| Variables | Coefficient | Std-error | Z | P>\|Z\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| ESR | -0.3412 | 0.1063 | -3.21 | 0.001 | -0.5496 | -0.1329 |
| LSR | 0.1124 | 0.0547 | 2.06 | 0.040 | 0.0053 | 0.2196 |
| PSR | -0.0861 | 0.0403 | -2.14 | 0.033 | -0.1650 | -0.0071 |
| SIZE | -0.0402 | 0.0151 | -2.66 | 0.008 | -0.0698 | -0.0105 |
| PRF | -0.0054 | 0.0003 | -1.56 | 0.119 | -0.0122 | 0.0014 |
| OPE | -0.0025 | 0.0016 | -1.53 | 0.126 | -0.0056 | 0.0007 |
| LAR | -0.0026 | 0.0073 | -0.36 | 0.722 | -0.0169 | 0.0117 |
| Cons | 868.3905 | 1.9453 | 446.41 | 0.000 | 864.5778 | 872.2032 |
| **F - test** | | | | 0.0009 | | |

*Source: Authors' calculations with stata 14 software*

The data presented in Table 5 details the results of model estimations aimed at assessing the impact of corporate social responsibility (CSR) on the sustainability of enterprises in Vietnam. The findings indicate that the p-value from the F-test is 0.0009, which is below the 5% significance threshold, thus confirming the suitability of the research model. When examining the variable representing Economic Responsibilities (ESR) as a measure of corporate social responsibility, we find a regression coefficient of -0.341, which is both negative and statistically significant at the 1% level. This suggests that Economic Responsibilities (ESR) negatively affect corporate sustainability, leading to the rejection of hypothesis H1. Specifically, an increase of 1% in the ESR ratio corresponds to a decrease of approximately 0.3412 percentage points in the average sustainability level of enterprises in Vietnam. In the analysis involving the variable Legal Responsibilities (LSR), which also represents corporate social responsibility, the model yields a regression coefficient of 0.1124. This coefficient is positive and statistically significant at the 5% level, indicating that CSR, when measured through Legal Responsibilities (LSR), has a positive impact on corporate sustainability, and we accept hypothesis H2. This finding implies that a 1% increase in LSR will lead to an average increase of 0.1124 percentage points in sustainability among enterprises. Lastly, the estimation results for the variable Philanthropic and Ethical Responsibilities (PSR) reveal a regression coefficient of -0.0861, which is negative and statistically significant at the 5% level. Thus, CSR measured through Philanthropic and Ethical Responsibilities (PSR) negatively influences corporate performance, resulting in the rejection of hypothesis H3. In practical terms, a 1% increase in the PSR ratio would lead to an average decline of 0.0861 percentage points in sustainability across the firms included in the sample.

In conclusion, corporate social responsibility (CSR) exerts both negative and positive influences on the sustainability of enterprises in Vietnam. This finding is aligned with previous empirical research. For example, Newman et al. (2018; 2020) highlighted that community-related social responsibility can adversely affect financial performance, which in turn impacts the sustainability of businesses. Similarly, Ebner and Baumgartner (2006) found that while an emphasis on philanthropic responsibilities might influence revenue or profit margins, it can also enhance a company's image and promote business growth. Additionally, research by Bagnoli and Watts (2003) and Malesky et al. (2015) indicates that adhering to legal responsibilities or compliance obligations can improve operational efficiency, thereby enhancing business sustainability. The research period from 2019 to 2023 coincides with significant disruptions

caused by the Covid-19 pandemic, as well as shifts in the global economy and politics, which may explain why the findings did not meet the expectations of the research team. Nonetheless, these results allow us to tentatively accept the relationships between CSR variables and corporate sustainability. The findings underscore that corporate sustainability is a pressing issue for businesses, with success in this area depending not only on economic performance but also on the influence of corporate activities on broader social engagements (Lawler & Worley, 2012). Investing time and resources into developing CSR initiatives aimed at sustainability may be challenging, but when viewed as a valuable resource, corporate social responsibility holds the promise of fostering long-term development and achieving sustainability in the future.

## V. CONCLUSION

The relationship between corporate social responsibility (CSR) and corporate sustainability (CS) has garnered considerable attention from scholars and is extensively discussed in the literature. Prior research has approached the concepts of CSR and corporate sustainability through various lenses, utilizing different datasets, criteria, and methodologies, leading to diverse findings regarding the impact of CSR on sustainability. The current study focuses on analyzing the effect of CSR on the sustainability of enterprises in Vietnam from 2019 to 2023.

Utilizing annual panel data covering five years, the study employs the Feasible Generalized Least Squares (FGLS) method for estimation. The findings reveal that CSR has both positive and negative influences on corporate sustainability. Specifically, CSR initiatives centered on legal responsibilities exhibit a positive impact on sustainability, while efforts related to economic responsibilities, philanthropy, and ethical responsibilities have a negative effect. This indicates that current practices related to economic, philanthropic, and ethical responsibilities require improvement to mitigate their adverse impacts, while enhancing the execution of CSR through legal responsibilities could help to bolster corporate sustainability among Vietnamese enterprises. The results of this research carry important policy implications for businesses in Vietnam and local governance structures. To ensure that CSR effectively enhances corporate sustainability, business managers should focus on adequately fulfilling legal responsibilities, as the analysis indicates a positive relationship between legal compliance and sustainability outcomes. Conversely, for CSR initiatives based on economic, philanthropic, and ethical responsibilities, managers need to assess and enhance their implementation effectiveness to ensure they contribute positively to sustainability. Moreover, these findings offer significant insights for policymakers aiming to foster sustainable business practices that create jobs, reduce unemployment, attract foreign direct investment (FDI), and promote economic growth in Vietnam. The Vietnamese government should work to enhance the business and investment environment by refining institutions and regulations to facilitate effective and sustainable corporate operations.

Finally, Like any empirical research, the current study has certain limitations. First, despite the authors' diligent efforts to gather data, our sample consisted of only 19 out of the 100 sustainable enterprises published annually by the Vietnam Chamber of Industry and Commerce (VCCI), due to data constraints. Future research could benefit from including a larger number of enterprises to better test their hypotheses. Second, this study focused on a limited set of variables representing corporate social responsibility, utilizing just three indicators based on Carroll's (1991) analytical framework. This narrow selection may not fully capture the breadth of CSR activities being implemented. Future studies should consider expanding the range of indicators to include additional variables that represent a more diverse array of CSR efforts, thereby providing a more comprehensive exploration of their impact on corporate sustainability. Third, the analysis period in this study spans only five years, which may not adequately represent long-term corporate sustainability trends. Subsequent research could extend the timeframe to at least a decade to uncover broader insights regarding the impact of CSR on corporate performance and sustainability in Vietnam.

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# THE FUNCTION OF SWOT AND PEST SITUATION ANALYSIS IN GLOBAL CORPORATIONS' GREEN AND SUSTAINABLE DEVELOPMENT PLANS

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**ABSTRACT**

The context and development environment of three well-known companies—Chase Sapphire, which represents Chase's financial services industry; Vingroup, one of the biggest corporations in Vietnam; and LEGO, the largest toy manufacturer in the world—are clarified by the article using PEST (Political, Economic, Social, and Technological) and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analyses. Every business operates in a separate industry and deals with particular possibilities, problems, and outside influences. Nevertheless, each business guarantees robust growth and development despite the variations and diversity in green and sustainable development plans. Using PEST and SWOT analysis to create green and sustainable development strategies for growth and development is a lesson that many multinational corporations around the world may learn from this.

*Key words:* "Challenges", "Economics", "Opportunities", "Politics", "Technology"

## I. INTRODUCTION

International businesses face significant environmental, social, and economic issues in the context of globalization and growing calls for sustainable development. In addition to being a strategic decision, the trend toward green and sustainable development has become essential for businesses to meet stakeholder expectations, international norms, and competitive advantage.

Two crucial strategic tools that assist multinational corporations (MNCs) in making wise decisions and adjusting to the business environment are PEST and SWOT analysis. The original results from these two approaches can support long-term strategy in the following ways when used in the context of green and sustainable development:

### 1.1. PEST analysis for sustainable and green development

Political, Economic, Social, and Technological (PEST) analysis aids businesses in comprehending how the outside world influences their operations. PEST can highlight significant elements from the standpoint of sustainable development, including:

Political: measures like carbon taxes and ESG (Environmental, Social, Governance) rules that promote sustainable growth. global accords to reduce greenhouse gas emissions (COP, SDGs). push from the government to utilize green energy.

Economic: the effects of sustainable financing, green investment, and the circular economy. Green business concepts present opportunities. Green technology's high upfront expenditures and effect on earnings. Social: increasing consumer knowledge of sustainable consumption. The influence of corporate social responsibility (CSR) on brands. shifts in the workforce and the need for environmentally friendly workplaces.

Technological: Monitoring and improving sustainable supply chains through the use of green technologies like blockchain, AI, and IoT. innovation in resource conservation and clean production. expanding the operational use of renewable energy.

### 1.2. SWOT analysis in a long-term plan

Businesses can evaluate their internal strengths and possibilities for sustainable development by using the SWOT analysis (Strengths, Weaknesses, possibilities, and Threats).

Strengths: The advantage of green branding draws in eco-aware clients.

Large scale facilitates cost optimization throughout the shift to a sustainable business strategy. availability of green investment and funding.

Weaknesses: Making the switch to a green model may temporarily disrupt operations. high R&D expenses for environmentally friendly technology. insufficient internal ESG management competence.

Possibilities include rising consumer demand for eco-friendly goods. backing for sustainable development from financial institutions and governments. chances to collaborate with entrepreneurs in green technologies. Risks: Intense rivalry among the green business industry. Manufacturing processes and supply chains are impacted by climate change. stricter environmental standards that must be strictly adhered to.

### 1.3. Using PEST and SWOT analysis in multinational firms' sustainable development plans

Businesses can use the following tactics based on the results of PEST and SWOT analysis:

Corporate governance with an ESG focus: Include sustainable development objectives in the overarching plan. Invest more in green technology: Reduce carbon emissions and optimize supply chains with data and AI. Increase the range of green products offered: Fulfill consumer demand and seize long-term commercial prospects. Work together with governments and organizations: Benefit from green investment funding and supportive policies. Create business models that are circular: Minimize waste, maximize energy, and reuse resources.

Multinational firms can spot trends, opportunities, and difficulties by using PEST and SWOT analysis into their green growth strategies. This helps them make well-informed decisions that will lead to a sustainable and environmentally conscious economy.

Specific and thorough citations on the primary concerns of the research topic are provided in the documents that follow.

SWOT analysis is mentioned as a crucial technique in corporate strategy in the book "Marketing Management (16th ed.)" that gives an overview of marketing strategy (Kotler, P., & Keller, K. L, 2022).

Details on PEST and SWOT analysis in strategic planning are provided in the paper "Exploring Corporate Strategy: Text and Cases (12th ed.)" with a focus on sustainable development and the global corporate context (Johnson, G., Scholes, K., & Whittington, R, 2020).

The corporate strategy analysis models included in the book "Contemporary Strategy Analysis (11th ed.)" include PEST and SWOT analysis, which are crucial for creating green strategies. (R. M. Grant, 2021).

The concept of competitive advantage and sustainable growth strategy based on business environment analysis, related to PEST and SWOT, is introduced by the author of the book "Competitive Advantage: Creating and Sustaining Superior Performance" (Porter, M. E., 2008).

The book "The Green Swans: The Coming Boom in Regenerative Capitalism" highlights how analytical models might support environmentally conscious corporate practices and sustainable innovation (Elkington, J., 2018).

Trends in sustainable development and the influence of political, economic, and technological elements on global company strategy are examined in the OECD report "The Future of Business Sustainability" (OECD, 2021).

Two crucial instruments in marketing and strategic management are PEST and SWOT analyses. In order to develop effective strategies, they are meant to assist organisations in comprehending both external and internal influencing variables. Although each firm has a different method based on their industry and operational environment, LEGO, Chase Sapphire, and Vingroup have all used PEST and SWOT analysis to find and implement environmentally friendly and sustainable growth plans. Here are the main distinctions in each company's strategic direction as well as how they have utilised these analytics to develop their green and sustainable growth plans.

## II. SUPPLIES AND TECHNIQUES

### 2.1. Research methodology and techniques

#### 2.1.1 Methods of research

This study assesses the use of SWOT and PEST scenario analysis in the green and sustainable development strategy of multinational corporations using a combination of qualitative and quantitative approaches. Particular techniques consist of:

– Review of Literature: Through scholarly publications, monographs, company reports, and international

organizations, compile and evaluate prior research on the use of PEST and SWOT in sustainable business strategy.

– Method of qualitative research: Interviews with experts: Interview researchers, strategists, and managers at multinational companies that use PEST and SWOT analysis for sustainable development in-depth. Content analysis: To create useful application models, examine the corporate reports and green development plans of businesses like Unilever, Tesla, Nestlé, IKEA, and others.

– Method of quantitative research: Analysis of secondary data: To assess the strategy's efficacy, consult financial reports, ESG (Environmental, Social, and Governance) reports, and corporate sustainability metrics. Statistical analysis: Assess the relationship between internal factors (SWOT) and company outcomes, as well as the influence of political, economic, social, and technical (PEST) aspects on sustainable strategy, using SPSS or Stata software.

**2.1.2. Methodology of research**

This study combines theoretical and empirical analysis using positivist and interpretive methodologies:

– Interpretivism Method:used to comprehend how companies use SWOT and PEST into their sustainability plans.based on case studies to extract knowledge from actual companies.

– The positivist Method: Test theories regarding the connection between PEST, SWOT, and a company's sustainability performance using quantitative data. Make use of sustainability performance metrics like CO2 emission reduction and the Dow Jones Sustainability Index (DJSI).

**2.1.3. Methodical examination of related research**

– The use of SWOT and PEST in strategic management and its application to sustainable development are examined in the paper "Contemporary Strategy Analysis (11th ed.)" (Grant, R. M., 2021).

– A corporate strategy model that includes an examination of the influence of PEST elements on sustainability may be found in the book "Exploring Corporate Strategy: Text and Cases (12th ed.)" (Johnson, G., Scholes, K., & Whittington, R, 2020).

– Competitive advantage and sustainable development are achieved by combining business environmental variables, according to the author of the book "Competitive Advantage: Creating and Sustaining Superior Performance" (Porter, M. E, 2008).

– According to Elkington (2018), the book "The Green Swans: The Coming Boom in Regenerative Capitalism" examines how companies might grow sustainably by implementing long-term strategies based on SWOT and PEST.

– The paper "A Viewpoint on Global Businesses and Climate Change: Insights from "An Inconvenient Truth"?" examines the employment of green practices by multinational firms to reduce the effects of climate change (Kolk, A., & Pinkse, J, 2008).

– In relation to PEST analysis, the publication "The Future of Business Sustainability" evaluates the sustainable development patterns of businesses (OECD, 2021).

– The PEST model is extended to PESTEL (containing environmental and legal aspects) and used to company strategy in the paper "Developing a Multi-Criteria Decision Making Model for PESTEL Analysis" (Yüksel, I., 2012).

**2.2. History of PEST situation analysis**

Political, Economic, Social, and Technological is what PEST analysis stands for. Businesses can use this external environment analysis methodology to find elements that may have an impact on their operations and business plans.

In order to better understand how environmental elements impact businesses, economic and management researchers developed PEST analysis in the 1960s and 1970s. Later, this model was broadened to incorporate other elements like legal and environmental considerations, and it was dubbed PESTEL or PESTLE.

**2.3. History of SWOT analysis**

A management technique called SWOT analysis is used to assess an organization's, project's, or business situation's Strengths, Weaknesses, Opportunities, and Threats.

Under the direction of Albert Humphrey, a research team at the Stanford Research Institute created the SWOT

model in the 1960s and 1970s. Finding out why organisations fail throughout the planning phase was the goal of the original study. Since then, SWOT analysis has grown in popularity and usage as a c For determining the internal and external elements influencing a firm, SWOT analysis is a helpful tool. SWOT analysis is frequently used in business initiative evaluation and strategic planning. PEST and SWOT differ in the following ways: company strategy tool.

### 2.4.Compare PEST and SWOT

**Scope**: SWOT encompasses both internal and external elements, whereas PEST concentrates on external factors over which the company has no influence.

**Purpose**: SWOT analysis assists firms in understanding their place in the business environment and identifying the strategies they need, whereas PEST is frequently used to analyse a company's macroenvironment.

By supporting one another, these two models can give companies a more thorough understanding of their place in the larger socio economic framework. (Assouline, S, 2019).

## III. RESULTS AND DISCUSSION ON PEST SITUATION ANALYSIS AND SWOT ANALYSIS OF LEGO AND CHASE SAPPHIRE AND VINGROUP

### 3.1. LEGO SWOT analysis and PEST situation analysis

One of the most well-known brands in the world, LEGO has a long history of success. It makes more than $4 billion a year and is the world's second-largest toy company as of 2021. **(IBISWorld, 2021).**

The following macroenvironmental elements that may have an impact on LEGO's activities are examined using PEST scenario analysis:

| **Political** | **Economic** |
|---|---|
| – To safeguard children's health, LEGO must adhere to stringent product safety regulations. +Since LEGO is a worldwide brand, adjustments to import and export duties will have an impact on their earnings, particularly in major regions like the US and China.(Business Source Ultimate, 2021). | – Consumer spending is impacted by the state of the world economy, particularly when it comes to non-essential things like LEGO toys. + Although LEGO toys are more expensive than traditional toys, their strong brand value and price retention draw middle-class and upper-class families. |
| **Social** | **Technological** |
| – Thanks to technological advancements, children now have more entertainment options, which eventually decreases their interest in conventional toys. Since their products foster children's creativity and logical thinking,<br>– LEGO takes advantage of the STEM and STEAM education trends. | – LEGO has introduced a number of technologically advanced goods that appeal to tech-savvy consumers, like LEGO Mindstorms and LEGO Boost.<br>– LEGO can maximise the sales process by utilising the e-commerce platform to reach global customers. |

The following elements are among the strengths, weaknesses, opportunities, and threats that LEGO's business may face and are examined using SWOT situational analysis:

| **Strengths+** | **Weaknesses -** |
|---|---|
| – LEGO has put together a group of seasoned professionals that are committed to creating innovative designs, technologies, and products. According to Assouline (2019), LEGO is already a well-known brand, particularly among kids and young people, with items available in more than 150 countries.<br>– A wide range of themes in a high-quality product line that caters to a variety of age groups and interests. Famous businesses like Marvel, Harry Potter, and Star Wars have partnered with LEGO. | – Because LEGO uses high-quality materials to make its products, manufacturing expenses might be considerable.<br>– LEGO products can be pricey, which may limit their attractiveness to consumers on a budget.<br>– Limited customer base: remains primarily limited to children and families (The Times 100, 2019). Due to rivalry from other toy businesses and video and digital games, LEGO may have a restricted market share and room for growth (The Times 100, 2019). |
| **Opportunities +** | **Threats -** |

| | |
|---|---|
| – Growing the education market: LEGO has the chance to increase the number of STEM-related educational products it offers in classrooms.<br>– Green consumption trend: To keep up with this trend, LEGO might increase the number of products made from recycled plastic or eco-friendly materials.<br>– In order to provide fans with fresh and fascinating building experiences, LEGO has the chance to form strategic alliances with other well-known companies and franchises. (2019, The Times 100). | – Competition from alternative products: Children's attention is being drawn to digital games and smartphone apps, which is lowering the market for conventional toys.<br>– Price fluctuations for raw materials: Since plastic is the primary raw material used in LEGO, changes in the price of raw materials may have an impact on production costs.<br>– Intellectual property rights must be upheld by LEGO. LEGO faces the threat of counterfeiters stealing its designs and intellectual property as it develops new goods (The Times 100, 2019). |

Suggestions derived from the examination of LEGO: 1. Creating mobile gaming applications with LEGO characters and sets might give fans a new opportunity to interact with the brand and increase sales of connected goods. 2. Virtual Building: establishing a platform for virtual construction where enthusiasts can construct and share their own LEGO creations. 3. LEGO emphasises techniques that integrate the digital and physical worlds (Cordon et al., 2016). LEGO mapped their current core value offer to the market opportunity using PEST and SWOT studies. The secret to LEGO's success is its constant adjustment to shifting consumer tastes and industry trends, all the while maintaining its investment in R&D to keep its products appealing and relevant. lead clients.

### 3.2. SWOT and PEST scenario analysis of Chase Sapphire

PEST analysis helps businesses better comprehend the value framework by providing insight into external elements from both local and global perspectives. These factors include the following:

| **Political** | **Economic** |
|---|---|
| – Credit cards are impacted by government policies and regulations, modifications to consumer protection legislation, and government rules pertaining to privacy and the security of financial data. Ultimate Business Source, 2021).<br>– Chase must guarantee adherence to stringent security regulations, particularly with regard to personal data protection laws like the CCPA (USA) and GDPR (EU). The banking sector is subject to stringent government regulations, including those pertaining to interest rates, debt management. | – The state of the economy has an impact on credit card usage and consumer spending. effects of international economic variables on the travel and hospitality sector. Since personal consumption is still at 7.59% in 2022, there may be more demand for Chase goods.<br>– Banks rely significantly on interest rates, which have a direct impact on their bottom line. Chase Sapphire has an opportunity as customers seek integrated, convenient financial services with alluring benefits.(European Business Magazine, 2024). |
| **Social** | **Technological** |
| – Customers who want a high-end experience are the objective of Chase Sapphire's incentive programs for middle- and high-end clients.<br>– As consumers' awareness of privacy and financial security grows, they seek out high-security services.<br>– The focus on sustainable tourism is growing due to trends in tourism and hospitality. Millennials are becoming a target market as a result of shifting demographics.. (IBISWorld, 2021). | – Technological developments that produce mobile payment options have affected the credit card sector. Digital marketing and data analytics are becoming more and more crucial for identifying and interacting with consumers. (IBISWorld, 2021).<br>– Chase Sapphire makes extensive use of technology in digital banking services to give clients a simple and adaptable experience. Chase has a competitive edge thanks to AI's application to enhance security and customer service. |

The following elements are among the SWOT analysis's strengths, weaknesses, opportunities, and threats that could have an impact on Chase Sapphire's operations:

| Strengths+ | Weaknesses - |
|---|---|
| – Chase Sapphire is renowned for its strategic alliances with lodging and travel businesses as well as its top-tier rewards and perks programs. enticing promotional and introductory deals for new clients. IBISWorld (2021).<br>– Chase uses cutting-edge technology to protect consumer data and transactions. By offering superior customer service via its wide retail network, JP Morgan Chase has achieved a competitive edge. | – The high annual fee required by Chase Sapphire may deter many clients and restrict opportunities for development in other areas. Some consumers may be deterred by the Sapphire card's high annual fee. When compared to comparable credit cards, the card's overseas transaction fees might not be competitive. Some consumers might find the conditions to be too onerous in order to qualify for the bonus.(Gonzales, R, 2017). |
| **Opportunities +** | **Threats -** |
| – Chase can increase its consumer base by leveraging digital trends. Chase might broaden its reward programs to attract consumers who enjoy luxury goods and travel.<br>– By 2050, the Asian market will account for almost 60% of the global GDP because toits growing population and GDP, which presents Chase with a significant chance to grow its market share (Sturgess, 2017). | – Traditional banks are facing a serious threat from fintech and digital banks. The potential of fraud and security issues rises in tandem with the growth in online transactions.<br>– The state of the economy may have an impact on consumers' purchasing power. The profitability of credit card firms may be impacted by changes to legislation or regulations. (Chin Tiong Tan - Lipika Bhattacharya, 2020). |

It is evident from PEST and SWOT studies that Chase Sapphire faces both opportunities and difficulties in both its internal and external contexts. Chase Sapphire can keep setting itself apart from its rivals and expanding its clientele by implementing a varied marketing approach. However, in keeping with long-standing customs and aiming for further development, Chase must keep providing high-tech products to address global issues and add value for consumers and society.

### 3.3. Vingroup's SWOT and PEST situation analyses

Vingroup's operations may be impacted by the following macro environmental elements, which are examined using PEST analysis:

| Political | Economic |
|---|---|
| – The political climate in Vietnam is relatively stable, which makes it easy for businesses to grow, particularly big companies like Vingroup. Vingroup benefits from the government's pro-business policies in Vietnam.<br>– Vingroup operates in a variety of industries, including real estate and auto manufacturing, so it must abide by stringent regulations. | – The constant GDP growth rate in Vietnam has created favourable conditions for Vingroup's operational industries, including healthcare, real estate, and commerce. Vietnam's economic expansion makes it possible for Vingroup to grow in a number of industries, including healthcare and education. As the country integrates globally, several foreign businesses invest, putting pressure on Vingroup. **(Cordon et al., 2016).** |
| **Social** | **Technology** |
| – Vingroup can grow in sectors like Vinmec (healthcare) and Vinschool (education) as a result of consumers' growing interest in these areas.<br>– In order to maintain a competitive edge, Vingroup must recruit top talent, which is difficult in a competitive market.<br>– Customers are more interested in upscale, convenient services for products like VinHomes and VinPearl. Environmentally friendly products are becoming more and | – Vingroup is making significant investments in the technology sector, particularly in VinFast and VinAI, which help the group stay competitive and stay up to date with technological trends.<br>– VinFast is one of the first companies in Vietnam to introduce electric vehicles and is aiming for international markets, particularly those that prioritise eco-friendly technology. Vingroup is improving |

| | |
|---|---|
| more popular, giving Vingroup the chance to create VinFast. | customer experience and streamlining procedures by digitally converting businesses including VinMart, VinSchool, and Vinmec. |

The following elements are among the ways that Pham Nhat Vuong's Vingroup uses SWOT analysis to maximise opportunities, strengthen strengths, and reduce risks:

| **Strengths +** | **Weaknesses -** |
|---|---|
| – Vingroup is a well-known and reliable brand in Vietnam, with a broad range of investments in industries including technology, real estate, cars, healthcare, and education. Vingroup's multi-sector operations allow it to reduce business risks and capitalise on opportunities across many industries.<br>– Vingroup is able to invest in major initiatives because to its strong financial resources, particularly in the manufacturing of electric vehicles and technology.To improve its competitive position, Vingroup concentrates on emerging technological sectors like smart real estate, artificial intelligence, and electric cars. | – A significant amount of Vingroup's revenue still comes from real estate, so any changes in this market could have a negative impact on the business. Resources are needed to invest in new fields like VinFast and VinAI. High risks and a large investment, particularly in the early phases of development.<br>– Vingroup struggles to recruit and retain tech expertise in the face of fierce competition from global tech firms. |
| **Opportunities +** | **Threats -** |
| – Vingroup has the chance to grow its market and offer more high-quality goods and services because of the steady economic growth and the expanding middle class.<br>– As consumers' interest in green, eco-friendly products grows, Vingroup has the chance to develop its technology products and the Vin Fast electric car line. Vingroup intends to bring VinFast to the worldwide market, which is a fantastic chance to solidify its position as a global player and boost sales.( Hong Hiep Le, 2019). | – Vingroup faces intense competition, particularly in the electric vehicle sector, due to the participation of numerous large foreign corporations in its operations.<br>– Vingroup's revenue and operating costs can be impacted by factors like inflation and market fluctuations, particularly for projects requiring significant investment capital. Business strategies may be impacted by modifications to management rules and laws, particularly in the automotive and real estate sectors. |

Pham Nhat Vuong's Vingroup can maximise opportunities, strengthen strengths, and reduce risks by having a solid understanding of PEST and SWOT scenarios. Vingroup must, however, encourage digital transformation, create high-value goods and services, and diversify its investment portfolio to lessen its reliance on real estate if it is to maintain sustainable development. create and capitalise on emerging trends like international development and green technologies.

### 3.4. To ascertain each company's green and sustainable growth plan and the variations in their strategic orientation, Vingroup, LEGO, and Chase Sapphire Study employed PEST Situation Analysis and SWOT Analysis.

#### 3.4.1. LEGO: Green and Sustainable Development Strategy:

**A Sustainable Development Path for the Toy Industry.**

In order to support sustainable development activities, LEGO has used PEST and SWOT analysis, particularly in its supply chain and products:

– Making the switch to recycled materials: According to the PEST analysis, LEGO has been substituting recycled and bioplastics for conventional plastics in its products after observing pressure from societal and political considerations regarding the need to utilise environmentally friendly materials.

– Cutting emissions: As part of its efforts to lessen its carbon footprint, LEGO plans to run its manufacturing process entirely on renewable energy. The demand for eco-friendly products is rising, according to the economic study, which

enables LEGO to transition to a green production model while maintaining profitability.

– Product-based environmental education: LEGO integrates sustainable development and environmental education into its STEM product sets to help kids learn about environmental protection from a young age.

**Disparities in the Strategic Path**

Being an educational toy company, LEGO has the benefit of emphasising the incorporation of environmental consciousness into their products. In addition to modifying materials, LEGO's plan aims to educate consumers and change the way the next generation thinks about environmental conservation.

### 3.4.2. Chase Sapphire: A Financial Services Approach to Sustainable Development

**Strategy for Green and Sustainable Development**

Targeting the upscale clientele, Chase Sapphire, a division of JPMorgan Chase Bank, has modified its sustainable growth strategy using PEST and SWOT analysis:

– Investing in green projects: Chase Sapphire is dedicated to using loans and financial investments to support renewable energy and sustainable development initiatives. The US government has prioritised sustainable energy initiatives, according to PEST data, therefore Chase can follow the trend and create an eco-friendly image by funding these projects.

Offering green banking services: Chase Sapphire has created "green" financial solutions, including savings accounts devoted to ecological initiatives and credit cards that do not use conventional plastic.

– Improving security and cutting emissions with digital technology: Chase uses digital technology and digital banking to cut down on printed paper, lower its operational carbon footprint, and use high-security technologies to safeguard the privacy of its customers.

**Strategic Direction Differentiation**

For its affluent clientele, who are more concerned with environmental preservation and ethical consumption, Chase Sapphire has a distinct focus on eco-friendly financial goods. Instead of concentrating on consumer goods, Chase's sustainable development prioritises funding and investment for environmentally friendly projects.

### 3.4.3. Vingroup: Multi-Sector Green and Sustainable Development Strategy with Sustainable DevelopmentStrategy

Vingroup has used PEST and SWOT analysis to create sustainable business plans that work for a range of industries, including healthcare, education, real estate, and auto manufacturing:

– VinFast electric car development: PEST study demonstrates the global and Vietnamese trends towards green consumption. To cut pollution and advance a sustainable transportation future, Vingroup is concentrating on creating VinFast electric cars. This is Vingroup's primary approach to foreign market expansion, satisfying the demand for the use of electric vehicles.

– Creating eco-friendly communities and green buildings: Vingroup has created eco-friendly metropolitan regions with water recycling and energy-efficient building designs. This project offers people a green living environment and satisfies the growing need for ecologically friendly housing.

– Promoting sustainable healthcare and education: Vingroup creates comprehensive, eco-friendly healthcare and education services in the healthcare and education sector, from reducing medical waste to employing renewable energy to teaching students about environmental preservation.

**Disparities in the Strategic Path**

Vingroup's sustainable development approach is more extensive than those of LEGO and Chase Sapphire, impacting a wide range of sectors, including real estate, healthcare, education, and vehicles. In addition to creating eco-friendly products, Vingroup is committed to creating a sustainable ecosystem, from green homes to public services that promote sustainable growth.

## 3.5. Compare Vingroup, LEGO, and Chase Sapphire's approaches to green development

| Company | An emphasis on green development | Disparities in the Strategic Path |
|---|---|---|
| LEGO | Emphasise eco-friendly items and teach kids about protecting the environment. | By integrating education with toys, green development raises consumer awareness in a way that lasts. |
| Chase Sapphire | Invest in sustainable financial products and ecological initiatives, with a particular emphasis on financial services. | Green financial goods and investments in eco-friendly projects are the main for cusses of sustainable development. |
| Vingroup | creating eco-friendly cities, electric cars, and sustainable health and education. | Building a sustainable multi-sector ecosystem, directly impacting the community and international markets. . (Einhorn, B et all, 2020 ) |

## IV. CONCLUSION

Based on PEST and SWOT analysis, LEGO, Chase Sapphire, and Vingroup each have unique strategies for sustainable development. Chase Sapphire concentrates on green financial products and investing in eco-friendly projects, whereas LEGO uses green development as an educational tool. With its advantages across several industries, Vingroup has established a sustainable ecosystem and for cusses on green consumption across a wide range of industries, including electric automobiles, real estate, healthcare, and education. This amply illustrates how each company's approach to sustainable development can be tailored to suit its geography and industry. Many multinational corporations worldwide can learn from the development strategies and success of the three organisations to employ PEST and SWOT analysis when creating sustainable and green development plans for expansion. and grow.

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# COMPETITIVE TRADE OPENNESS IMPROVES SOVEREIGN SOLVENCY IN LOW-AND MIDDLE-INCOME COUNTRIES – A PANEL VECTOR AUTOREGRESSION ANALYSIS

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**ABSTRACT**

Globalization and digitalization raise demand of goods and have wide-ranging impacts. Today, logistics is a crucial component of a supply chain supported by internet platforms concerned with consumer pleasure and service. To fill in the gaps in the evaluation of variables that impact perception, buying behavior, and service satisfaction, particularly when shopping online, customers' willingness to pay for the logistics service should be studied. The paper presents an investigation into challenges and concepts concerning customer willingness to pay as well as research methodologies based on peer-reviewed materials. As a consequence, cost, time, dependability, flexibility, and value-added services are utilized to evaluate client payment behavior. In particular, value-added services in logistics are unnecessary extras that enhance a product or service, often based on the cost-to-make ratio. In addition, customer's willingness to pay is also depending on respondent characteristics, with age and gender being moderate factors. The stated preference approach is used to comprehend and assess consumer preferences. The purpose of this article is to reflect the elements influencing stated choice in anticipating consumer behavior and to assist managers in providing more cost-effective service and improved distribution on online platforms.

*Key words:* “digitalization”, ”willingness to pay”, “online platforms”, “logistics service”

(Abstract only)

# DEVELOPING SHARING ECONOMY IN TOURISM FORWARDS POVERTY REDUCTION IN THE NOTHERN MOUTAIN PROVINCES OF VIETNAM

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**ASTRACT**

The sharing economy model (SE) is becoming increasingly popular due to the development of science and technology and there is a great deal of interest in the potential of these models such as efficient use of resources; economic, social, cultural and environmental benefits; creating new markets... This study will focus on analyzing the prospects of the SE model in the tourism sector associated with the national goal of poverty reduction in the northern mountain region of Vietnam. The study uses the Cronbach Alpha test method; T - test based on survey data with a scale of 200 samples in 03 Nothern mountain provinces including Phu Tho, Yen Bai and Ha Giang. The research results revealed that: The SE model in tourism brings economic opportunities for poverty reduction in these 3 provinces.

*Key words*: "Sharing economy", "tourism", "Poverty reduction", "Mountain provinces"

## I. INTRODUCTION

### 1.1. Background of the study

Sharing and collaborative behaviors have deep historical roots, serving as essential components for both survival and the development of social bonds (Miguel et al., 2022). While early forms of SE were primarily motivated by community building, social connections, charity, and non-monetary transactions, the contemporary model is increasingly driven by commercial interests. The global economic downturn prompted a reassessment of consumer spending habits, leading to innovative approaches for utilizing underutilized assets through peer-to-peer interactions on online platforms. This shift fostered a move towards sharing and collaboration over ownership. The rise of the SE was significantly influenced by the financial crisis in the early 2010s, coinciding with the rapid adoption and expansion of a new generation of digital multi-sided platform services. According to Google Trends, awareness of the term "SE" surged in 2013 (Bergh et al., 2021), marking the onset of its rapid growth in popularity in subsequent years.

The raise of variety global sharing platforms in mobility (i.e. Uber, Lyft, Grab…), accommodation (i.e. Airbnb; CouchSurfing…) and food supply (i.e Eat With), has challenged the traditional tourism structures by introducing an inclusive model (Fang et al, 2016). This model offers incredible potential to enable much greater access for communities which have often been excluded from or are unable to meet their needs through the traditional one (Belk 2014).

Other the hands, the rise of SE in tourism has been driven by contemporary trends and tourist preferences that favor engaging experiences over conventional, impersonal mass travel. Nowadays, tourists seek to immerse themselves in the local environment, demonstrating a heightened appreciation for the authentic uncontrived contexts (Tussyadiah et al., 2015; Forno et al., 2015). These emerging trends reflect a contemporary tourism demand model referred to in the literature as "relational tourism". This model emphasizes human interactions that rely on creativity and engagement with local contexts and services typically provided by small businesses or SMEs. Here, local culture serves as the cornerstone of genuine tourist experiences (Richards, G. 2014). And according to Paulauskaite et al. (2017), a key factor of authenticity within sharing platforms like Airbnb is the notion of "living like a local," while experience co-creation enhances these feelings of authenticity. Other contributing factors to the growth and proliferation of SE practices in tourism include innovations in digital technology that provide quality data sharing platforms; advancements in digital payment systems that enable peer-to-peer transactions after services are rendered; and the increasing of smartphones owners (Bakker et al, 2018).

In the tourism sector specifically, there are numerous platforms and mobile applications to support consumer and provider. The Timbro SE Index (SEI) represents the first global index dedicated to assessing this model; 4,651 services candidates in 213 countries were collected and evaluated however classifies only 286 as true SE services (Bergh et al,

2021). Current practices within this sector appear most pronounced in areas such as accommodation, transportation, food supply chains, tours, and guided experiences (Bergh et al, 2021).

As the population grow rapidly and economic activities broaden, nations such as Vietnam—especially its northern mountainous provinces—confront challenges that threaten their prosperity. The Sustainable Development Goals tackle these global issues by a comprehensive framework aimed at fostering a more equitable, sustainable, and peaceful world (Mensah, J. 2019). Advocates of the SE model contend that it offers a viable solution for alleviating poverty by optimizing the underutilized assets and reducing inequality through income generation for individuals from diverse socio-economicbackgrounds (Szymanska, A.I. 2021). Furthermore, the research of Dabbous and Tarhini (2019) show that the SE model provides the opportunity to become micro-entrepreneurs to individuals from diffirent socio-economic backgrounds, thereby bringing in more income through their available assets. Similarly, the potential for profit or additional income opportunities significantly influences participation in providing tourism services within the sharing economy (Gazzola et al., 2018). This perspective is also reflected in analyses conducted by other researchers. In agreement, Lai Thi Tuyet Lan (2020) and Navickas et el (2020) suggest that developing the SE in the tourism industry, such as Airbnb's accommodation-sharing platform, contributes to increased income and job creation for local residents.

Sharing activities in tourism transformed it into a more inclusive business model compared to traditional approaches by creating new opportunities for impoverished and low-income group. While previous studies examined the opportunities and challenges of shared tourism activities broadly (Pizam, A. 2014; Bremser, K and Alonso-Almeida M, 2017; Skalska, T 2017), evaluating the specific impact of these activities on low-income communities remains challenging. This difficulty arises from a lack of analytical research exploring how shared tourism models influence low-income populations, coupled with their generally low participation rates in such initiatives (Business for Social Responsibility, 2016).

### 1.2. Research Questions

To address this gap, the study seeks to answer key research questions regarding the current situation of the SE in tourism and its potential opportunities for poverty reduction in the northern mountainous provinces of Vietnam.

The primary research question is: What opportunities does the SE in tourism present for poverty alleviation in these northern provinces, and how can Vietnam governmen constrains the potential opportunities for poverty reduction? The next research question focuses on analyzing current situation of the SE in tourism and finding solutions to encourage participation in tourism activities of SE, particularly among low-income group.

## II. MATERIAL AND METHOD

### 2.1. Conceptual Foundation

#### 2.1.1. Sharing Economy

In recent years, there has been significant growth in the variety of terms used to describe a particular economic model. It facilitates the utilization of assets and skills at levels closer to the full potential while optimizing limited resources and underutilized assets through cooperative matches among diverse needs. Terms such as collaborative consumption, collaborative economy, on-demand economy, zero-marginal-cost economy, crowd sourcing, crowd-based capitalism, and SE have emerged prominently. While these terms refer to the same underlying economic framework, each offers distinct perspectives on its nature and application. (Kostakis and Bauwens, 2014; Sundararajan, 2016; Selloni, 2017; Aluchna and Rock, 2018).

#### 2.1.2. Sharing Economy in tourism

The SE in the tourism sector is highly diverse and continuously evolving, encompassing a broad range of areas where individuals are willing and able to share resources. This tourism-SE leverages innovative ideas and technologies to enhance granting access to tourism assets, thereby generating revenue from existing surplus goods and services. The core of this concept is the principle of shared consumption, which prioritizes access over ownership.

#### 2.1.3. Poverty reduction

Poverty is a phenomenon that extends beyond the lack of basic necessities such as water, healthcare, food, education, housing, and clothing. Futher more, it also encompasses secure employment for building human capital and

achieving social status, along with inadequate physical safety, limited voice in decision-making, and restricted opportunities for self-improvement. In this context, Sen, Amartya (1999) defines poverty as the inability to fulfull fundamental needs, including adequate nutrition, access to healthcare for maintaining a healthy life a healthy life, and acquisition of necessary skills for social and economic participation. This perspective aligns with the characterization provided World Bank (2022) which refers poverty not only as a lack of income but also insufficiency in meeting essential basic needs and achieving human development. Therefore, poverty reduction addressing widespread attention and a sustained effort aimed at identifying factors contributing to its long-term mitigation.

### 2.2. Research method

#### 2.2.1 Research Hypotheses

H1- The SE in tourism industry offers valuable economic opportunities for impoverished communities in the northern mountainous provinces of Vietnam.

H2 - The SE in tourism industry offers valuable social opportunities for impoverished communities in the northern mountainous provinces of Vietnam.

H3 - The SE in tourism industry offers valuable environmental opportunities for impoverished communities in the northern mountainous provinces of Vietnam.

#### 2.2.2. Data collection

The survey method was used in order to answer the research questions. A questionnaire is designed to collect data related to SE current situation in tourism and indicat its potential impacts on the poverty reduction in the Northern mountain provinces of Vietnam. It is consisted of two parts, the first part aims at identifies SE practices in tourism in the Northern mountain provinces of Vietnam. The purpose of next part is exploring the potential opportunities of SE practices in tourism for poverty reduction in the Vietnam's Northern mountain provinces conducted from previous literature using five Likert scale. The questionnaire was pre-tested by experienced academics, representatives of platforms, participants of sharing in tourism activities, and representatives of tourism governmental agencies in Vietnam. A survey of 200 individuals was administrated in three ways (Email and messenger; Telephone; Face to face interview) during the period of November 2023 to March 2024. The number of valid questionnaires reached 176 respondents which represent 88%.

#### 2.2.3 Data Analysis Approach

Descriptive analysis is used to describe the current situation of SE in tourism in the Northern mountain provinces of Vietnam.

Mean and Std. Deviation are calculated to evaluate the potential opportunities of SE in tourism for the poor in the Vietnam northern mountain provinces. Potential opportunities are devided into 3 pillars: Economic pillar; Social pillar and environmental pillar.

- One sample T test is used to determine the significance of the research hypotheses.

## III. RESULT AND DISCUSSION

### 3.1. Current landscape of sharing economy in Tourism in the provinces of Northern Vietnam.

The first question directly anwsered about the level of participation in SE activities related to tourism in the Northern provinces of Vietnam. It can be seen that about 53.6% of respondents rated their level of participation as low. Meanwhile, 34% voted as moderate, and only 12.4% considered it high. Futhermore, participants indicated that accommodation was the predominant practice within the SE in tourism in the Northern provinces of Vietnam, accounting for 82.2%, followed by transportation at 10.9%, and guiding services at 27%. However, most responses fell within the moderate to low range, consistent with their earlier assessments regarding participation levels in SE activities.

When asked about income levels among participants engaged in these activities in the Northern provinces of Vietnam, responses revealed that 66.7% identified themselves as middle-income earners, while 23% classified themselves as high-income earners and just 10.3% reported a low-income status. These findings suggest a limited engagement from poorer and lower-income groups.

Regarding motivations for participating in SE activities within tourism in the Northern provinces of Vietnam, economic factors emerged as paramount, with unanimous agreement (100%) among respondents.

Lastly, when participants were asked to identify barriers to involvement in SE activities related to tourism in the Northern provinces of Vietnam —drawing insights work—results highlighted several challenges: all respondents agreed on a lack of awareness regarding opportunities (100%), followed by low personal capacity (73,86%).

**Table 3.1 - Factors hindering suppliers from participating in tourism - sharing economy in the provinces of Northern Vietnam**

| Barriers | Number of participation | % |
|---|---|---|
| Lack of knowledge of the opportunities | 176 | 100 |
| Low personal capacity | 130 | 73,86 |
| Lack of trust between (people, date, System, process) | 55 | 31,25 |
| Lack of infrastructure | 37 | 21 |
| Complex monetary payment transactions | 40 | 22,72 |

### 3.2. Potential opportunities of sharing economy in tourism for poverty alleviation in the Northern Vietnam's provinces

Respondents evaluate the potential opportunities under three main pillar economic, social and environmental by using 5 Likert scale (between very liely and very unlikely) and the results are illustrated in table (2).

**Table 3.2 - Mean, Std. Deviation, Skewness, and Kurtosis of feasible benefits**

| | Mean | Std. Deviation | Variance | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| **I. Economic** | | | | | | | |
| Create jobs for the underemployed | 4.1649 | 1.06732 | 1.139 | .229 | .245 | .858 | .485 |
| Enable individuals to increase their income | 4.8247 | .38216 | .146 | .035 | .245 | .032 | .485 |
| -Enable vulnerable or underserved groups (women) | 3.7629 | 1.14358 | 1.308 | .085 | .245 | .176 | .485 |
| Make finding a new or part time job easier | 3.9691 | .97311 | .947 | .045 | .245 | .149 | .485 |
| Allow resource reallocation in weak communities | 3.0515 | 1.07213 | 1.883 | .043 | .245 | .025 | .485 |
| **II. Social** | | | | | | | |
| Stimulate Community capacity building | 4.1959 | 1.27997 | 1.638 | .172 | .245 | .837 | .485 |
| Enhance cultural Development | 4.0206 | .96802 | .937 | .119 | .245 | .567 | .485 |
| Dimish social inequality | 4.1340 | 1.11995 | 1.742 | .362 | .245 | .747 | .485 |
| **III. Environment** | | | | | | | |
| Reduce material in construction | 2.6701 | 1.09733 | 1.953 | .308 | .245 | .185 | .485 |
| Reduce energy and water consumption | 1.8557 | .96813 | .937 | .281 | .245 | 1.048 | .485 |
| Decrease waste production | 1.7526 | .89012 | .792 | .874 | .245 | .137 | .485 |

The survey result indicates that enable individual to increase their income (4.8247)"is the most likely opportunities. The following are the stimulate community capacity-building"(4.1959); create jobs for the underemployed (4.1649);"diminish social inequality"(4.1340); enhance cultural and behavior development"(4.0206)"and finding a new or additional part time job easier (3.9691). In contrast, decrease waste production"(1.7526)"is the very unlike opportunities.

### 3.3. Hypotheses Testing:

One sample T test is used to test the hypotheses. It tests what scientists call the null hypothesis and a claim is shown to be valid by demonstrating the improbability of the counter-claim that follows from its denial.

**Table 3.3 - One-sample t test**

| H0: mean = 3 vs. Ha: mean > 3 | | | | | | |
|---|---|---|---|---|---|---|
| | t-value | Df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| H1 | 8.4436 | 96 | 0.0000 | 0.8568 | 0.655376 | 1.058224 |
| H2 | 5.7861 | 96 | 0.0000 | 0.6443 | 0.655376 | 1.058224 |
| H3 | -9.0691 | 96 | 0.9980 | -0.0928 | -0.708638 | -1.105762 |

For H1: The null hypothesis is rejected as the p-value is (0.0000), and the alternative is accepted.

For H2: The null hypothesis is rejected as the p-value is (0.0000), and the alternative is accepted.

For H3: The null hypothesis is accepted as the p-value is (0.9980), and the alternative is rejected.

These results lead to accepting H1 and H2 that SE in tourism offers economic and social opportunities for the poor in the provinces of Nothern Vietnam, denying H3 that SE in tourism delivers environmental advantages for the poor in the nothern provinces in Vietnam.

## IV. CONCLUSION

The academic literature, along with broader practical discussions, posits that the SE within the tourism sector represents a sustainable and inclusive business model that optimizes surplus resources. Through its varied practices—spanning accommodation, transportation, and tour guidance—the SE has generated economic, social, and environmental benefits conducive to sustainable poverty alleviation in the northern provinces of Vietnam. It is strongly recommended to implement a strategic vision that promotes a sharing model within the tourism sector of northern Vietnam, leveraging these opportunities to improve livelihoods for impoverished and low-income communities.

For this strategy to succeed, it is imperative that the following solutions be implemented.

Firstly, it is essential to raise awareness of sharing activities within the tourism sector and their potential to enhance the livelihoods of local populations. This can be achieved by promoting greater inclusion throughout all supply chains related to tourist services and disseminating cultural paradigms and norms that embrace the sharing economy within impoverished and low-income communities. Secondly, providing financial and technical support is crucial. Finally, it is important to design training programs that identify community potentials while addressing existing barriers.

This study has limitations concerning data collection; specifically, the survey primarily targets respondents in three northern mountainous provinces of Vietnam, resulting in a small sample size. Expanding the research to include a more diverse population could improve accuracy and generalizability of findings. Additionally, another limitation of this study lies in its exclusive focus on opportunities without addressing potential challenges.

Future research should investigate the potential challenges associated with the sharing economy in tourism for marginalized populations. It should also propose strategies for overcoming barriers to participation in sharing economy activities within the northern provinces of Vietnam.

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# ECONOMIC DEVELOPMENT AND ENVIRONMENTAL PROTECTION IN HO CHI MINH CITY: THEORETICAL AND PRACTICAL

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**ABSTRACT**

Ho Chi Minh City, as the nation's center of economy, culture, and science-technology, aims to "build a smart, rapid, and sustainable city while maintaining its role as the economic locomotive of the country". This objective emphasizes "harmonious development of the economy, culture, and society; environmental protection; and adaptation to climate change" (Ho Chi Minh City Party Committee, 2020, p. 168). The city has achieved notable accomplishments in economic development and environmental protection, contributing to improved living standards for its residents and laying a solid foundation for more rapid and sustainable growth in the future. However, the city still faces numerous challenges in economic development that hinder sustainable growth, with unresolved environmental issues and increasingly complex climate change posing significant obstacles. This article explores the theoretical and practical foundations of economic development and environmental protection in Ho Chi Minh City, offering solutions to leverage achievements and mitigate challenges to enhance this relationship in the future.

*Keywords:* "Economic development", "environmental protection", "Ho Chi Minh City", "sustainable development"

## I. INTRODUCTION

Ho Chi Minh City, with a natural land area accounting for only 0.6% of the country's total area and a population of 9.2 million, holds a significant position as an economic, cultural, scientific-technological, and educational-training center of Vietnam. The city has achieved remarkable economic development, maintaining a high economic growth rate, possessing the largest economic scale in the country, contributing approximately one-fifth of the national GDP and more than one-fourth of the state budget revenue, and leading the nation in FDI attraction, import-export activities, and the number of active enterprises, which account for nearly 30% of the country's total. On this basis, environmental protection efforts have become increasingly effective, contributing to improving the quality of life for the city's residents. These transformations demonstrate the city's commitment to "harmonizing economic and socio-cultural development, protecting the environment, and adapting to climate change" (Ho Chi Minh City Party Committee, 2020, p. 168).

However, in recent years, Ho Chi Minh City's economic growth rate has shown signs of slowing down. At the same time, rapid population growth, climate change, and increasingly complex environmental pollution issues pose significant challenges. Therefore, to realize the goal of "building a smart, fast, and sustainable city while maintaining its role as the country's economic locomotive" (Ho Chi Minh City Party Committee, 2020, p. 40), the city must properly address the relationship between economic development and environmental protection.

## II. RESEARCH METHODOLOGY

In this article, the author employs the dialectical materialism and historical materialism methodologies. Additionally, the research is grounded in Marxist methodological principles such as objectivity, comprehensiveness, development, and historical specificity. Specific research methods utilized include analysis and synthesis, comparison and contrast, historical and logical approaches, interdisciplinary research methods, and the systematization and philosophical generalization method (Tri, N.M., & Hoa, L.T., 2023).

## III. RESEARCH RESULTS

### 3.1. Theoretical framework of economic development and environmental protection

The term "economic development" is defined from various perspectives and research objectives. According to the Dictionary of Economics, "Economic development is the process of economic transformation associated with structural

changes in the economy through industrialization, an increase in gross domestic product, and per capita income" (Nguyen Van Ngoc, 2006, pp. 410-411). The Vietnamese Encyclopedia defines it as "the process of transforming the national economy by increasing production and improving the standard of living of the population" (Vietnamese Encyclopedia, vol. 3, 2003, p. 425). These definitions view economic development as a comprehensive process of economic growth, structural transformation towards rationality, efficiency, and modernization, integrating economic development with social justice and progress.

Environmental protection is defined by the 2020 Vietnam Environmental Protection Law as "activities that prevent and mitigate adverse impacts on the environment; respond to environmental incidents; remedy pollution and environmental degradation; improve environmental quality; utilize natural resources and biodiversity rationally; and respond to climate change" (Environmental Protection Law, 2020, Article 3, Clause 2). Humans are the main agents of environmental protection, and it is both a responsibility and an obligation for everyone.

Economic development and environmental protection are two fundamental pillars of sustainable development, inseparable from each other and from the remaining pillar, which aims to achieve "a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (UENP, 2011, p. 107). In essence, sustainable development represents a holistic approach to progress, acknowledging the interdependence of economic, social, and environmental factors to achieve long-term prosperity while preserving and enhancing the well-being of both present and future generations (Tri, N. M., 2024). From an economic perspective, sustainability "requires ensuring long-term economic growth through efficient and high-performance methods on a large scale" (Tri, N. M., 2024). From an environmental perspective, sustainability emphasizes that social progress should not come at the expense of environmental degradation, highlighting the importance of protecting ecosystems and ensuring that future generations can benefit from natural resources and a pristine environment. Throughout the development process, the responsible exploitation and use of natural resources are crucial, along with efforts to protect, nurture, and rejuvenate them, maintain ecological balance and biodiversity, and minimize environmental degradation (Tri, N. M., 2024). Therefore, the dialectical relationship between economic development and environmental protection is reflected in the following key aspects:

First, economic development has a significant impact on environmental protection. Economic growth provides the material foundation for environmental protection, as increased social wealth and accumulation enable structural transformation towards modernization, allowing for the rational and scientific use of natural resources, waste reduction, efficiency improvement, and environmental protection. Economically developed nations possess sufficient financial resources to invest in green infrastructure, such as modern public transportation systems that reduce CO2 emissions or ecosystem restoration projects that generate income for local populations while effectively preventing environmentally harmful activities. Economic growth also fosters advancements in science and technology, promoting a transition in production methods towards "wise resource utilization, pollution reduction, environmental protection and restoration, improved quality of life, and responsible economic development" (Tri, N. M., 2024). However, if economic development prioritizes short-term profits while neglecting environmental concerns, excessive resource exploitation and pollution emissions beyond the ecosystem's absorption capacity can lead to severe environmental degradation, which in turn becomes a constraint on future economic growth. "Studies estimating the loss of environmental resources relative to GDP suggest figures ranging from a few percent to over 10%" (Do Phu Hai, 2018). Therefore, a comprehensive socio-economic development strategy must be aligned with a synchronized environmental protection strategy to maximize the positive impacts of economic progress on environmental sustainability.

Second, environmental protection can either promote or hinder economic development in the following ways: (1) Environmental protection serves as a driver for rapid and sustainable economic development by safeguarding productive capacities, maintaining essential inputs for production, and creating favorable conditions for broad and deep economic growth. According to Stern, strict environmental policies can drive technological innovation, thereby increasing labor productivity (Stern, D. I., 2004). Measures such as developing renewable energy, improving energy efficiency, and managing resources sustainably can help reduce production costs in the long run (Porter & Van der Linde, 1995), laying the foundation for green production, a green economy, and green consumption. (2) Environmental protection contributes to comprehensive human development, which is a key driver of sustainable economic growth.

The natural environment is an “inorganic body” of human beings, and any damage or imbalance in it impedes human development. Since people are both the subjects and the ultimate goal of sustainable development, the Human Development Index serves as a key measure of sustainability. (3) Environmental protection ensures political and social stability and national security, which are prerequisites for rapid and sustainable economic development. According to the OECD, countries with effective environmental protection strategies tend to have more stable economies and higher competitiveness in the global market (OECD, 2011). (4) However, environmental protection may also impose constraints on economic development due to the financial and human resource allocations required for implementation. Effective and sustainable environmental protection measures are often costly, requiring long-term, coordinated efforts, which may reduce short-term economic incentives. In certain cases, economic benefits must be sacrificed to achieve environmental sustainability.

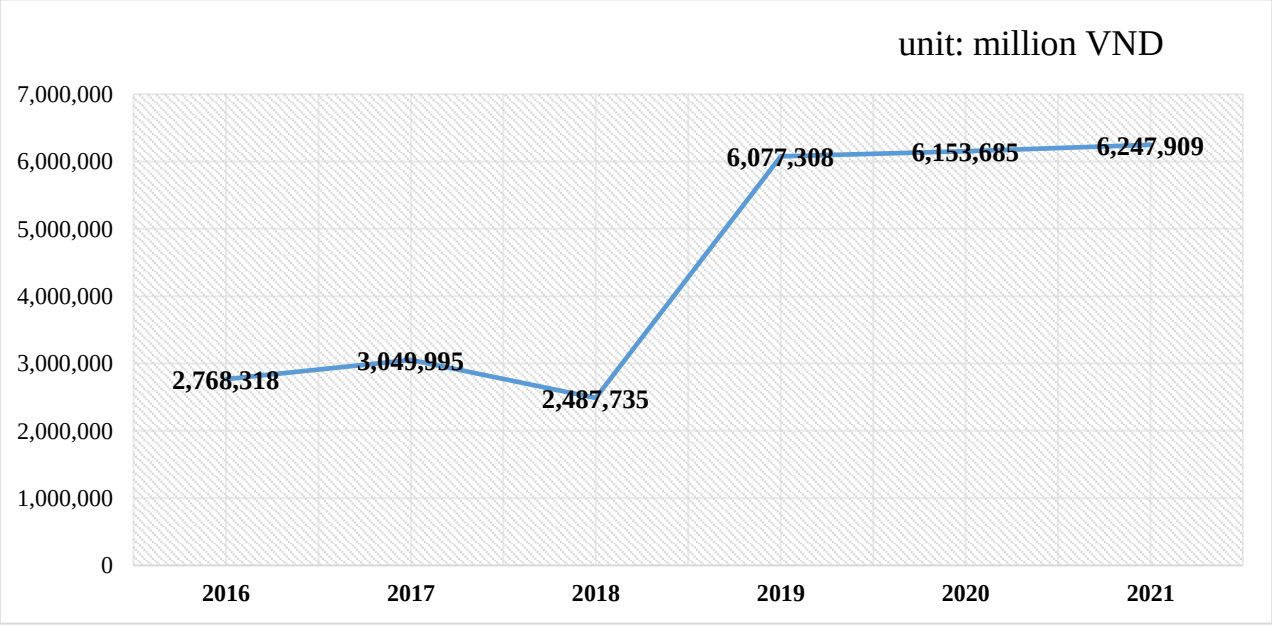
Thus, sustainable development is built on the balanced and harmonious integration of economic growth and environmental protection. Consequently, one of Vietnam’s key development orientations is to “harmonize economic growth with cultural, social, and environmental protection while adapting to climate change” (Communist Party of Vietnam, 2021, vol. I, p. 214), serving as the foundation and guideline for localities, including Ho Chi Minh City, in formulating appropriate development strategies.

### 3.2. Economic development and environmental protection practices in Ho Chi Minh City

Ho Chi Minh City has a development history of over 300 years, experiencing various ups and downs. Despite occupying only 0.6% of the country's total area and having a population of 9.2 million, the city has firmly established itself as a special urban center and a major hub for economy, culture, education and training, science and technology, as well as an important gateway for international exchange and integration. The city has achieved remarkable accomplishments in balancing economic development and environmental protection, specifically:

First, Ho Chi Minh City has consistently maintained a high economic growth rate. During the 2016–2020 period, the average growth rate was 6.41%, 1.62 times higher than the national average (Ho Chi Minh City Party Committee, 2020, p. 98). In 2022, the city recorded a growth rate of 9.03%, while in 2023, it was 5.81%. The economic structure has shifted towards modernization, with the proportion of agriculture, forestry, and fisheries accounting for 0.51% in 2023, industry and construction making up 21.83%, services contributing 64.92%, and product taxes (excluding subsidies) at 12.74% (Ho Chi Minh City Statistics Office, 2024, p. 7). Based on this economic development, the city's state budget allocated for environmental protection has continuously increased, as illustrated in Chart 1.

**The state budget capital for environmental protection in Ho Chi Minh City from 2016 to 2021.**




*Source: Author compiled from the Ho Chi Minh City Environmental Status Report 2021 (Ho Chi Minh City Department of Natural Resources and Environment, 2021, p. 135)*

During the period 2019–2021, the city allocated VND 18,478,902 million to environmental protection, an increase of over 200% compared to the period 2016–2018 (VND 8,306,048 million). Additionally, the city invested VND 5,453 billion in the flood reduction program during 2016–2020, putting 44 projects into operation, resulting in a significant positive shift as the number of flood-prone areas decreased, while flood depth and duration were also reduced. A general assessment states that "Environmental pollution is gradually being controlled, and the program to relocate pollution-causing facilities in the city is continuing to be implemented. The environmental pollution reduction program has achieved significant results" (Ho Chi Minh City Party Committee, 2020, pp. 116–117).

Furthermore, the city has increased investment in science and technology to create a material foundation for the effective and sustainable exploitation of resources, linking economic development with environmental protection. From 2016 to 2019, investment reached VND 43,908 billion per year, with an estimated VND 6,800 billion in 2020, averaging VND 10,142 billion per year (Ho Chi Minh City Party Committee, 2020, p. 234). The Total Factor Productivity (TFP) contribution to annual GRDP increased by 37.53% from 2016 to 2019 (Ho Chi Minh City Party Committee, 2020, p. 226), with science and technology contributing 74% to TFP growth. Labor productivity during 2016–2020 grew at an average of 5.17% per year, supporting a shift in production towards more efficient resource use. These foundations allow the city to focus on solutions to prevent environmental re-pollution trends within the 2020–2030 pollution reduction program while gradually refining its environmental protection strategy, improving environmental quality, adapting to climate change, and working towards achieving sustainable development goals by 2030.

Secondly, environmental protection activities achieved remarkable results during 2016–2020, creating significant environmental improvements and contributing to enhancing the quality of life for city residents. Specifically, pollution prevention and remediation efforts met their targets, particularly in waste collection and treatment. Currently, 100% of export processing zones, industrial parks, and high-tech zones have centralized wastewater treatment systems and automatic wastewater monitoring systems transmitting data to regulatory authorities; 97% of industrial production facilities have wastewater treatment systems (Ho Chi Minh City Department of Natural Resources and Environment, 2021, p. 35). Moreover, 100% of household solid waste, hazardous waste, and medical waste are collected, transported, treated, recycled, and reused in compliance with environmental standards (Ho Chi Minh City Department of Natural Resources and Environment, 2021, p. 97). The total area of forests and scattered green trees reached 84,442.88 hectares, with a forest coverage rate of over 40% (Ho Chi Minh City Department of Natural Resources and Environment, 2021, p. 132). Many initiatives have been launched to raise public awareness about environmental protection, including community-driven models such as "Reducing Plastic Bag Use", "Turning Trash into Cash", "Green Sundays", "Green - Clean - Beautiful Boarding Houses", and "Turning Landfills into Flower Gardens", among others.

The city's achievements in environmental protection have provided a strong impetus for economic growth, especially in tourism, which has rapidly developed by leveraging the city's geographical, transportation, and diverse tourism business ecosystem advantages. Ho Chi Minh City has "4,426 tourist accommodation establishments with over 46,800 rooms" (Ho Chi Minh City Department of Natural Resources and Environment, 2021, p. 47). As a result, eight out of nine key service sectors recorded positive growth in 2023: trade increased by 10.17%; transportation and warehousing by 7.64%; accommodation and food services by 16.37%; information and communications by 5.94%; finance, banking, and insurance by 5.69%; professional, scientific, and technological activities by 6.61%; education and training by 7.03%; and healthcare and social assistance by 3.24% (Ho Chi Minh City Statistics Office, 2024, p. 7). Furthermore, environmental advantages have been a crucial factor in maintaining a high Human Development Index (HDI) for the city. From 2016 to 2020, Ho Chi Minh City's HDI consistently remained above 0.777, higher than the national average, reaching 0.795 in 2020, ranking second nationwide. Additionally, the average life expectancy of city residents was 76.5 years. These positive environmental transformations have strengthened public trust in the city's Party Committee and government, serving as a powerful motivation for the city's continued development towards becoming a "civilized and compassionate city".

However, there are still many limitations and shortcomings in balancing economic development and environmental protection. As a result, the city's economic growth rate and labor productivity increase have not been high and have shown signs of slowing down. The proportion of FDI attraction is no longer at a high level, and environmental issues

have become increasingly complex, including water, air, and noise pollution. Additionally, the burden of waste, wastewater, and garbage collection and treatment is growing. According to statistics, the city's industrial sector emits more than 17.6 million tons of CO2eq annually, with the chemical industry accounting for 63%. In terms of transportation, road vehicles release over 13.4 million tons of CO2eq per year, with motorcycles—numbering over 7.3 million—being the largest source of emissions (Phien An, 2022). According to IQAir, Ho Chi Minh City's PM2.5 fine dust levels are currently 4.2 times higher than the World Health Organization (WHO) standard, leading to nearly 1,400 deaths annually due to air pollution (Hoang Tho - Thanh Thao, 2024). Moreover, the city faces increasing economic losses due to climate change, with flood-related damages amounting to up to USD 250 million per year, potentially rising to over USD 350–500 million annually by 2030 if climate change worsens. Specifically for Ho Chi Minh City, economic losses from climate change could reach USD 50 million annually (Nguyen Nga, 2024).

The causes of these limitations and shortcomings stem from the fact that the city's economic development and environmental protection strategies and policies have not been comprehensively formulated, still contain many inconsistencies, and urban planning and management remain overlapping and conflicting. The legal framework for resource exploitation and environmental protection is still incomplete and inconsistent, lagging behind practical changes. Additionally, most manufacturing enterprises in the city are small and medium-sized, often using outdated technology and prioritizing profit over waste collection and treatment, exacerbating pollution while yielding low economic efficiency. In daily life, a significant portion of the population lacks environmental awareness, and sustainable consumption habits are not yet fully developed. Therefore, in the coming period, the city must implement comprehensive and decisive solutions to overcome these limitations, minimize negative impacts, and fully capitalize on the achievements made in balancing economic development and environmental protection.

### 3.3. Solutions for implementing the relationship between economic development and environmental protection in Ho Chi Minh City in the current period

First, the Party Committee and the city government need to enhance the awareness of their staff, thereby facilitating changes in strategic planning and policies for economic and social development that align with practical realities. This will enable the establishment of directions, tasks, and solutions that both promote rapid economic growth and effectively protect the environment. Strategies play a foundational role in this relationship, creating mechanisms to further stimulate innovation and scientific-technological development in the direction of a green economy and a circular economy. It is essential to boldly reform mechanisms and policies to encourage and mobilize all resources and entities in economic development and environmental protection, thereby generating substantial collective strength to carry out the proposed tasks. There should be active creativity in communication efforts to engage the public in environmental protection and promote sustainable economic development through changing consumption behavior towards greener practices.

Second, businesses need to strictly adhere to regulations regarding production processes, environmental protection, and resource conservation during production. There should be appropriate investments in waste collection and treatment activities as per general regulations. Companies should maximize the utilization of the city’s resources and incentives to improve technology, enhance resource efficiency and product value, and gradually transition to environmentally friendly, green production methods. Businesses should actively participate in community environmental protection activities initiated by the city and residents, demonstrating their social responsibility.

Third, residents need to have a comprehensive and accurate understanding of environmental issues and take practical and specific actions in their daily lives and production activities. As responsible citizens, they should actively engage in local environmental protection activities and, as consumers, prioritize purchasing and consuming environmentally friendly products while minimizing the use of single-use items. Furthermore, they should contribute positively to the economic development of the city. Everyone, depending on their position and role, can make different contributions to the city’s economic development and environmental protection.

To effectively implement the relationship between economic development and environmental protection in Ho Chi Minh City, it is necessary to carry out the solutions fully and effectively targeting different stakeholders. This will allow the city to leverage its advantages and achievements while addressing challenges to create a strong collective force,

tapping into both internal and external resources to facilitate rapid and sustainable development in the next phase.

## IV. CONCLUSION

Thus, economic development and environmental protection in Ho Chi Minh City mutually influence and stimulate each other, enabling the city to maintain its role as the economic locomotive of the country and the southern economic region while improving the quality of life for its residents. However, there are still many limitations that hinder economic growth and increase pollution, primarily due to the inadequate handling of this relationship in practice. For the city's economy to develop sustainably, it requires the efforts of the Party Committee, the government, and the people in formulating strategies, institutionalizing them into specific policies, and ensuring the voluntary and serious compliance of every citizen. Only then can the city truly become a "civilized, modern, and compassionate urban center".

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# EXPLORING E-PROCUREMENT'S ROLE IN MITIGATING CORRUPTION AMIDST BUREAUCRATIC CHALLENGES

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**ABSTRACT**

This study examines the persistent corruption in Indonesia's government procurement sector, despite the use of e-procurement systems designed to enhance transparency and efficiency. Indonesia was chosen as the study context due to its strong economic growth and the highest GDP in ASEAN, contrasting with its low GDP per capita and poor corruption ranking. Employing both the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM), this study explores how behavioral factors—such as financial temptation and monetary intelligence—interact with technological acceptance to influence e-procurement adoption and effectiveness. Findings indicate that while e-procurement enhances administrative efficiency and transparency, it falls short in preventing corruption due to human factors. Bureaucrats' susceptibility to financial temptations and self-serving motives undermines the system's impact. The study highlights the need for integrating robust technological solutions with cultural and ethical reforms, including anti-corruption education, stricter enforcement mechanisms, and incentive structures to reduce reliance on material rewards. By addressing both technical and behavioral dimensions, this research provides actionable insights for strengthening public procurement integrity and reducing corruption risks in rapidly developing economies like Indonesia.

*Keywords*: “behavior”, “bureaucrats”, “corruption”, “e-procurement”, “technology”

## I. INTRODUCTION

Corruption remains a pervasive issue in Indonesia’s government procurement sector, despite measures like the e-procurement system. Indonesia was chosen for this study due to its economic and governance paradoxes: it exhibits strong economic growth and the highest GDP in ASEAN but lags in GDP per capita compared to neighboring countries and consistently ranks poorly on global corruption indices (Transparency International, 2023; World Bank, 2022). Key behavioral factors, such as temptation and monetary intelligence, drive unethical actions, including corruption (Tang & Sutarso, 2013). Collusion between bureaucrats and private parties to manipulate tenders, inflate prices, or accept bribes persists, undermining the effectiveness of technological solutions (Gorsira et al., 2016; Aidt et al., 2020; Komakech, 2016). These practices highlight the influence of entrenched social norms and weak enforcement mechanisms (Armitage & Conner, 2001). This study emphasizes the need for combining technological innovations with cultural and regulatory reforms to combat corruption effectively in Indonesia and similar developing economies.

To address corruption, the Indonesian government implemented an e-procurement system, designed to enhance transparency and efficiency in procurement processes by minimizing face-to-face interactions and digitizing tender submissions and contract management (Tukamuhabwa et al., 2017; Weigang et al., 2020). Despite these efforts, high-profile cases like the electronic identity card (e-KTP) scandal highlight the continued prevalence of corruption due to human factors, including unethical intentions among bureaucrats (Huang & Xia, 2019). Understanding these persistent issues requires examining both behavioral and technological factors, as explored in this study. Evidence from studies such as Kish-Gephart et al. (2010) also underscores how perceived behavioral control can undermine the effectiveness of such systems. Aboelmaged (2010) demonstrates the utility of combining both theory to looks at factors influencing e-procurement adoption.

While e-procurement reduces face-to-face interactions and improves transparency, it often fails to deter corruption due to persistent human motivations (Tukamuhabwa et al., 2017; Weigang et al., 2020). TPB has has been accustomed to examine unethical intentions by analyzing three factors’ attitudes, subjective norms, and also perceived behavioral control (Ajzen, 1991; Armitage & Conner, 2001), but its application within the context of e-procurement remains limited (Tang & Chen, 2008; Gorsira et al., 2018). Similarly, the TAM focuses on perceived usefulness and ease of use

(Davis, 1989; Venkatesh et al., 2003) but does not fully address ethical dimensions or why corruption persists despite technology adoption (Kish-Gephart et al., 2010; Weigang et al., 2020).

This study uses TPB and TAM to investigate why corruption persists in Indonesia's e-procurement system. TPB highlights how attitudes, subjective norms, and perceived behavioral control shape intentions to engage in corruption (Ajzen, 1991; Armitage & Conner, 2001; Kish-Gephart et al., 2010), while TAM examines the impact of perceived usefulness and ease of use on e-procurement acceptance (Davis, 1989; Venkatesh et al., 2003). However, technological acceptance alone cannot mitigate corruption risks, as individual motivations and opportunity structures play key roles (Tang & Chen, 2008). This study underscores the need for robust, user-friendly technology that deters corrupt practices, along with ethics training, organizational reforms, and enhanced internal controls to strengthen e-procurement's deterrence capabilities and promote integrity in government procurement.

## II. MATERIAL AND METHOD

### Government Procurement of Goods and Services in Indonesia

Indonesia has undertaken significant reforms in government procurement to enhance transparency, efficiency, and accountability, aligning with economic development goals and reducing corruption (Setiawan & Azizah, 2021). The foundational framework, established by Presidential Regulation No. 16/2018, replaced the older regulation (No. 54/2010), emphasizing international standards, transparency, and strategic alignment with national development objectives (Hamid, 2020). Subsequent updates, including Presidential Regulation No. 12/2021 and No. 17/2023, introduced better contract management, delay mitigation mechanisms, and improved monitoring systems, ensuring procurement activities remain efficient and responsive to administrative and market needs (Suharto et al., 2022).

The implementation of e-procurement by the National Procurement Agency represents a significant advancement in Indonesia's procurement system (LKPP) and its digital platform, e-Katalog. This platform reduces human intervention, minimizes corruption, and enhances transparency, enabling swift and cost-efficient procurement from pre-approved vendors (Liu & Pratama, 2022). Studies show e-Katalog has led to a 20% reduction in procurement time and increased cost efficiency (Siregar, 2023). Additionally, its audit trails reinforce anti-corruption measures and accountability (Nasution & Rachmat, 2022), making it a cornerstone of Indonesia's modern procurement strategy.

Despite these advancements, challenges remain, particularly in combating corruption, limited vendor competition, and inefficiencies at the local government level (Transparency International, 2023). Technological and infrastructural gaps in rural areas further hinder e-procurement adoption (Mardiana et al., 2023). Addressing these issues requires ongoing reforms and capacity-building efforts to ensure procurement improvements benefit all regions equally. Overall, these systematic reforms and innovations not only enhance public sector efficiency but also foster public trust in government operations.

### Overview of the Theory of Planned Behavior and Its Utilization in Corruption Studies

Researchers like Tang and Sutarso (2013) have expanded TPB by highlighting the role of temptation and monetary intelligence in shaping corrupt intentions. Their findings reveal that financial temptation, coupled with low cognitive restraint, significantly increases susceptibility to unethical behavior, particularly in environments with weak norms or low perceived consequences (Tang & Sutarso, 2013; Svensson, 2013; Bandura, 1999; Treviño et al., 2006). In government procurement, TPB shows how attitudes and subjective norms influence corrupt practices despite measures like e-procurement, as permissive cultures and weak enforcement persist (Tukamuhabwa et al., 2017; Transparency International, 2023). Tang and Sutarso (2013) further demonstrate that temptation mediates ethical lapses when corruption is perceived as low-risk or socially acceptable (Tang & Chiu, 2003; Graham et al., 2005). This underscores the need for fostering ethical cultures and enhancing detection risks to reduce corruption (Gorsira et al., 2018; Restubog et al., 2011), integrating ethical reinforcement with robust monitoring systems for effective anti-corruption strategies (Huang & Xia, 2019).

### Technology Acceptance Model 2 Concerning E-Procurement and Corruption

This theory developed by Davis (1989), simplifies technology acceptance into two key constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). PU refers to the conviction that technology enhances job performance, while PEOU indicates the conviction that technology necessitates minimal exertion. Both directly

influence Behavioral Intention (BI), leading to Actual System Use (Venkatesh & Davis, 2000). Widely applied in various sectors, including e-government and e-procurement, TAM explains how user perceptions drive technology adoption (Al-Gahtani, Hubona, & Wang, 2007; Venkatesh, Thong, & Xu, 2012).

TAM 2, an extension by Venkatesh and Davis (2000), incorporates social and cognitive elements such as Subjective Norms, Image, and Job Relevance, they also implemented elements such as Output Quality, and Result Demonstrability. These additions address the social pressures and task relevance influencing technology acceptance, particularly in structured environments like government organizations (Rana, Dwivedi, & Williams, 2015). Job Relevance, the perceived alignment of technology with professional tasks, observable benefits of its use, are particularly relevant for e-procurement. These constructs explain how systems designed to improve efficiency and transparency gain user acceptance (Chang, Hwang, & Hung, 2014). E-procurement's potential to reduce corruption by standardizing processes and minimizing discretion underscores the importance of its adoption, which is heavily influenced by TAM 2 constructs (Huang & Benyoucef, 2014).

Research indicates that social influences (e.g., Subjective Norms and Image) and task alignment (e.g., Job Relevance and Result Demonstrability) are crucial for the adoption of e-procurement in governmental contexts. Perceived benefits, such as enhanced transparency and accountability, further strengthen user intentions (Carter & Bélanger, 2005; Weerakkody & El-Haddadeh, 2011). TAM 2 offers a comprehensive framework for comprehending and promoting technology acceptance in public administration, offering practical insights for reducing resistance and enhancing system effectiveness in combating corruption (Venkatesh & Davis, 2000; Chang et al., 2014).

**Hyphothesis**

The e-procurement system in Indonesia's government was designed to enhance transparency and efficiency, yet it remains undermined by bureaucrats' attitudes, peer influences, and perceived control over corrupt practices, as described in the TPB (Ajzen, 1991). Research has demonstrated that unethical decisions are significantly influenced by social norms and perceived control (Armitage & Conner, 2001; Kish-Gephart et al., 2010). Tang and Sutarso (2012) further highlight that temptation, encompassing impulsive behavior and low self-control, can lead to poor monetary intelligence (MI) and unethical actions. Even with temptation controlled, unethical behaviors persist, with men displaying stronger direct tendencies toward corruption, while women's actions are mediated by MI. These findings reveal systemic and behavioral challenges to curbing corruption through e-procurement.

In order to enhance the behavioral perspective, this study incorporates the TAM2 to investigate technological acceptance in the adoption of e-procurement. TAM2 extends the original TAM by incorporating factors like Job Relevance, particularly critical for bureaucrats engaged in procurement tasks. Job Relevance ensures users perceive e-procurement as directly beneficial to their roles, fostering effective adoption as an anti-corruption tool (Venkatesh & Davis, 2000; Ifinedo, 2011; Al Awadhi & Morris, 2009; Rana et al., 2015). Aligning the system with bureaucrats' specific responsibilities enhances their commitment to its use and the broader goal of procurement integrity.

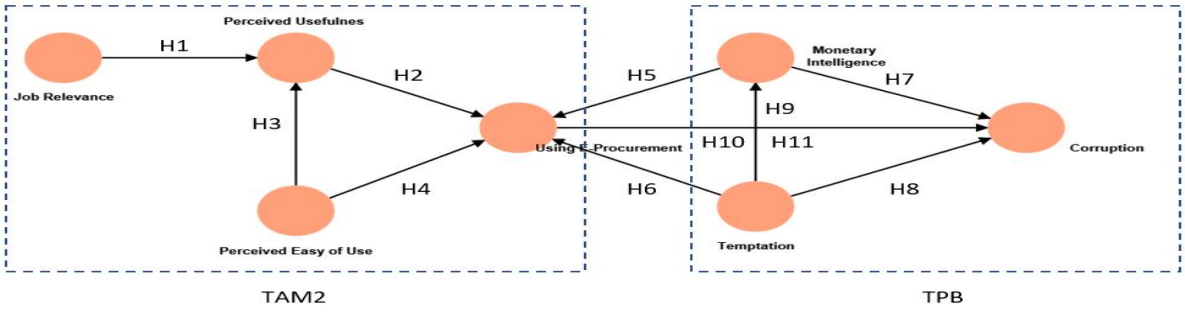



**Figure 1. Proposed Theoretical Framework**

**Hypothesis 1.** Job Relevance has a significant positive effect on Perceived Usefulness. Bureaucrats who feel that e-procurement is relevant to their tasks will find the system more useful.

**Hypothesis 2.** Perceived Usefulness has a significant positive effect on the use of the e-procurement system (Using E-Procurement) Bureaucrats who feel that e-procurement is useful are more likely to use the system actively. Perceived Usefulness has a significant positive effect on the use of the e-procurement system.

**Hypothesis 3.** Perceived Ease of Use has a significant positive effect on Perceived Usefulness. If bureaucrats find e-procurement easy to use, they will also consider it more useful.

**Hypothesis 4.** Perceived Ease of Use does not have a significant effect on the use of the e-procurement system (Using E-Procurement) because its use is mandatory. The use of e-procurement is still carried out by bureaucrats because of obligations, not because they feel the system is easy to use.

**Hypothesis 5.** Monetary Intelligence has a significant negative effect on the use of the e-procurement system (Using E-Procurement). Bureaucrats with a mindset that tends to focus on financial gain may be less likely to utilize e-procurement effectively.

**Hypothesis 6.** Temptation does not affect the use of e-procurement because it is mandatory, but temptation makes bureaucrats continue to look for loopholes to commit corruption through the system. Bureaucrats continue to use e-procurement because it is mandatory, but the temptation of corruption makes them abuse this system.

**Hypothesis 7.** Monetary Intelligence has a significant positive effect on the level of corruption. Bureaucrats who focus on financial gain are more susceptible to corruption, even in a supervised environment such as the e-procurement system.

**Hypothesis 8.** Temptation has a significant positive effect on the level of corruption. Bureaucrats who are easily tempted are more likely to engage in corruption even though e-procurement exists.

**Hypothesis 9.** Monetary Intelligence has a significant positive effect on Temptation.The way bureaucrats think about money affects their level of temptation to commit corruption.

**Hypothesis 10.** Using E-Procurement does not have a significant effect on preventing corruption. Although e-procurement is designed to reduce corruption, corruption still occurs due to external factors, so its implementation is not effective in preventing corruption directly.

**Hypothesis 11.** Temptation has an indirect influence on corruption through the use of e-procurement. Temptation can affect how bureaucrats use e-procurement, which in turn can contribute to corruption, even though e-procurement is implemented, the effect of temptation remains and can be reflected through system abuse or other means outside the system.

To complement the behavioral perspective, this framework integrates the TAM2 to examine technological acceptance in the adoption of e-procurement. TAM2 extends the original TAM by incorporating factors like Job Relevance, particularly critical for bureaucrats engaged in procurement tasks. Job Relevance ensures users perceive e-procurement as directly beneficial to their roles, fostering effective adoption as an anti-corruption tool (Venkatesh & Davis, 2000; Ifinedo, 2011; Al Awadhi & Morris, 2009; Rana et al., 2015). Aligning the system with bureaucrats' specific responsibilities enhances their commitment to its use and the broader goal of procurement integrity.

This framework emphasizes that both behavioral and technological factors shape corruption in e-procurement. Technological factors like Job Relevance and perceived usefulness are expected to significantly enhance system adoption, whereas ease of use and mandatory usage may not directly deter corruption. Behavioral factors such as monetary intelligence and temptation play critical roles; high MI may paradoxically increase both temptation and corruption while reducing system utilization. Temptation, although not directly affecting system use due to its mandatory nature, may drive efforts to exploit loopholes, indirectly fueling corruption. Thus, merely implementing e-procurement is insufficient to curb corruption. Policymakers should prioritize enhancing the system’s relevance and perceived usefulness while addressing behavioral drivers like temptation and unethical practices to strengthen the integrity of procurement processes.

**Questionnaire Design**

This study utilizes validated measurement scales within the TPB framework to assess key constructs. Susceptibility to temptation is measured using a 19-item scale capturing five factors related to unethical decision-making (Tang & Sutarso, 2013). For corruption, two scales assess bribery intentions and past behaviors without explicitly mentioning "corruption" to reduce social desirability bias (Gorsira et al., 2018; Transparency International, 2013; And & Ahmad, 2020). A Five-point Likert scale measures temptation (Likert, 1932), while a seven-point scale measures corruption-

related behaviors (Gorsira et al., 2018). Respondents are prompted to self-assess potential unethical actions using validated methodologies (Ajzen, 1991; Fishbein & Ajzen, 1975; Mazar, Amir, & Ariely, 2008; Kaptein, 2015). These tools provide a robust framework for evaluating psychological and behavioral dimensions of unethical behavior.

This study uses validated TAM2 scales with a seven-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree) to assess key constructs. "Intention to Use" is measured with a three-item scale by Venkatesh and Davis (2000), while Perceived Ease of Use and Perceived Usefulness are evaluated using scales by Davis et al. (1989) and Agarwal and Prasad (1997). Job Relevance is assessed through Venkatesh and Davis (2000), focusing on system applicability and output quality. Scales were translated into Bahasa Indonesia using AI-supported translations (GPT-4.0) and verified through human review, aligning with the rise of AI in research (Kunst & Bierwiaczonek, 2023). These measures comprehensively analyze psychological factors in technology adoption.

**Data Collection**

This study surveyed 86 government bureaucrats with procurement responsibilities using a two-wave sequential design via online Google Forms. This method ensured convenience and minimized respondent fatigue while capturing complementary dimensions of data (Dillman et al., 2014; Fowler, 2014; Lavrakas, 2008). Surveys were sent directly to respondents' mobile numbers, enhancing participation (Qiao & Cummings, 2008; Qiao, Thai, & Cummings, 2009; Choi et al., 2020). The first wave collected baseline data on TAM constructs, while the second examined TPB-related outcomes and corruption, clarifying cause-and-effect relationships (Menard, 2002; Babbie, 2010). Non-repetitive questionnaires maintained engagement and improved response quality (Fowler, 2014; Lavrakas, 2008).

To further ensure the validity of the findings and address potential biases, the study incorporates several strategies to prevent common method variance (CMV). Temporal separation was introduced by providing a time gap between the waves to reduce response bias (Podsakoff et al., 2003). Different types of questions and response scales were used in each wave to introduce variation and mitigate response patterns (MacKenzie & Podsakoff, 2012). Respondents were assured of anonymity to encourage honest and candid responses, particularly on sensitive topics (Chang et al., 2010). Additionally, the instruments underwent rigorous trial phases to ensure clarity and to avoid overlap between constructs, further enhancing the reliability of the measurements (Liang et al., 2007). These measures collectively contributed to the robustness of the study design and minimized potential biases in the data collection process.

**Structural Model**

This study utilizes Partial Least Squares (PLS) in SmartPLS to develop a structural model exploring relationships among latent variables based on the theoretical framework. Following Hair et al. (2014), constructs like Behavioral Intention (BI) and User Behavior (UB) were included with observed indicators in a path model. Model fit indices such as SRMR, d_ULS, d_G, and Chi-Square were evaluated against established criteria (Henseler et al., 2015; Hu & Bentler, 1999). R-squared values assessed variance explained by the model. Mediation analysis, performed via bootstrapping with 5,000 samples in SmartPLS 4, examined BI's mediating role between constructs like performance expectancy, effort expectancy, social influence, and perceived security on use behavior (Hair et al., 2017). Bootstrapping provided precise confidence intervals for testing indirect effects.

## III. RESULT AND DISCUSSION

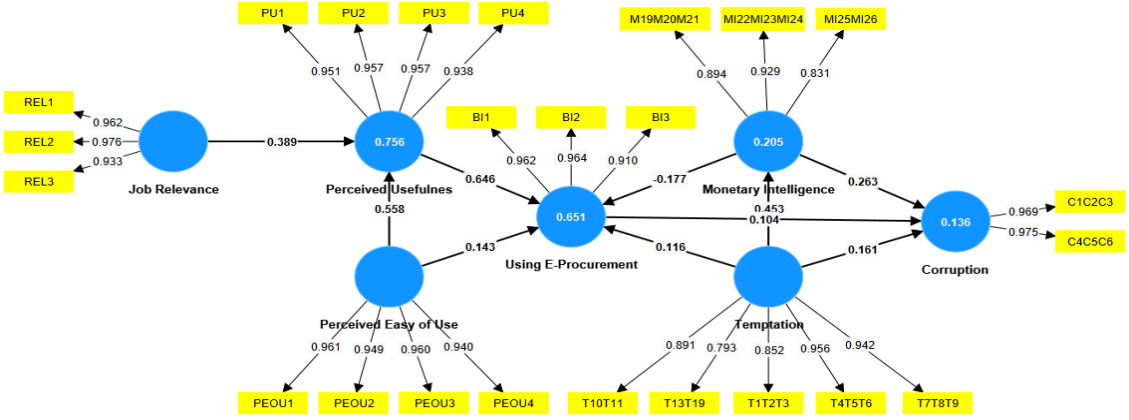



**Figure 2. PLS-SEM Algorithms Results**

According to the findings of the factor loading assessment in this study, numerous items failed to satisfy the established threshold value criteria (usually ≥ 0.7). Therefore, the following items were eliminated from the analysis to ensure construct validity and reliability.

**Table 1. Deleted Factors**

| Construct | Code | Monetary Intelligence | Temptation |
|---|---|---|---|
| Social Moral Values | T12 | | 0.445 |
| Motivator | MI4 | 0.606 | |
| | MI5 | 0.701 | |
| | MI6 | 0.697 | |
| Importance | MI7 | 0.684 | |
| | MI8 | 0.637 | |
| | MI9 | 0.594 | |
| Make Money | MI10 | 0.408 | |
| | MI11 | 0.319 | |
| | MI12 | 0.279 | |
| Budget Money | MI13 | -0.095 | |
| | MI14 | -0.095 | |
| | MI15 | -0.05 | |
| Donate | MI16 | -0.025 | |
| | MI17 | 0 | |
| | MI18 | 0.014 | |
| Power | MI27 | 0.461 | |
| Contribute | MI28 | 0.431 | |
| | MI29 | 0.44 | |
| | MI30 | 0.393 | |

The results of the structural equation modeling, as presented in the table, indicate that all hypotheses were supported based on the theoretical framework. The path coefficients between constructs are statistically significant for the majority of them, with p-values below 0.05, demonstrating the robustness of the proposed relationships. Specifically, key relationships such as Job Relevance → Perceived Usefulness (p = 0.003), Monetary Intelligence → Corruption (p = 0.046), and Perceived Ease of Use → Perceived Usefulness (p = 0.000) were confirmed with significant path coefficients and high T-statistics.

**Table 2. Path Coefficients**

| | Original sample | Sample mean | Standard Deviation | T statistic | P values |
|---|---|---|---|---|---|
| JR → PU | 0.389 | 0.370 | 0.131 | 2.963 | 0.003 |
| MI → C | 0.263 | 0.236 | 0.132 | 1.994 | 0.046 |
| MI → BI (using e-proc.) | -0.177 | -0.180 | 0.067 | 2.626 | 0.009 |
| PEOU → PU | 0.558 | 0.578 | 0.127 | 4.385 | 0.000 |
| PEOU → BI | 0.143 | 0.179 | 0.154 | 0.930 | 0.352 |
| PU → BI | 0.646 | 0.612 | 0.149 | 4.333 | 0.000 |
| T → C | 0.161 | 0.165 | 0.080 | 2.006 | 0.045 |
| T → MI | 0.453 | 0.463 | 0.096 | 4.707 | 0.000 |
| T → BI | 0.116 | 0.123 | 0.078 | 1.495 | 0.135 |
| BI → C | 0.104 | 0.078 | 0.125 | 0.831 | 0.406 |

It is worth noting that certain paths, such as Temptation → Using E-Procurement (p = 0.135) and Using E-Procurement → Corruption (p = 0.406), were not statistically significant. However, this lack of significance is consistent with the theoretical assumptions and supports the hypothesis that these relationships are weak or negligible.

These results validate the conceptual framework by confirming the expected nature of both significant and non-significant relationships. Overall, the findings demonstrate the reliability of the model in explaining the proposed relationships within the data.

**Table3. Total Indirect Effects**

| | Original sample | Sample mean | Standard Deviation | T statistic | P values |
|---|---|---|---|---|---|
| JR → C | 0.026 | 0.017 | 0.033 | 0.794 | 0.427 |
| JR → BI | 0.251 | 0.234 | 0.111 | 2.266 | 0.023 |
| MI → C | -0.018 | -0.014 | 0.025 | 0.723 | 0.470 |
| PEOU → C | 0.053 | 0.042 | 0.069 | 0.763 | 0.446 |
| PEOU → BI | 0.361 | 0.347 | 0.102 | 3.531 | 0.000 |
| PU → C | 0.067 | 0.046 | 0.078 | 0.857 | 0.391 |
| T → C | 0.123 | 0.114 | 0.073 | 1.684 | 0.092 |
| T → BI | -0.080 | -0.083 | 0.037 | 2.162 | 0.031 |

The results of the structural equation modeling (SEM) for total indirect effects, as shown in the table, provide further validation of the theoretical framework. Several indirect relationships between constructs were found to be statistically significant, with p-values below 0.05. Notably, the indirect effects of **Job Relevance → Using E-Procurement** ($p$ = 0.023), **Perceived Ease of Use → Using E-Procurement** ($p$ = 0.000), and **Temptation → Using E-Procurement** ($p$ = 0.031) were confirmed, indicating meaningful mediating effects within the model. On the other hand, some indirect effects, such as **Job Relevance → Corruption** (p = 0.427), **Monetary Intelligence → Corruption** ($p$ = 0.470), and **Perceived Ease of Use → Corruption** ($p$ = 0.446), were not statistically significant. These findings align with the theoretical assumptions and provide evidence that these relationships are not strong or are less relevant in the context of this study. This mix of significant and non-significant results aligns with the hypothesized framework and highlights the nuanced interactions within the model. Overall, the findings demonstrate that the proposed indirect pathways effectively capture the dynamics between constructs and support the validity of the model.

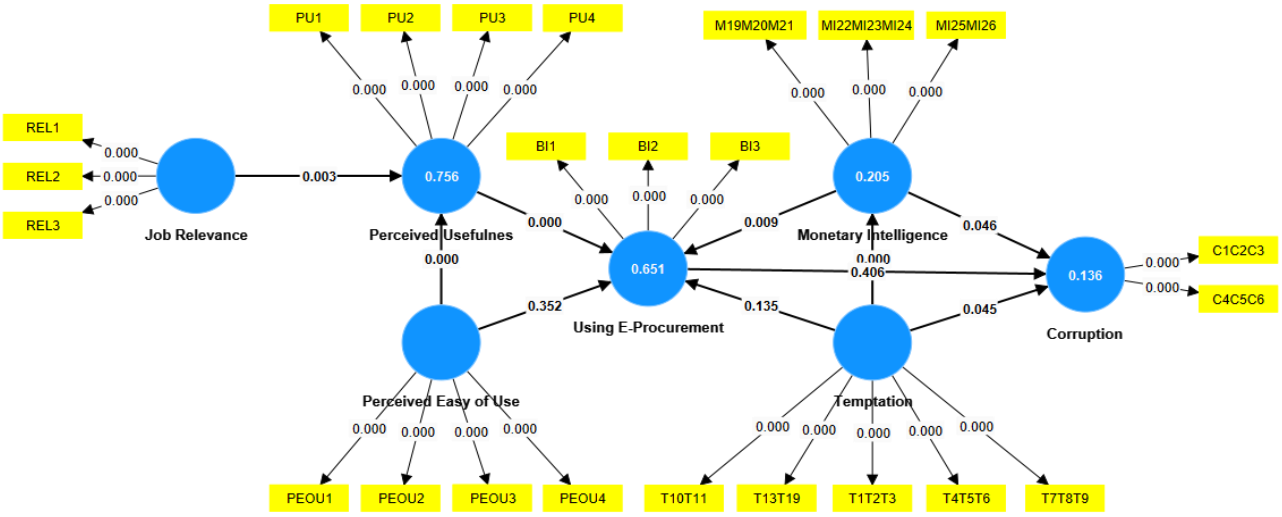



**Figure 3. Bootstrapping results**

The structural equation modeling (SEM) results, as depicted in the diagram, demonstrate that the majority of hypothesized relationships between the latent constructs were supported, with significant path coefficients (indicated by the values along the arrows). These findings confirm the validity of the proposed theoretical model. Each construct is measured by multiple indicators, and the factor loadings, shown as numbers between constructs and their indicators, support strong convergent validity. Interestingly, some relationships in the model were not statistically significant; however, this lack of significance aligns with and supports specific hypotheses. These results suggest that certain relationships were expected to be weak or negligible based on theoretical assumptions, and the findings provide empirical confirmation of this expectation. Overall, these findings validate the conceptual framework, confirming that all hypotheses—both significant and non-significant—were consistent with the theoretical predictions, demonstrating

the robustness and nuanced understanding provided by the model. Validate all hypothesis.

**Hypothesis 1.** Job Relevance has a significant positive effect on Perceived Usefulness. From the "Path coefficients" table, the path coefficient of Job Relevance → Perceived Usefulness is 0.389 with a T-statistics value = 2.963 and p-value = 0.003, indicating a positive and significant effect.

**Hypothesis 2.** Perceived Usefulness has a significant positive effect on the use of the e-procurement system (Using E-Procurement**)** The path coefficient Perceived Usefulness → Using E-Procurement is 0.646 with a T-statistics value = 4.333 and p-value = 0.000, indicating a significant positive effect.

**Hypothesis 3**. Perceived Ease of Use has a significant positive effect on Perceived Usefulness**.** Evaluation: The path coefficient of Perceived Ease of Use → Perceived Usefulness is 0.558 with a T-statistics value = 4.385 and p-value = 0.000, indicating a significant positive effect.

**Hypothesis 4**. Perceived Ease of Use does not have a significant effect on the use of the e-procurement system (Using E-Procurement) because its use is mandatory. The path coefficient of Perceived Ease of Use → Using E-Procurement is 0.143 with a T-statistics value = 0.930 and p-value = 0.352, which indicates no significant effect.

**Hypothesis 5.** Monetary Intelligence has a significant negative effect on the use of the e-procurement system (Using E-Procurement). The path coefficient of Monetary Intelligence → Using E-Procurement is -0.177 with a T-statistics value = 2.626 and p-value = 0.009, indicating a significant negative effect

**Hypothesis 6**. Temptation does not affect the use of e-procurement because it is mandatory, but temptation makes bureaucrats continue to look for loopholes to commit corruption through the system. Evaluation: For Temptation → Using E-Procurement, the coefficient is 0.116 with a T-statistics value = 1.495 and p-value = 0.135, indicating no significant effect. For Temptation → Corruption, the coefficient is 0.453 with a T-statistics value = 4.707 and p-value = 0.000, indicating a significant effect.

**Hypothesis 7.** Monetary Intelligence has a significant positive effect on the level of corruption. The path coefficient of Monetary Intelligence → Corruption is 0.263 with a T-statistics value = 1.994 and p-value = 0.046, indicating a significant positive effect at the 5% confidence level.

**Hypothesis 8.** Temptation has a significant positive effect on the level of corruption. The path coefficient of Temptation → Corruption is 0.453 with a T-statistics value = 4.707 and p-value = 0.000, indicating a significant positive effect.

**Hypothesis 9.** Monetary Intelligence has a significant positive effect on Temptation. The path coefficient of Monetary Intelligence → Temptation is 0.463 with a T-statistics value = 4.707 and p-value = 0.000, indicating a significant positive effect.

**Hypothesis 10.** Using E-Procurement does not have a significant effect on preventing corruption. The path coefficient Using E-Procurement → Corruption is 0.104 with a T-statistics value = 0.831 and p-value = 0.406, indicating no significant effect.

**Hypothesis 11.** Temptation has an indirect influence on corruption through the use of e-procurement. Temptation → Corruption through Using E-Procurement shows an indirect effect of 0.114, with a T-statistics value = 1.684 and p-value = 0.092. In other words, it is approaching significant

## IV. CONCLUSION

The study demonstrates that while e-procurement improves efficiency and transparency, it is insufficient to prevent corruption due to human factors like monetary intelligence and temptation. Perceived usefulness (PU) emerges as a key factor in adoption, influenced by job relevance (coefficient: 0.389; p-value = 0.003) and ease of use (coefficient: 0.558; p-value = 0.000). However, its mandatory nature reduces the impact of usability (coefficient: 0.143; p-value = 0.352), overshadowing motivational elements.

Human factors present significant challenges to corruption prevention. Bureaucrats with high monetary intelligence, focusing on financial gain, are less likely to use the system effectively (coefficient: -0.177; p-value = 0.009). Temptation remains a pivotal driver of corruption, with a strong direct influence (coefficient: 0.453; p-value = 0.000). Furthermore, the study highlights the interplay between monetary intelligence and temptation, where a

heightened focus on financial gain increases susceptibility to corruption (coefficient: 0.463; p-value = 0.000). These dynamics indicate that e-procurement alone cannot deter corrupt practices; a cultural and behavioral transformation is necessary.

E-procurement enhances procedural transparency but struggles with corruption due to external factors. To address these issues, technological advancements should prioritize security, usability, and fraud prevention. Simultaneously, non-technical interventions such as anti-corruption education, fostering integrity, and reforming bureaucratic culture are critical. Establishing robust monitoring systems, stricter law enforcement, and automated controls can help prevent system abuse. Providing non-financial incentives to reduce the emphasis on material rewards is also essential for promoting ethical behavior. A holistic approach combining these measures is necessary to maximize e-procurement's potential as an anti-corruption tool.

Designing an effective e-procurement system to mitigate corruption risks requires a multi-pronged approach that integrates technological and behavioral strategies. One fundamental measure is the full digitalization of procurement processes to enhance transparency, ensuring that bidding, contract awarding, and payment procedures are conducted through an end-to-end e-procurement platform without manual intervention. Publicly accessible procurement dashboards should be utilized to facilitate real-time monitoring by civil society, journalists, and independent auditors, reducing opportunities for illicit transactions (Nasution & Rachmat, 2022). Additionally, making e-procurement mandatory for all public tenders ensures strict regulatory compliance, preventing bureaucrats from bypassing the system and reinforcing accountability through legal repercussions for off-system procurement (Transparency International, 2023).

Advanced automation mechanisms, including smart contracts and blockchain-based payment verification systems, can ensure that payments are released only upon fulfillment of contract terms, thus reducing the risk of kickbacks and fraudulent financial transactions. AI-driven audit trails further enhance compliance by automatically verifying adherence to procurement regulations (Aboelmaged, 2010). Additionally, a risk-scoring system should be developed to assess vendors based on past performance, pricing anomalies, and links to corruption cases. Automated background checks on procurement officials can help identify potential conflicts of interest and financial discrepancies, thereby strengthening internal oversight (Ajzen, 1991).

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# FORECASTING VIETNAM'S CPI USING DEEP LEARNING ALGORITHM

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**ABSTRACT**

Forecasting macroeconomic indicators plays an important role in macroeconomic planning. It is an important analytical tool for the financial and monetary strategies of countries. Governments and central banks rely on macroeconomic forecasting to formulate and implement monetary, fiscal and regulatory policies. With the advancement of computer science in the 4.0 era, the application of machine learning algorithms to forecast macroeconomic indicators is easier and more popular. In this paper, we present how to use deep learning algorithms to forecast the Customer Price Index (CPI) of Vietnam, with monthly data from January 1995 to December 2023. We present how to set up a CPI forecasting model using Deep Neural Networks (DNN), Recurrent Neural Networks (RNN), Long Short - Term Memory (LSTM), Bidirectional Long Short-Term Memory Network (BiLSTM) and a Scalar extension of LSTM (s-LSTM). The forecasting results show an accuracy of over 99% and a fairly small mean square error (MSE). This proves that the proposed deep learning algorithms are suitable for forecasting CPI in Vietnam.

*Keywords:* “DNN”, “Forcasting VietNam’s CPI”, “LSTM”, “RNN”, “s-LSTM”.

## I. INTRODUCTION

The Consumer Price Index (CPI) is a statistical measure expressed as a percentage, reflecting the relative change in the prices of consumer goods and services over time. CPI is commonly used to measure inflation, which quantifies the general rate of price increase within an economy over a specific period. High inflation can diminish consumer purchasing power, destabilize the economy, and reduce real income. On the other hand, moderate inflation is often considered beneficial for the economy as it promotes spending and investment. Forecasting the CPI entails predicting its future value. This is a critical task, providing valuable insights into macroeconomic, enabling policymakers, businesses, investors, and individuals to make well-informed decisions regarding resource allocation and economic planning.

Current research on CPI forecasting can be broadly categorized into three primary directions. The first approach leverages tranditional statistical methods such as Vector Autoregressive (VAR), Generalized Autoregressive Conditional Heteroskedasticity (GARCH), Autoregressive Integrated Moving Average (ARIMA), state-space methods [1] [14][20]. The second approach employs machine learning and deep learning algorithms, including neural networks and other advanced predictive techniques [4][5][12][16][19]. Recent advancements in computational power and the proliferation of data have catalyzed the exploration of machine learning (ML) methods as viable alternatives to traditional forecasting techniques. The third approach integrates statistical models with machine learning or deep learning methodologies [3]][7][9][13], aiming to capitalize on the complementary strengths of both paradigms. The following are some typical studies of recent approaches.

Lit et al. (2019-2023) [14] has created a time series forecasting software (Time series Lab - TSL) including time series forecasting models such as structural models, ARIMA, score-driven models, model averaging, machine learning models (XGBoost Regression). Momo et al. (2021) [16] proposed forecasting the inflation rate by employing various machine learning algorithms, including Support Vector Regression (SVR), Random Forest Regressor (RFR), Decision Tree, AdaBoost, Gradient Boosting, and XGBoost. Their study utilized a statistical dataset obtained from CEIC dataset, comprising 107 records spanning nine years, from January 2012 to October 2020. The models demonstrated satisfactory accuracy when applied to variables such as the CPI, food, non-food, clothing and footwear, and transportation. Among the evaluated models, AdaBoost achieved the most favorable performance, yielding the lowest Mean Squared Error (MSE) value of 0.041. Pratap et al. (2019) [19] reviewed the paradigm of machine learning and applied it to forecasting inflation in India. Various machine learning algorithms were trained and evaluated for their forecasting accuracy in comparison with traditional statistical methods. The findings indicated that machine learning approaches generally

outperformed conventional statistical models in terms of predictive performance. N Sibal et al. (2024) [17] forecasted the Saudi Arabian Consumer Price Index using six machine learning methods: Decision Tree (Tree), k-Nearest Neighbors (kNN), Linear Regression (LR), Neural Networks (NN), Random Forest (RF), and Support Vector Machine (SVM). These methods were applied to historical CPI data from January 2013 to November 2020, utilizing the Orange 3 data mining and analytics platform. The results indicate that the multilayer perceptron (MLP) neural network model outperforms all other machine learning approaches, achieving predictions closest to the actual CPI, and may be used to forecast the CPI for up to 3 years beyond the latest training data. Lee et al. (2024) [12] studied evaluating the performance of five ML techniques: Autoregressive Integrated Moving Average (ARIMA), Geometric Brownian Motion (GBM), Gated Recurrent Unit (GRU), Long Short-Term Memory (LSTM), and Adaptive Neuro-Fuzzy Inference System (ANFIS), in predicting Malaysia's CPI from October 2022 to September 2023. Results indicate that GRU model performs best, exhibiting the lowest MSE. Feng et al. (2024) [9] approached separately constructs the LSTM and the Vector Autoregression (VAR) model, a classic econometric approach for time series forecasting, based on 23 factors that affect CPI directly or indirectly. The results showed that the error of the LSTM was significantly lower than that of the VAR in forecasting China's CPI, while the VAR model provided an explicit explanation of the factors of CPI forecasting through the Granger causality test. Kong et al. (2024) [10] exploited the power of LSTM in time series forecasting, proposing a simple but effective algorithm called P-sLSTM, which is built on sLSTM (LSTM with scalar memory, scalar update, and new memory mixing) by combining patching and channel independence. These modifications significantly improve the performance of sLSTM in time series forecasting, achieving state-of-the-art results.

In Vietnam, there are also some studies on forecasting inflation index. Vuong Quoc Duy and Huynh Hai Au (2014) [1] used the Box-Jenkins method (1976) to model and forecast Vietnam's inflation rate. The results showed that the most suitable model was ARIMA(1,0,1), (2,0,3) and forecasted that in the next 12 months, inflation in Vietnam will fluctuate insignificantly, except for the first month of 2014. However, the results of this study also partly provide practical information for investors as well as policy makers in finding appropriate solutions to prevent and minimize damage caused by inflation. Pham Thi Thanh Xuan et al. (2020) [4] forecasted inflation for Vietnam by applying artificial neural networks (ANN) with the back-propagation algorithm. Monthly Vietman's inflation data from 2000 to 2018. The studying showed that actual and predicted inflation were relatively close. This has contributed to other domestic and foreign studies confirming that the ANN model used in macroeconomic forecasting in general and inflation in particular is effective and reliable. Nguyen Huong Ly, Hoang Thi Thu Ha (2022) [3] used the Seasonal Autoregressive Integrated Moving Average (SARIMA), RNN, LSTM and combined forecasting models to forecast monthly inflation index of Vietnam in the period 2000 - 2021. The results showed that LSTM gave better results than SARIMA in the short term, but worse in the long term, and the combined forecast gave the best forecasting results in both the short and long term. However, the forecasting results were not as good as expected because part of the data was in the pandemic period, so there was a large error in inflation forecasting.

Above is an overview of some studies applying machine learning in forecasting CPI. There are not many studies applying machine learning algorithms on Vietnamese data, and the models used have not been updated. Therefore, research on applying machine learning algorithms in forecasting CPI in Vietnam is really necessary. Deep learning is a subset of machine learning that focuses on utilizing neural networks to perform tasks such as classification, regression, and representation learning. In this paper, we introduce five Deep learning models included Deep Neural Networks (DNN), Recurrent Neural Networks (RNN), Long Short - Term Memory (LSTM), Bidirectional Long Short-Term Memory Network (BiLSTM) and a Scalar extension of LSTM (s-LSTM) to predict Vietnam's CPI, ultilizing monthly data from January 2015 to December 2023. The forecasting results of all models show an accuracy of over 99% and a fairly small mean square error (MSE). This proves that the proposed deep learning algorithms are suitable for forecasting CPI in Vietnam.

## II. MATERIAL AND METHOD

### 2.1. Preliminaries

#### 2.1.1. Deep Neural Networks (DNN)

Basically, artificial neural networks (ANN) are a computational model, they are built based on the structure and function of neural networks in Biology (although the structure of ANN will be affected by a flow of information). It is a collection of layers to perform a specific task. Each layer consists of a collection of nodes to operate together. These networks usually consist of an input layer, one to two hidden layers, and an output layer.

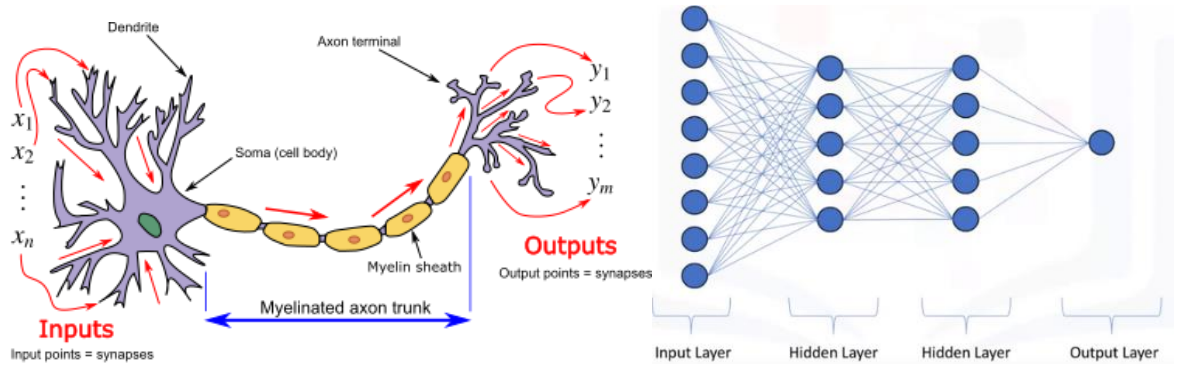



**Figure 1. Structure of a typical neuron 0.**

DNN have a complex hidden layer structure with a wide variety of different layers, such as a convolutional layer, max-pooling layer, dense layer, and other unique layers. These additional layers help the model better understand problems and provide optimal solutions to complex projects. DNN are also called Multi-layer Perceptrons (MLP).

Layers: The set of input data $x_i$ $(i = \overline{1,n})$ is called the input layer; the set of values of $y_j$ $(j = \overline{1,m})$ is called the output layer. Beside input layers and output layers, hidden layers are generally denoted by $l-th$ layer.

**Nodes:** Input data, output results, and the computing nodes are collectively called units. The input of the hidden layers is denoted by z, the output of each unit is denoted by a after applying the activation function to z. The output at each hidden layer does not have to be 2, and does not have to be the same across all layers. The output of the i-th unit in the l-th layer is denoted by $a_i^{(l)}$ and the number of units in the l-th layer (excluding bias) is $d^l$, we have $a^l \in \mathbf{R}^{d^l}$.

**Weight and Bias**: In a Perceptron with one layer, the parameter w is called the weight. The element $w_{i,j}^{(l)}$ is the parameter in the connection between the i-th node of the $(l-1)$ -th layer and the j-th node of the $l$-th layer. Consider the input as the 0-th layer, the weights form the matrix. This is the weight matrix connecting the $(l-1)$-th layer and the $l$-th layer. There are L weight matrices for an MLP with L layers: $W^{(l)}, l = 1,2,\ldots,L$. The bias term plays a important role in helping the model fit the data better by adding flexibility to the activation of a neuron. We denote $b^l$ is the bias added to the weighted sum of inputs for the $l$-th layer before applying the activation function.

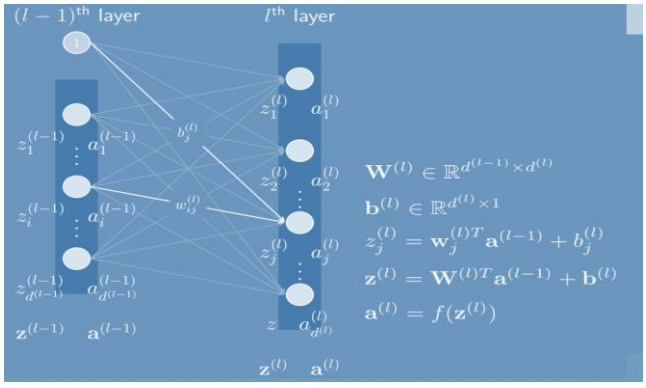



**Figure 2. The relation between *l* - 1 layer and *l* layer 0**

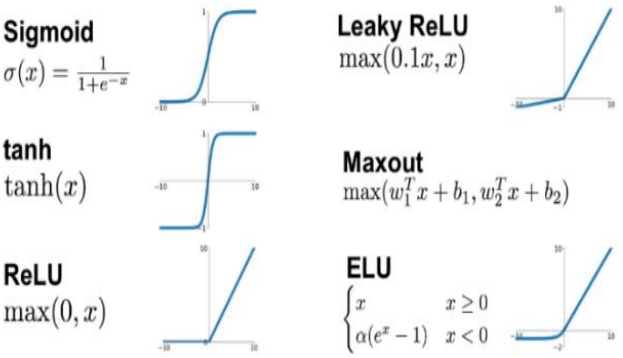



**Figure 3. Some form of activation function**

**Activation functions:** introduce non-linearity into the model, enabling it to learn complex relationships. An output of an unit (excluding input units) calculated based on the formula:

$$a_i^{(l)} = f\left(w_i^{(l)T} a^{(l-1)} + b_i^{(l)}\right) = f\left(z_i^{(l)}\right)$$

Where $z_i^{(l)} = \sum_{j=1}^{d^{(l-1)}} w_{i,j}^{(l)} a_j^{(l-1)} + b_i^{(l)}$, f (·) is a (nonlinear) activation function (figure 3).

In vector form: $a^{(l)} = f\left(W^{(l)T} a^{(l-1)} + b^{(l)}\right) \in R^{d^{(l)}}$

**Loss functions**: measures the difference between the predicted output and the actual target value, such as

– Mean Square Error (MSE):

$$J_0(\mathbf{W}, \mathbf{b}, \mathbf{X}, \mathbf{Y}) = \frac{1}{N}\sum_{n=1}^{N}\|y_n - \hat{y}_n\|_2^2 = \frac{1}{N}\sum_{n=1}^{N}\|y_n - a_n^{(L)}\|_2^2 .$$

– Mean absolute error (MAE):

$$J_0(\mathbf{W}, \mathbf{b}, \mathbf{X}, \mathbf{Y}) = \frac{1}{N}\sum_{n-1}^{N}|y_n - \hat{y}_n| = \frac{1}{N}\sum_{n=1}^{N}|y_n - a_n^{(L)}|.$$

– Cross-entropy:

$$J_0(\mathbf{W}, \mathbf{b}, \mathbf{X}, \mathbf{Y}) = -\sum_{n-1}^{N}\left(y_n \log a_n^{(L)} + (1 - y_n)\log\left(1 - a_n^{(L)}\right)\right)$$

Where, $\{(x_n, y_n)\}_{n=1}^{N}$ are the training data pairs; $\hat{y}_n$ are the predicted outputs of the model. Note that at the last layer $\hat{y}_n$ are the predicted outputs of xn through the model. In the end layer Lth: $\hat{y}_n = a_n^{(L)}$. To find the parameters W, b for the model, we need to solve the minimization problem: $\hat{y}_n = a_n^{(L)}$ The simplest and most popular method for optimizing MLP is Gradient Descent (GD). In general, J(W, b, X, Y) is not a convex function, so we cannot be sure whether the obtained extrema is the global extrema. However, with a properly chosen initial approximation, the Gradient Descent method usually still gives a good enough solution (parameter set W, b).

**2.1.2. Recurrent neutral networks (RNNs)**

RNNs were introduced by John Hopfield in 1982 and have since become a significant paradigm in Deep learning. RNNs is a type of artificial neural network architecture specifically designed to process sequence data, where information from previous steps in the sequence is linked and influences the current prediction. The term "recurrent" refers to the repetitive nature of performing the same task for each component in the sequence. In which, the output at the current time depends on the computation results from previous time steps. Training an RNN follows a process similar to that of training a traditional neural network. However, the value at each output depends not only on the calculation at the current step but also on the results from previous steps.

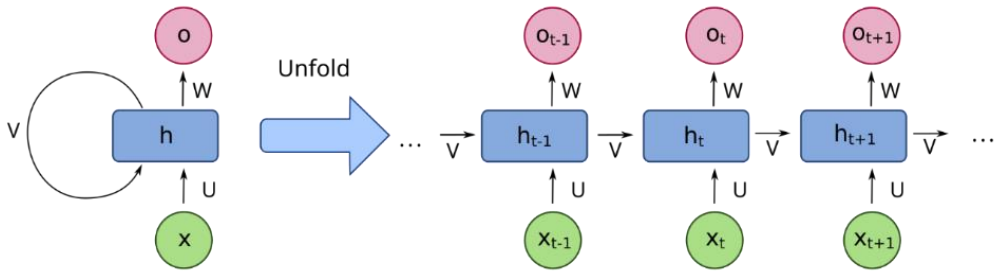



**Figure 4. Simple Recurrent Neural Network.**

In **figure 4**, the reverse arrow is the loop. On the left is the condensed image of the network (representing the loop). On the right is the network after it has been expanded. It is worth noting that the network will no longer receive a simple signal vector *x*, but a series of signal vectors $x_1, x_2, ..., x_t$ corresponding to the input signal of the data point $t = 1 \to t$ at the current time. Furthermore, the network will also produce hidden results, equivalent to the output signal vector at that time *t*. The hidden state at time *t*, is calculated by

$$h_t = \sigma_h(W_h x_t + U_h h_{t-1} + b_h),$$

Where $x_i$ is input at time *t*, $h_{t-1}$ is hidden state at time $t - 1$, $W_h$ is weight matrix for connections input-to-hidden, $U_h$ is weight matrix for connections hidden-to-hidden, $b_h$ is bias of hidden state and $\sigma_h$ is activation function of hidden state, commonly used function Tanh

$$\left(Tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}\right)$$

### 2.1.3. Long Short-Term Memory (LSTM)

LSTM is a specialized architecture of RNNs introduced by Hochreiter & Schmidhuber (1997) as a solution to the challenge of relying on distant past information, which traditional RNNs struggle to retain effectively. LSTM is well-suited for predictive and sequencing tasks, exceling at capturing long-term dependencies. Its applications extend to time series related-problems. Unlike traditional neural networks, LSTM incorporates feedback connections, allowing it to process entire sequences of data rather than individual data points. The core innovation of LSTM lies in the cell state, which acts as a "conveyor belt" to allow information to flow through the network with minimal modifications. Symbol $X_t^{train}$ is the input training data. **Figure 5** shows the structure of an LSTM network, which consists of one or more hidden layers, an input layer, and an output layer with three primary gates:

**Forget gate:** The forget gate determines whether information from the previous time step should be retained or discarded. It takes two inputs $h_{t-1}$ and $X_t^{train}$ and returns a value between 0 and 1 via the sigmoid function for each state cell value. A value of 1 represents 'retain all information' and 0 represents 'forget all information'. Mathematically, it is expressed as:

$$f_t = \sigma\left(W_f \times \left[h_{t-1}, X_t^{train}\right] + b_f\right)$$

where $f_t$ is forget state activation at time $t$, $h_{t-1}$ is hidden state at time $t-1$, $W_f$ is forget gate weights, $b_f$ is forget gate bias, $\sigma(x) = 1/(1+e^{-x})$ is sigmoid activation function.

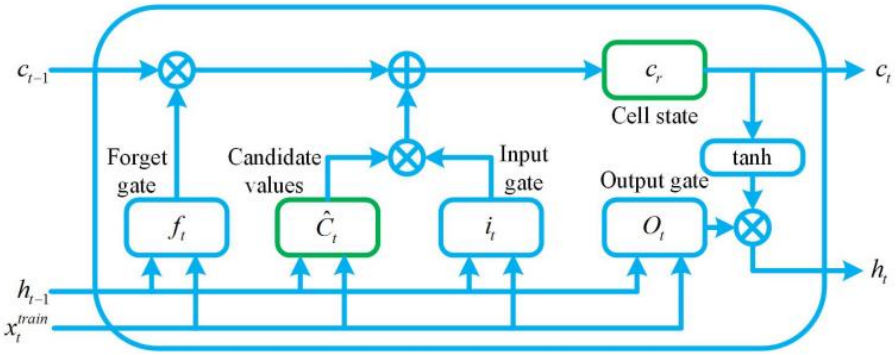



**Figure 5. Structure of LSTM 0**

**Input gate:** The input gate decides which new information should be stored in the cell state. It involves two steps. The first step, a sigmoid layer determines which values to update. The second step, a tanh layer generates a candidate vector for the new state values. The results from these layers are combined to update the cell state. This process is expressed as:

$$i_t = \sigma\left(W_i \times \left[h_{t-1}, X_t^{train}\right] + b_i\right),\ \hat{C}_t = tanh\left(W_c \times \left[h_{t-1}, X_t^{train}\right] + b_c\right)$$

The new cell state is updated as: $C_t = f_t * C_{t-1} + i_t * \hat{C}_t$, where $i_t$ is input gate activation at time *t*, $\hat{C}_t$ is candidates cell state at time *t*.

**Output gate:** The output gate determines what information to output. First a sigmoid function identifies the relevant parts of the cell state. Then, the cell state is passed through a tanh function to scale the values between [-1,1] and this result is multiplied by the output of the sigmoid gate. The formula is:

$$O_t = \sigma(W_o[h_{t-1}, x_t] + b_o), h_t = O_t * tanh(C_t),$$

where $o_t$ is output gate activation at time *t*, $h_t$ is hidden state at time *t*.

### 2.1.4. Bidirectional Long-short term memory (BiLSTM)

BiLSTM was introduced in 1997 by Schuster and Paliwal. It connects two hidden layers operating in opposite directions to the same output, allowing the model to access both past (backward) and future (forward) states simultaneously. BiLSTM does not require fixed input data and can leverage future input information from the current

state. At a given time step t, the minibatch input is denoted as $X_t \in \boldsymbol{R}^{n\times d}$, where n is the number of samples, and d is the dimensionality of the input features. The activation function for the hidden layer is represented as $\emptyset$. In the two-dimensional architecture, we assume that the forward and reverse hidden states of this time step are respectively $\vec{H}_t \in \boldsymbol{R}^{n\times h}$ and $\overleftarrow{H}_t \in \boldsymbol{R}^{n\times h}$, h here denotes the number of hidden nodes. We compute the forward and backward updates of the hidden state as follows:

$$\vec{H}_t = \emptyset\left(X_t W_{xh}^{(f)} + \vec{H}_{t-1} W_{hh}^{(f)} + b_h^{(f)}\right), \overleftarrow{H}_t = \emptyset\left(X_t W_{xh}^{(b)} + \vec{H}_{t+1} W_{hh}^{(b)} + b_h^{(b)}\right)$$

Where $W_{xh}^{(f)} \in \boldsymbol{R}^{d\times h}, W_{xh}^{(b)} \in R^{d\times h}$ are input weights for forward and backward states; $W_{hh}^{(f)} \in \boldsymbol{R}^{h\times h}, W_{hh}^{(b)} \in R^{h\times h}$ are recurrent weights for forward and backward states; $b_h^{(f)} \in \boldsymbol{R}^{1\times h}, b_h^{(b)} \in \boldsymbol{R}^{1\times h}$ are bias terms for forward and backward states.

The hidden states $\vec{H}_t, \overleftarrow{H}_t$ are concatenated to form the final hidden state $H_t = \left(\vec{H}_t, \overleftarrow{H}_t\right) \in \boldsymbol{R}^{n\times 2h}$ which is passes to the output layer. In deep bidirectional recurrent neural networks, this information is propagated as input to subsequent bidirectional layers. The output layer computes the final output $O_t \in R^{n\times q}$ ($q$ is dimensionality of the output) as follows:

$$O_t = H_t W_{hq} + b_q,$$

where $W_{hq} \in \boldsymbol{R}^{2h\times q}$ is output weights and $b_q \in \boldsymbol{R}^{1\times q}$ is output bias.

The forward and backward directions can have different numbers of hidden nodes, allowing for more flexibility compared to traditional RNNs. **Figure 6** illustrates the structure of a BiLSTM with a single hidden layer. The principle of BiLSTM is to divide the neurons of a conventional RNN into two directions, one for the positive time direction (forward state) and the other for the negative time direction (backward state). The outputs of these two states do not interact with the opposite direction's inputs. By leveraging both time directions, BiLSTM can utilize past and future input information within the current time frame. This feature differentiates it from standard RNNs, which require a delay to incorporate future information.

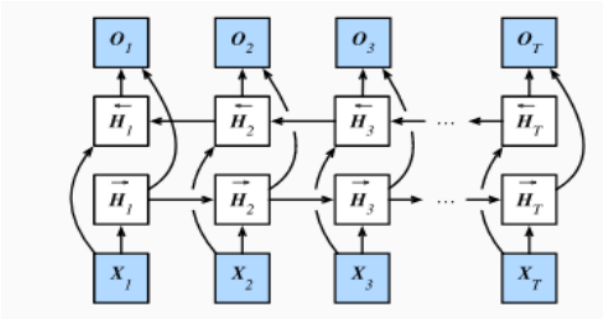



**Figure 6. Bidirectional recurrent neural network structure.**

### 2.1.5. Scalar Long Short-Term Memory (s-LSTM)

s-LSTM is an extension of the traditional LSTM architecture, recently introduced as part of the xLSTM framework by Beck et al (2024) 0. It enhances the LSTM by incorporating exponential gating and a new memory mixing mechanism. sLSTM uses exponential ( $\exp(x)$ ) or sigmoid function ( $\sigma$ ) instead of linear functions at the forget and input gates.

Forget gate: The sLSTM allows for the use of either a sigmoid or exponential activation function in the forget gate, whereas traditional LSTM strictly uses sigmoid. The forget gate in sLSTM is represented as

$$f_t = \sigma\left(W_f \times \left[h_{t-1}, X_t^{train}\right] + b_f\right) \text{ or } f_t = exp\left(W_f \times \left[h_{t-1}, X_t^{train}\right] + b_f\right)$$

where $f_t$ is forget gate activation at time *t*, $W_f$ is forget gate weight matrix, $b_f$ is forget gate bias and $\left[h_{t-1}, X_t^{train}\right]$ is concatenated hidden state and input vector.

Input gate: In sLSTM, the input gate replaces the sigmoid activation function in traditional LSTMs with an exponential function. This is defined as:

$$i_t = exp\left(W_i \times \left[h_{t-1}, X_t^{train}\right] + b_i\right)$$

where $i_t$ is input gate activation at time t, $W_i$ is input gate weight matrix and $b_i$ is Input gate bias.

Normalizer State and Hidden State: The sLSTM introduces a normalizer state $n_t$ to stabilize calculations over long sequences and modifies the hidden state calculation as follows:

$$h_t = o_t \, \boldsymbol{R} \, \tilde{h}_t, \tilde{h}_t = c_t \, \boldsymbol{R} \, n_t^{-1}$$

where the normalizer state is updated as: $n_t = f_t \boldsymbol{R} n_{t-1} + i_t$

These modifications on the exponential gating in both the forget and input gates provides more flexibility in controlling information flow, while the normalizer state helps in stabilizing the hidden state calculations over long sequences.

### 2.2. Method

#### 2.2.1 Data Preprocessing and Normalization

We collected monthly Consumer Price Index (CPI) data for Vietnam from January 1995 to December 2023 from the website of General Statistics Office of Vietnam (https://www.gso.gov.vn/). The dataset consists of two columns: the time in months and years, and the CPI, resulting in a total of 347 data points.

To prepare the data for modeling, we implemented a dataset window with three parameters: window_size = 20, batch_size = 32, and shuffle_buffer = 500. The window_size parameter determines the length of each dataset window in the time series. A window is a subset of the data series used as input for the model. A rolling window with size 20 is used to separate data, meaning we predict the CPI for the next month based on historical data from the previous 20 month. This approach results in a point-by-point prediction. The batch_size parameter defines the number of data samples processed simultaneously during each training iteration. For example, if batch_size = 32, each training session will handle 32 windows of data at a time. The shuffle_buffer parameter specifies the buffer size used to shuffle the data before feeding it into the model. We set the buffer size equal to the length of the sequence to optimize memory usage. During training, the training window is initialized with all real training data. The window is then shifted to include the next real data point at its end to predict the next point and so forth.

To standardize the data, we applied the "min-max" normalization method to scale the values to the interval $[0,1]$, using the following formula:

$$X_t^n = \frac{X_t - \min(X_t)}{\max(X_t) - \min(X_t)}$$

where $X_t^n$ represents the normalized data. After predictions are made, it is necessary to denormalize the results to obtain the original CPI values. The denormalization process is given by:

$$\hat{X}_t = \hat{X}_t^n \left[\max(X_t) - \min(X_t)\right] + \min(X_t) \quad (1)$$

where $\hat{X}_t^n$ represents the normalized predicted data, and $\hat{X}_t$ is the corresponding value after denormalization.

#### 2.2.2 Training setting

We trained deep learning models, including DNN, RNN, LSTM, BiLSTM, and s-LSTM in Python programming language. Below, we detail the architecture and methodology of each model:

**DNN Model:** The DNN model represents a fundamental deep learning approach, constructed as a series of layers where the output of one layer serves as the input for the next. This simple model consists of three Dense layers with 30, 10, and 1 neurons, respectively, and employs the ReLU activation function. The Mean Squared Error (MSE) loss function and the Stochastic Gradient Descent (SGD) algorithm are used to optimize the model weights during training. Additionally, a learning rate scheduler is implemented to adjust the learning rate dynamically. For the CPI dataset, we chose the learning rate equal $5\times10^{-6}$ to a fixed value and used 100 epochs.

**LSTM Model:** We built the LSTM which comprises six layers arranged in the following sequence: an LSTM layer, a dropout layer, another LSTM layer, an additional LSTM layer, a dropout layer, and finally, a Dense layer. Each LSTM layer contains 50 neurons and is structured to maintain and adjust information across time steps, making it well-

suited for handling long sequential data. We used three LSTM layers, the first two LSTM layers have the parameter return_sequences=True, ensuring that they return the full output sequence at each time step for the subsequent layers; the last LSTM layer has return_sequences=False, returning only the output at the last time step, which serves as input to the Dense layer. Dropout layers, with a dropout rate of 0.2, are included to prevent overfitting. The Dense layer reshapes the output with a single neuron and employs a linear activation function. We chose the learning rate equal $10^{-6}$ , used the MSE loss function and the ADAM optimizer due to its efficiency and suitability for large datasets with extensive parameters.

**RNN model:** The RNN model is designed as a Sequential model to process and predict time series data. It includes the following layers A Lambda layer to transform the input data with input_shape=window_size. A SimpleRNN layer with 40 neurons and return_sequences=True, ensuring that the result sequence is returned at each time step for subsequent layers. Another SimpleRNN layer, also with 40 neurons, but return_sequences=False, returning only the output at the last time step. A Dense layer as the output layer with one neuron and no activation function, predicting the value at each time step. In this model, we also chose the learning rate equal $10^{-6}$, used the MSE loss function and the ADAM optimizer.

**BiLSTM model***:* The BiLSTM model uses Bidirectional LSTM layers to capture sequential relationships in the data from both temporal directions - past to present and vice versa. This model includes five layers: A Lambda layer to add a dimension to the input data, converting it into a 3D tensor (batch_size, window_size, 1) to meet the input requirements of LSTM layers. The first Bidirectional LSTM layer with 32 neurons and return_sequences=True, enabling the entire output sequence to be passed to subsequent layers. The second Bidirectional LSTM layer with 32 neurons, but without return_sequences=True, ensuring it only returns the output at the last time step. A Dense layer with one neuron as the output layer for time series predictions. We also chose the learning rate equal $10^{-6}$, used the ADAM optimizer and the MSE loss function for this model.

**sLSTM model:** The sLSTM model employs an sLSTMCell layer, a variant of LSTM that uses an exponential function in the forget and input gates. We built the sLSTM architecture with three layers: An Input layer to receive the data, an RNN layer with sLSTMCell containing 50 neurons and an output Dense layer with one neuron. We chose the learning rate equal $10^{-6}$, used the ADAM optimizer and MSE loss function for optimization and training.

**2.2.3. Forecasting and accuracy evaluation**

We used forecasting method which describes a sliding window-based forecasting approach for time series data, enabling models to learn from temporal dependencies effectively. Firstly, a time series dataset is converted into sliding windows of fixed size (window_size), where each window acts as a small sequence of data points used for prediction. The sliding windows move step-by-step (with a shift of 1 by default), ensuring that every point in the series contributes to the prediction. Secondly, the windows are flattened into batches for efficient processing. Larger batches (batch_size) are created, and prefetching is used to optimize input/output operations during prediction. Third, the trained model is applied to the prepared dataset of sliding windows. It processes these windows to generate predictions for the next time step or steps, depending on the model's configuration. After that, the predictions are flattened (squeezed) to remove unnecessary dimensions, resulting in a clean, one-dimensional output array containing the forecasted values.

The forecasting models aim to minimize the following loss function:

$$L = \min \sum_{t=k+1}^{k+T} \left\| X_t - \hat{X}_t \right\|^2$$

where $T$ represents the number of prediction intervals, i.e. $t = 1,...,k$ are observations (training input data), $t = k+1,...,k+T$ are the predictions (training output data); and $\hat{X}_t$ are given by (1), $\|.\|$ is the Euclidean norm.

The accuracy is calculated as:

$$Accuracy = 1 - \frac{1}{T} \sum_{t=k+1}^{k+T} \left| \frac{X_t - \hat{X}_t}{X_t} \right|$$

## III. RESULT AND DISCUSSION

### 3.1. Results

We conducted model training and forecasting for Vietnam's CPI using DNN, RNN, LSTM, BiLSTM, and s-LSTM models. The results for MSE, accuracy, training time, and forecasting time are summarized in **Table 1**. This result represent the average performance over 10 runs for each model, trained with 100 epochs on a laptop equipped with an Intel(R) Core(TM) i7-5600U CPU @ 2.60GHz 2.60 GHz.

**Table 1. Summary of results MSE, Accuracy, training time, and forecast time.**

| | DNN | LSTM | RNN | BiLSTM | sLSTM |
|---|---|---|---|---|---|
| **MSE** | 0.3544209 | 0.299408 | 0.391363 | 0.302579 | **0.29527** |
| **Accuracy** | 0.995509 | 0.995461 | 0.995102 | 0.995848 | **0.995951** |
| **Training time** | 22.91688 | **16.56191** | 21.4725 | 49.57649 | 21.63822 |
| **Forecasting time** | 0.47436 | 1.56916 | 0.63755 | 2.72748 | **0.30306** |

Figures 7 to 11 are comparison of Actual vs Predicted CPI on the validation set using DNN, LSTM, RNN, BiLSTM, s-LSTM models, respectively.

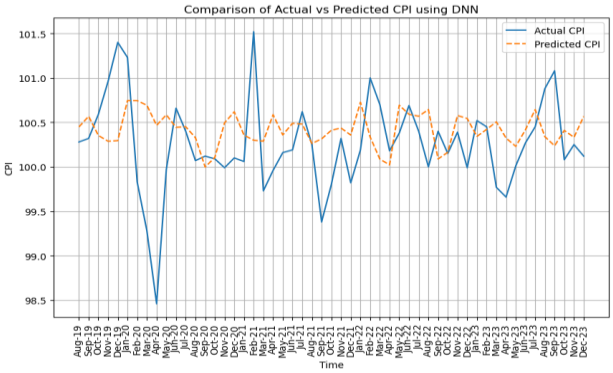



**Figure 7. CPI forecast graph using DNN**

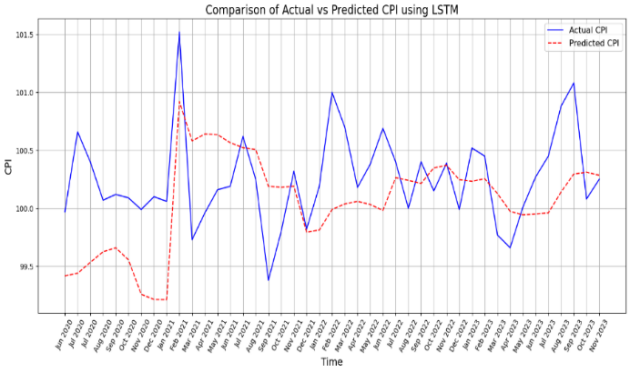



**Figure 8. CPI forecast graph using LSTM**

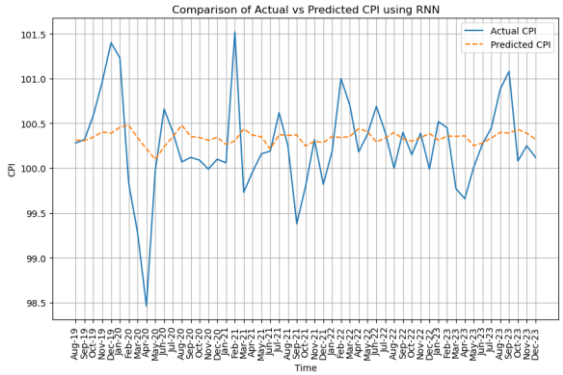



**Figure 9. CPI forecast graph using RNN**

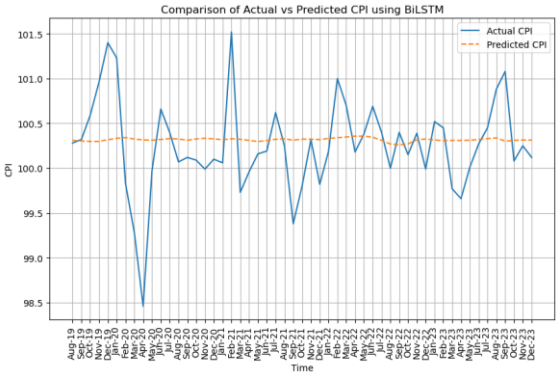



**Figure 10. CPI forecast graph using BiLSTM**

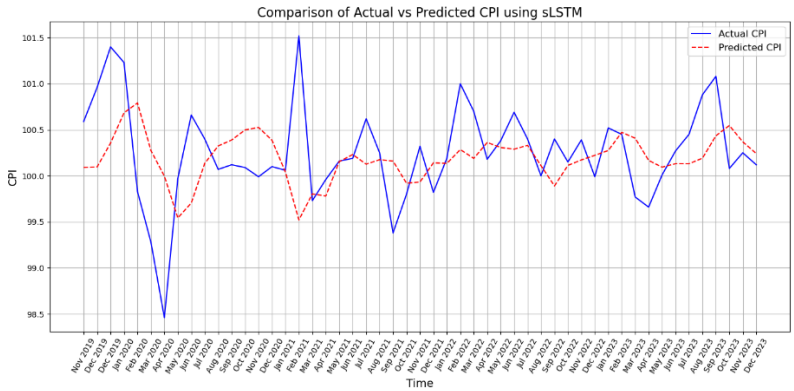



**Figure 11. CPI forecast graph using s-LSTM.**

### 3.2. Analysis of results and discussion

From the summary results in **Table 1**, it can be observed that the DNN, RNN, LSTM, BiLSTM, and s-LTSM models are all highly suitable for forecasting CPI, achieving high accuracy rates exceeding 99% and low MSE values. Among them, the sLSTM model demonstrated the best performance, achieving the highest accuracy of 99.5961% and the lowest MSE of 0.29527. Additionally, the LSTM model achieved the second-lowest MSE of 0.299408 and recorded the fastest training time of 16.56191 seconds. Meanwhile, the s-LSTM model achieved the fastest forecasting time of 0.30306 seconds. These results highlight that the deep learning models implemented in this study provide highly accurate CPI forecasts with competitive computational efficiency. According to Kong et al (2024) 0, multiple sLSTM blocks can be stacked together to form deeper networks, referred to as Ps-LSTM, which enhanced the model's capacity to capture complex temporal dependencies in sequential data. This suggests that the s-LSTM model has great potential in forecasting time series data in general and CPI in particular.

## IV. CONCLUSION

Forecasting macroeconomic indicators, including CPI, is inherently challenging due to the scarcity of data and the necessity to consider multiple influencing factors. In this study, we employed deep learning algorithms to forecast Vietnam's CPI. Based on the analysis of results, we propose the use of our LSTM model and its extension, the sLSTM model, as effective approaches for CPI forecasting. In future work, we plan to continue researching and applying more flexible machine learning models, optimizing hyperparameters, selecting appropriate features, or combining with other methodologies to develop more comprehensive forecasting models. This will enable us to analyze and address additional aspects of forecasting with greater precision.

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# DIGITAL TRANSFORMATION AND ISSUES ARISING IN IMPROVING THE ORGANIZATION AND OPERATION OF URBAN GOVERNMENT IN VIETNAM TODAY

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**ABSTRACT**

Digital transformation is an inevitable trend for the economic, cultural and social development of countries, building a digital government increases the efficiency of governments at all levels, contributes to preventing and combating corruption and negativity, and increases openness and transparency. Therefore, the issue of researching and perfecting the organization and operation of urban governments in Vietnam today is an objective reality that requires research. Based on identifying the research problem, the article focuses on analyzing the theoretical basis and requirements of digital transformation associated with innovation in the organizational model and operation methods of urban governments. Using the method of analysis and comparison to study the requirements of digital transformation, the article will raise issues and policy suggestions to contribute to perfecting the organization and operation of urban governments in Vietnam today, in order to build and operate urban government governance models in a streamlined, effective and efficient manner.

*Keywords:* "digital transformation", "digital transformation requirements", "urban government"

## I. INTRODUCTION

There are currently many studies and concepts about Digital Transformation. Digital transformation can be understood as the use of digital technology, in addition to the improvements and support of traditional methods, to encourage and promote innovation (Kaputa et al., 2022). More specifically, digital transformation is a process of improving an object by activating significant changes in its properties, based on the combination of information, electronic devices, communication technology and online connections (Vital, 2019). This process, which requires an organized, well-planned approach, with the participation of all stakeholders, both inside and outside the organization, is often referred to as a digital transformation strategy, to exploit the potential and impact of new technology quickly and creatively (Bones, 2016). Digital transformation is the change in culture, organization and operations of an organization, industry or ecosystem through the intelligent integration of digital technologies, processes and capabilities at all levels and functions in an organized and strategic manner (i-SCOOP, 2018). In short, digital transformation is defined as the use of digital data and technology to comprehensively and comprehensively change all aspects of economic and social life, reshaping the way we live, work and relate to each other (N.T, 2020). In the context of urban government, digital transformation not only focuses on technology but also requires changes in leadership thinking, organizational structure and operating methods. Digital transformation is associated with a new public governance model, emphasizing the application of information technology and innovation to reform organizations, enhance transparency and interaction between government and citizens.

Urban government plays a central role in managing urban resources, providing public services and regulating social development. Digital transformation helps urban government improve management capacity, increase transparency and operational efficiency, and facilitate citizen participation in the decision-making process. It can be said that perfecting the organization and operation of urban government in Vietnam is an urgent requirement to meet the needs of socio-economic development and improve the quality of life for people.

In particular, the urban government organization model suitable to the circumstances and socio-economic situation of the city and the country will be the driving force to exploit the strengths of the city, to propose reasonable urban planning policies and plans, contributing to promoting the development of the city in particular as well as the development of the region and the country in general. Especially in the context of digital transformation playing an

important role in perfecting the organization and operation of urban government in Vietnam today. Specifically, since the recent 13th Party Congress, in the documents, urban development is considered a "strategy" and special attention is paid to the strategy, thinking, vision, tools and policies for urban and urban economic development. In the documents of the 13th Party Congress, the task is set out: "Continue to perfect the organization of local government in accordance with rural areas, urban areas, islands, administrative units, special economic zones according to the law; implement and summarize the pilot urban government to build and operate urban government governance models in a streamlined, effective and efficient manner"( (Documents of the XIII Congress, 2021). This is an important basis for cities nationwide to have more opportunities to develop in a more systematic and synchronous manner in the new context and situation.

In which, each urban area is a unified entity in terms of economy - society - population, closely bound and interdependent in production, business, service and consumption activities. Therefore, it is required that the urban government must be a government built on the basis of promoting dynamism and responsiveness in management, solving work with high work efficiency, ensuring accuracy and timeliness. State management activities in urban areas are complex, diverse with a large volume of work. Urban authorities must manage unified technical infrastructure in water supply and drainage, electricity supply, public lighting, education, health protection, environmental sanitation, traffic, and communications. At the same time, managing social infrastructure in terms of housing, services, commerce, education - training, scientific research, health care, culture, sports, food, entertainment, recreation, political security, order, social safety, etc. This shows that the organization and tasks and powers of urban governments cannot be the same as those of rural governments, especially in the context of digital transformation taking place strongly as it is today.

From the content of the organizational structure and operation of urban governments, the author determines the research content to clarify the theoretical basis and requirements of digital transformation associated with innovation in the organizational model and operation methods of urban governments in Vietnam today, within the scope of the research is the organization and operation of urban governments in the context of digital transformation. This is new content that needs to be analyzed and clarified in both theory and practice.

## II. MATERIAL AND METHOD

### 2.1. Theoretical basis of digital transformation for improving the organization and operation of urban government

Digital transformation in urban government is the process of applying digital technologies, big data, artificial intelligence (AI), Internet of Things (IoT) and other information technology solutions to modernize and optimize the organization and operation of urban government. Digital transformation can include:

- Technology: Using new technologies such as social media, smartphones, tablets and/or other technological devices.
- Organization: Changes in the organization's operations or creating new business models.
- Society: Human impacts such as user experience, openness or resistance/resistance to change (Reis, J et al., (2018).

This process not only focuses on digitizing current processes but also promotes administrative reform, innovation in management models, more efficient public service delivery and increased citizen participation in urban management activities. Digital transformation also changes the way cities/municipalities operate, and goes beyond digitizing processes by changing basic tasks and processes in cities/municipalities (Caponio et al., 2015). In some countries around the world, successful digital transformation models have been built by urban authorities in state governance such as:

+ Denmark: is the leading country in Europe in digital transformation. In terms of internet use, almost all Danes are online (95%) and scored highest (100 points) on the availability of domestic and cross-border online public services for 865 businesses, 88% of citizens interact digitally with public authorities at least once. Denmark has made the transition such as mandatory citizen accounts for government payments (NemKonto); secure electronic authentication solution (NemID), each person has a means of personal identification and secure online authentication; establishing a number of common portals such as personal health data (sundhed.dk), a single access point to all public services (borger.dk) and a dedicated public service portal for businesses (virk.dk). Digital learning tools and materials for everyone are widely

available; many basic public sector data are online and freely accessible (Nguyen Thi Huong, 2020). Denmark's digital transformation strategy focuses on creating a centralized IT infrastructure that links government agencies, local authorities with common services to implement digital infrastructure solutions, data reuse, data security, and digital welfare.

+ Estonia is one of the countries along with Denmark that has been very successful in digital transformation when building a state management government. This country has 1.3 million citizens and 867 standard services such as e-tax and personal ID. Citizens access 99% of state services, except for marriage, divorce, and real estate transactions. Each person living and working in the country has a unique ID to log into the system; 67% of citizens use the portal regularly and nearly half participate in online voting without leaving home.

+ French Republic: DCANT Program 2018-2020 (Program for the Development of e-Government from Central to Local Levels in France). The ambition of this Program is to "build together a seamless and effective local digital service". Citizens are the central target of the State and local governments in providing online public services. (Government, 2021).

+ Boston: A Digital City Transforming Urban Living, The city of Boston has emerged as a pioneer in digital transformation, leveraging digital technology to enhance urban living. The city's "Citizens Connect" platform serves as a digital hub for residents to interact with various city departments, report issues, and access municipal services. Boston has also implemented a mobile app that allows citizens to pay parking tickets, renew their licences, and receive real-time updates on city events and services. These digital initiatives have fostered a sense of community and empowered citizens to engage with the city administration more effectively (OECD, 2024).

Vietnam's urban government has been organized corresponding to equivalent administrative-territorial units and urban types are ranked equivalent to the administrative hierarchy of the territory. Selecting and building a government model suitable to political, economic, cultural conditions and specific development goals is a legitimate requirement of each locality. Implementing the innovation of the urban government organization model in a number of centrally-run cities is one of the issues that our Party and State pay special attention to. In July 2012, the Central Steering Committee for the development of a pilot project on the urban government organization model issued Plan No. 78/KH-BCĐTWCQDT "On developing a pilot project on the urban government organization model" with the "Outline of the pilot project on the urban government organization model". It clearly stated the viewpoint: The innovation of the organization and operation of local governments is posing the necessary requirement to clarify the difference between urban and rural areas, thereby determining the organizational model, regulating the functions, tasks, authority, responsibility and appropriate operating mechanism for urban and rural governments to ensure the unity, smoothness, effectiveness and efficiency of management at each level of government.

Resolution No. 27-NQ/TW dated November 9, 2022 of the 6th Conference of the Party Central Committee (13th tenure) on continuing to build and perfect the socialist rule-of-law State of Vietnam in the new period has set out the task of "Perfecting the organization of local governments suitable for urban, rural, mountainous, island areas, and special administrative-economic units; reducing appropriate levels of government in a number of localities; building a model of local government governance suitable for each locality, associated with the development requirements of regions and economic zones". Pursuant to the "open regulations" on the organization of local governments of the 2013 Constitution, the Law on Organization of Local Government 2015 (amended and supplemented in 2019) stipulates in Clause 1, Article 2: "Local governments are organized in administrative units of the Socialist Republic of Vietnam prescribed in Article 2 of this Law in accordance with the characteristics of rural, urban, island, and special administrative-economic units".

Resolution No. 76/NQ-CP dated July 15, 2021 of the Government promulgating the Overall Program for State Administrative Reform for the 2021-2030 period has set forth the requirement to "Research, amend, supplement, and perfect regulations on the organization of local governments in the direction of more clearly defining the organization of the administrative apparatus of urban, rural, island, and special administrative-economic units". Including the task of "Piloting the model of urban government under the provincial level, special administrative-economic units in places with sufficient conditions".

The 13th National Party Congress documents set out the task of "Continuing to perfect the organization of local

governments in accordance with rural, urban, island, and special administrative and economic units according to the law; implementing and summarizing the pilot urban government to build and operate urban government governance models in a streamlined, effective and efficient manner". Based on the Party's viewpoints and policies and the provisions of the 2013 Constitution and the 2015 Law on Organization of Local Government, the National Assembly issued Resolution No. 97/2019/QH14 dated November 27, 2019 on "Piloting the organization of the urban government model in Hanoi City"; Resolution No. 119/2020/QH14 dated June 19, 2020 "On piloting the organization of the CQDT model and some specific mechanisms and policies for the development of Da Nang City". Pursuant to the provisions of the Law on Organization of Local Government, amended and supplemented in 2019, the National Assembly issued Resolution No. 131/2020/QH14 dated November 16, 2020 on "Organization of urban government in Ho Chi Minh City". These are the localities taking the lead in building urban government in the new context, thereby summarizing the pilot implementation of the urban government model and specific mechanisms and policies for some localities will serve as a basis for early completion of the urban government institution... Continue to perfect the state management function on urban areas from the Central to local government levels; clearly define the functions and tasks of the focal state management agency on urban development at the Central and local levels, especially in the context that the whole country is focusing on promoting the implementation of the National Digital Transformation Program with three key pillars: Digital Government; Digital Economy; Digital Society.

**2.2. Research method**

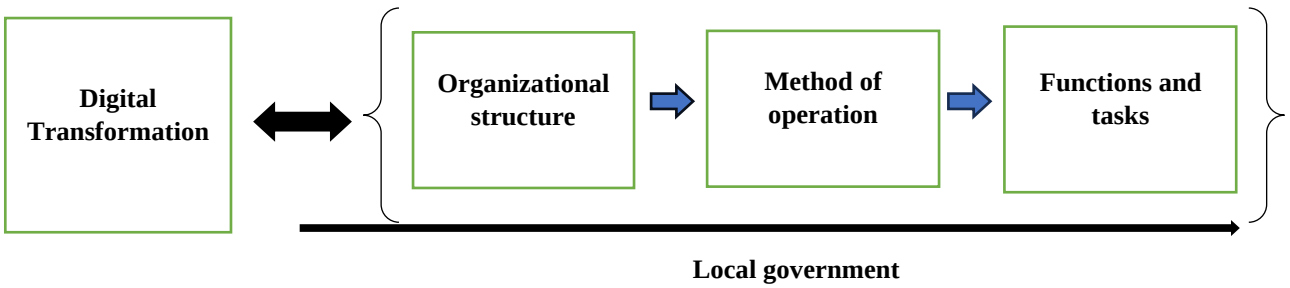
To analyze the requirements of digital transformation and propose policies to improve the organization and operation of urban governments in Vietnam, the research tools and methods that the author used are: secondary data analysis by collecting and synthesizing reports, legal documents, scientific documents related to digital transformation and urban management from government agencies, domestic and foreign organizations, previous studies. This provides a theoretical and practical foundation to identify basic requirements. Next, in-depth interview method was deployed to collect primary data. Interview subjects were management leaders at relevant departments in some localities that are building urban government. This method helps identify issues raised in the context of digital transformation, thereby suggesting policies to contribute to improving the organization and operation of urban governments in Vietnam today.

The impact of digital transformation in the organization and operation of urban governments is reflected in two aspects:

– In the organizational structure and operation of urban government when performing functions, tasks, and powers based on certain digital platforms. From management, operation, dialogue with people and businesses in all aspects, economic, cultural, social, educational, health fields...

– Digital transformation changes the way urban government apparatus operates, functions, and is organized to be more effective, transparent, and public.

**Fig. 2.2. Diagram of the relationship between digital transformation and the organization of urban government activities**



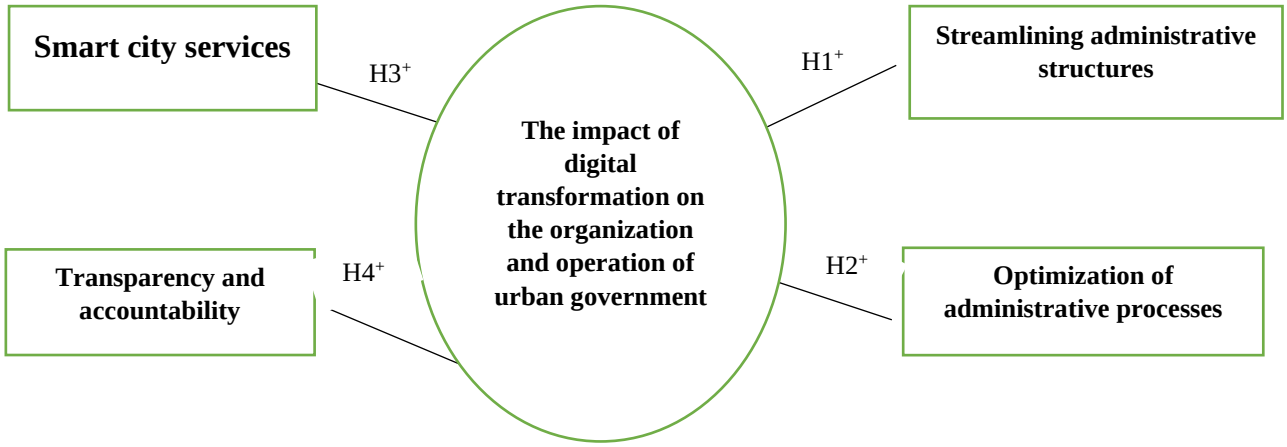

Digital transformation impacts the organizational structure and operation of local governments. This impact process includes changes in the organizational structure of urban government apparatus, operating methods, management processes and public services to suit and meet the requirements of digital transformation. The impact of digital transformation on the operation of local governments can reverse the problem: from the change in operating methods, it is required to consider and perfect the organizational structure and functions, tasks and operations of local

governments. Based on clarifying the relationship and impact of digital transformation on the organization and operation of local governments, the study suggests a number of solutions to meet the practical requirements in the process of building urban governments.

## III. RESULT AND DISCUSSION

### 3.1. Impact of digital transformation on the organization and operation of urban government

Research on the impact of digital transformation on the organization and operation of urban governments has received the attention of many researchers around the world. Swen and Reinhard (2020) highlight three main factors affecting the success of digital transformation for governments and organizations, including: the application of new technology, information and communication technology in operations, and digital capacity of leaders. Swen and Reinhard (2020) analyze the key factors for digital transformation as a multi-level model, starting from the individual and group levels to the organizational level. Meanwhile, Reis et al. (2018) classify the meaning of digital transformation into three groups: technological, organizational, and social. The technological group involves the use of new technologies such as social media and embedded devices. The organizational group involves the application of new models or changes to current processes. The study highlights digital transformation as a major challenge for the region's government organizational innovation system that requires strategic action across three key pillars: culture and skills, IT infrastructure, and ecosystem.




**H1:** Digital transformation helps eliminate intermediaries in the management apparatus, reducing bureaucracy and overlapping functions. The organizational structure is leaner and more flexible, instead of the traditional rigid hierarchical model. The trend of forming smart urban operation centers helps the government centralize data and coordinate more effectively.

**H2:** Optimization of administrative processes helps optimize administrative processes through digitizing records, applying data management systems and implementing e-government. As a result, administrative procedures are processed more quickly and transparently, minimizing bureaucracy and errors. In addition, technology also facilitates the provision of online public services, helping people easily access and perform procedures without having to go directly to government agencies. On the other hand, information technology promotes the smart city model, allowing the application of artificial intelligence (AI), big data and the Internet of Things (IoT) in traffic management, environment, security and many other areas. However, a significant challenge lies in the existence of legacy information systems that are incompatible with modern technology. These outdated systems can hinder the integration of new digital solutions, making it difficult for governments to keep up with technological advances. In addition, the prevalence of data and isolated systems hinder information sharing between different government departments and agencies. This fragmentation can lead to inefficiencies, delays and difficulties in providing comprehensive services to citizens.

**H3:** Digital transformation will revolutionize public services through digital government transformation and pioneering e-government initiatives. Citizens enjoy the convenience of accessing essential services from the comfort of their homes, reducing administrative barriers and improving overall efficiency. Digital transformation in government enables processes to be streamlined, paperwork reduced and repetitive tasks automated. This not only saves time and

resources but also improves accuracy and consistency in service delivery.

**H4:** Digital transformation promotes transparency and accountability. Digital systems provide a clear audit trail of transactions, making it easier to track and monitor government activities. This transparency helps prevent corruption and fosters public trust. Digital platforms allow citizens to access information on government budgets, policies and performance, empowering them to hold their governments accountable. The development of digital public services can lead to significant cost reductions. By automating processes, reducing paperwork and optimizing resource allocation, governments can save on operational costs. Additionally, digital services can generate revenue through online payments and fees, contributing to financial sustainability.

In addition, the application of technology in the digital transformation process in smart urban management helps save time and improve the management efficiency of the government. For example, cities are now deploying smart lighting systems, security surveillance cameras, and smart traffic management. These solutions not only optimize operating costs but also improve the quality of life of people. From there, they help urban authorities participate in the international integration process and become members of the World Intelligent Community Forum (ICF). In short, digital transformation not only helps urban authorities innovate their organization and operation methods but also brings about clear socio-economic efficiency, from improving the quality of public services, improving the living environment, to promoting sustainable development, but is also the key to building a modern, flexible and sustainable urban authority.

### 3.2. Requirements and discussion

Local authorities stand on the brink of a significant transformation, partly driven by harnessing digital tools and processes to enhance their capacities. There is immense potential for digitalization driven and enabled by local governments. It can spur economic growth, transparency, improved governance efficiency, and environmental sustainability. In a 2023 study on Digitalization: A Game Changer for Local Governments and Communities - Enhancing Capacities to Deploy Transformative Solutions. This report highlights how digitalization can revolutionize local governance, enhance community resilience, and simplify the path to a sustainable and equitable society. Digitalization helps cut costs and improve the efficiency of local government operations. Despite clear benefits, adopting digitalization is challenging, especially for cities in the Global South, where local governments face increased skills and technology gaps, infrastructure deficits, socio-economic barriers, and governance issues. This digital divide, which is more pronounced in developing regions, hampers the effective deployment of digital solutions.

Additionally, local governments should establish Digital Transformation Task Forces composed of members from various departments and tech experts. Such task forces are critical for ensuring a comprehensive and continuous approach to digitalization, spanning different administrative periods. The brief also emphasizes the importance of implementing Digital Literacy Programs. These program are crucial for equipping government employees and citizens with the necessary skills to use and benefit from digital technologies effectively.

Digital transformation is creating profound changes to the organizational structure and operating methods of urban governments, requiring management agencies to make appropriate adjustments to keep up with development trends. First of all, the most important requirement is to restructure the administrative apparatus towards streamlining, flexibility and digitalization. Urban governments need to reduce intermediaries, integrate technology platforms to automate work processes, thereby improving operational efficiency and minimizing cumbersome administrative procedures.

In addition, a significant challenge lies in the existence of legacy systems that are incompatible with modern technology. These outdated systems can hinder the integration of new digital solutions, making it difficult for governments to keep up with technological advances.

Integrating new technologies with legacy systems poses a technical challenge. Many government agencies rely on legacy information technology systems that are incompatible with modern digital technologies. Integrating new systems with these legacy setups can be complex, time-consuming, and costly, hindering the seamless implementation of digital transformation projects and initiatives.

To continue, protecting sensitive data is a top concern for governments. The public sector handles a large amount

of sensitive citizen information, and any breach of this data can have serious consequences. Ensuring robust cybersecurity measures and implementing strict data protection protocols for classified information is essential to maintaining public trust and preventing data breaches. Research on Digital transformation of local government: A case study from Greece (A Bousdekis, D Kardaras, 2020). This article lists five main challenges that local governments face when implementing digital transformation, including: Cybersecurity risks and security capabilities; The existence of information silos within the organization; Lack of resources and budget; Digital skills gap in the workforce.; rganizational culture that resists change.

A lack of effective coordination between government agencies can hinder digital transformation efforts. Successful digital transformation requires collaboration and alignment across different departments and agencies. However, bureaucratic silos and fragmented decision-making processes often hinder such collaboration, making it difficult to achieve a cohesive digital transformation strategy.

According to a study Reflections on Three Decades of Digital Transformation in Local Government (M Gasco Hernandez, 2024): This article summarizes three decades of digital transformation in local government, highlighting: The lack of organizational capacity in many local governments to implement digital transformation processes. This suggests that investment in capacity and skills development for human resources is needed to ensure the success of digital transformation projects. So, improving digital capacity for staff and civil servants is an urgent requirement. Digital transformation is not only about applying technology but also requires people to have sufficient knowledge and skills to effectively exploit digital tools. Therefore, urban authorities need to organize training and development programs on information technology, network security and data management to ensure that staff can operate the system effectively.

Another important requirement is to enhance connectivity and integration between agencies and units. Digital transformation requires a synchronous and interconnected management system between levels of government to avoid data fragmentation or overlap. Building a centralized database and applying artificial intelligence and big data will help improve decision-making and optimize operations.

In addition, ensuring information security and safety is a major challenge in the digital transformation process. As administrative activities gradually move to the digital environment, the risk of cyber attacks and data leaks is increasing. Therefore, urban authorities need to build a strong security system, deploy data encryption solutions and establish strict control mechanisms to protect personal information and important city data.

Finally, increasing citizen participation in the urban management process through digital platforms is also an important requirement. Authorities need to develop online public service portals, on-site reflection applications and digital communication channels so that people can easily contribute opinions, monitor government activities and participate in the decision-making process. This not only enhances transparency but also helps urban authorities operate more effectively.

In general, facing the strong impact of digital transformation, urban authorities need to innovate their organizational structure and operating methods towards a more modern, flexible and transparent direction. Timely adaptation to these requirements will help the government improve its management capacity, improve the quality of public services and better meet the needs of people in the digital age.

## IV. CONCLUSION

Digital transformation is not only an inevitable trend but also a strategic solution to improve the organization and operation of urban governments in Vietnam. This not only contributes to improving the organization and operation of urban governments but also creates a foundation to promote sustainable development and international integration. The synchronous combination of legal reform, human resource capacity improvement, and application of modern technology will help urban governments become more flexible, effective, and better meet the needs of society.

Researching the impact of digital transformation on the organization and operation of urban governments has great theoretical and practical significance. In theory, this study contributes to clarifying how digital transformation promotes the modernization of public administration, innovates the organizational model and operation methods of urban governments, thereby adding to the knowledge system on public management in the context of the 4.0 industrial

revolution. In practice, the study provides a scientific basis for developing policies and solutions to improve management efficiency, improve the quality of public services, and enhance transparency and accountability of urban authorities. At the same time, this study also helps guide the implementation of digital technology applications in smart urban construction, improve the relationship between the government and the people, promote sustainable socio-economic development, and increase the competitiveness of Vietnamese cities in the period of international integration.

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# GREEN DIGITAL MARKETING STRATEGY: A SUSTAINABLE PATH FOR BUSINESSES IN THE DIGITAL AGE

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## ABSTRACT

In recent years, digital marketing has gradually changed how companies communicate with customers worldwide. The increasing use of social media platforms and communication between customers and businesses give rise to new business models. Businesses are under increasing pressure to adopt sustainable practices - not only in their physical operations but also in their digital marketing strategies. Companies have considered digital marketing strategies not only as their present but also as their future. That's why they are also more conscious about the environment. A green digital marketing strategy combines the goals of sustainable business practices with digital marketing tools and channels, promoting both environmental responsibility and business growth. As more consumers demand transparency and eco-friendly practices from brands, organizations can leverage green digital marketing to build trust, enhance brand loyalty, and reduce their carbon footprint.

*Keywords*: “digital marketing”, “strategies”, “green digital marketing”, “sustainable”, “businesses”

## I. INTRODUCTION

Amidst globalization and rapid technological advancements, businesses are increasingly compelled to incorporate sustainability into their strategic planning. The pressing issues of climate change, environmental degradation, and resource scarcity necessitate a shift in corporate operations. Digital marketing has emerged as a crucial instrument, offering both an opportunity and an obligation for companies to not only meet commercial objectives but also to aid in sustainable progress. "Green Digital Marketing" extends beyond the promotion of eco-friendly products; it encompasses the utilization of digital platforms and strategies in a manner that minimally impacts the environment. Recognizing this significance, companies are adopting green digital marketing strategies to forge a sustainable trajectory for their future operations, ensuring growth that is both enduring and profitable.

This article seeks to explore the meaning of Green Digital Marketing in today's digital era and analyze the advantages it offers to both businesses and society. Additionally, it highlights the strategy's benefits and limitations. Consequently, it provides targeted recommendations for companies to implement sustainable strategies in the digital age.

Green Digital Marketing is an essential path that offers economic advantages while fostering sustainable development, addressing the demands of both the market and society in the digital age.

## II. MATERIAL AND METHOD

Since relevant research documents need to collected evaluation, it is important to choose their sources carefully. After a thorough review of the available literature from various sources, it was found that studies connecting green marketing topics with digital marketing are scarce and not widely available. Therefore, this article will select information from peer-reviewed journals on the topics of green marketing and digital marketing to investigate the connection between them.

Green digital marketing combines modern marketing strategies with the goal of protecting the environment. According to the American Marketing Association (AMA), "Green Marketing" or "Green Marketing" is the marketing of products or services based on environmental factors or perceptions. Research on the impact of green 4Ps marketing strategies on consumer purchase decisions shows that integrating environmental factors into products, prices, distribution and promotion can promote green purchase intentions and contribute to sustainable development goals.

Moreover, the distribution (Place) strategy in green marketing involves selecting environmentally responsible supply chains and minimizing transportation emissions, which aligns with sustainable development goals. Lastly,

promotional strategies in green marketing emphasize the use of digital platforms to raise awareness, educate consumers, and encourage sustainable consumption patterns. Promotional messages might include highlighting a company's commitment to sustainability, its use of renewable energy, or its efforts to reduce waste.

Research on the impact of these green 4Ps on consumer purchasing decisions has demonstrated that by integrating environmental factors into their marketing efforts, businesses can not only influence consumer behavior but also make a meaningful contribution to sustainable development goals. As consumers increasingly seek to make purchases that align with their values, green marketing offers businesses the opportunity to lead by example, drive positive environmental change, and foster long-term customer loyalty. Through effective green digital marketing, companies can not only grow their market share but also play a critical role in advancing sustainability at a global scale.

### 2.1. Theoretical Framework and Conceptual Understanding

#### 2.1.1. Green Digital Marketing Definition

The concept of "green products" has led to the development of "green advertising." It is well-established that product advertising significantly influences consumer behavior. Research has demonstrated that effective advertising strategies can alter daily habits and behaviors, increasing the likelihood of certain products being consumed. The advertising strategies and efforts aimed at encouraging the consumption of green products are known as green advertising (Ottman, 2007). The phrase "green marketing" was initially coined in the late 1980s and early 1990s by Polonsky and Everitt.

A green digital marketing strategy in the sustainability era focuses on harmonizing online marketing efforts with environmental, social, and economic sustainability goals (Table 1). Companies leverage digital tools and strategies to endorse sustainable practices, minimize environmental footprint, involve consumers in eco-friendly actions, and cultivate a brand reputation that reflects sustainable principles. Sustainability and digital marketing are becoming more intertwined.

Green marketing involves reducing a product's environmental footprint by redesigning the product, adopting sustainable manufacturing practices, and conducting comprehensive marketing campaigns. Its goal is to endorse eco-friendly products and cater to the growing demand for sustainable consumption (Dahhan & Arenkov, 2021). The primary aim of green marketing is to market these eco-conscious products effectively and attract consumers who prioritize environmental responsibility.

Grasping the difference between green marketing and sustainability marketing is essential. Green marketing is about advertising eco-friendly products, whereas sustainability marketing adopts a wider view, encompassing the whole community, its social goals, and environmental conservation efforts. It requires the engagement of national and local governments, businesses, and citizens, as well as vital resources like human expertise, financial support, and infrastructure (Burksiene et al., 2018).

**Table 1: Definition and criteria of green digital marketing**

| Criteria | Green Marketing | Sustainable Marketing |
|---|---|---|
| **Concept** | Advertising eco-friendly products to reduce environmental impact. | Focuses on social, environmental, and economic sustainability goals, including the community and environment. |
| **Goal** | Market eco-friendly products, promoting sustainable consumption. | Promote sustainable development across the entire ecosystem, including social and economic factors. |
| **Scope** | Narrow, only includes products and activities with a positive environmental impact. | Broader, includes government, community, businesses, and social goals. |
| **Strategy** | Use advertising strategies to encourage the consumption of eco-friendly products. | Promote collaboration among stakeholders, ensuring all activities and products meet sustainability requirements. |
| **Influencing Factors** | Primarily focuses on the environment. | Includes the environment, society, and the economy. |

| | | |
|---|---|---|
| **Example** | Advertising organic products, recycled products, products that reduce environmental impact. | Strategies to promote the development of sustainable businesses and inclusive societies. |

**2.1.2. Benefits of Green Digital Marketing**

For businesses, adopting a green marketing strategy represents a fresh and sustainable approach to business growth, offering numerous advantages. Implementing such strategies effectively helps companies cultivate a positive and credible brand image among consumers. By making public commitments to environmental protection, companies not only boost their reputation but also garner significant goodwill from customers who are concerned about environmental issues. This enables the brand to distinguish itself in the marketplace and secure a lasting competitive edge.

An increasing number of consumers are prioritizing brands that demonstrate social responsibility and a commitment to environmental protection. A green marketing strategy not only attracts these customers but also fosters loyalty through empathy and shared values. This presents businesses with the opportunity to cultivate long-term relationships with a customer base that is dedicated to supporting sustainable practices.

Strategies like content optimization, minimizing digital waste, and adopting sustainable technologies are not only beneficial for the environment but also aid businesses in reducing long-term operational costs. For instance, opting for green hosting services or producing evergreen content can significantly lower energy expenses and make resource use more efficient, leading to enduring financial advantages.

Moreover, being transparent about environmental conservation efforts can help companies establish trust with their customers, particularly when they publicize actions such as utilizing green supply chains or investing in carbon offset programs. When customers perceive a genuine commitment, they are more likely to remain loyal to the brand and promote a favorable image of the company within the community.

Optimizing business practices, such as enhancing website speed, creating mobile-friendly emails, and minimizing digital waste, not only reduces environmental impact but also elevates the user experience. A swift, effective, and user-centric website can lead to higher conversion rates and enable brands to engage more potential customers via online platforms.

Moreover, with the tightening of environmental regulations in numerous countries, companies must adopt sustainable strategies to avoid obsolescence. Those who lead in green marketing initiatives not only comply with legal mandates with ease but also position themselves as innovators, setting trends and gaining a competitive edge in the dynamic marketplace.

Adopting a sustainable approach, businesses are urged to find innovative solutions in production, marketing, and management. This strategy not only reduces negative environmental impacts but also fosters the innovation of products, services, and operations. Such innovation adds unique value and strengthens a business's market competitiveness.

Companies with sustainable practices often become preferred partners for collaboration, attracting investors and opening doors to funding and strategic alliances. Embracing a green identity yields immediate advantages and paves the way for enduring, valuable business relationships.

**2.1.3. Challenges and Barriers**

Green Digital Marketing Strategy: A Sustainable Path for Businesses in the Digital Age presents numerous benefits but also comes with its own set of challenges. Businesses transitioning to sustainable practices, like adopting green web hosting or obtaining eco-certifications, often face higher initial costs. Small businesses, constrained by limited budgets, may struggle with these changes. Insufficient financial resources can hinder businesses, causing them to lag and scale down operations. Additionally, many organizations lack the necessary knowledge or expertise to effectively implement sustainable digital marketing strategies, resulting in poorly executed initiatives that fail to achieve the intended impact.

While a green strategy aims to reduce environmental impact, businesses must ensure that these practices do not compromise marketing performance or ROI, which can be challenging to balance. The disparity in costs can create difficulties for businesses in managing and finding suitable solutions to balance their expenses.

Moreover, environmentally conscious consumers are becoming increasingly skeptical of "greenwashing" claims - false or exaggerated assertions about sustainability. Businesses must prioritize transparency and authenticity in their

efforts to foster trust, secure customer loyalty, and mitigate risks.

Businesses must monitor the environmental impact of their digital marketing efforts, including energy consumption and carbon emissions. This necessitates advanced tools and metrics, which may not be readily accessible to all companies. Consequently, businesses need to invest in these tools while also balancing costs to prevent excessive financial loss.

Sustainability initiatives often become secondary when businesses are under immediate pressures, such as achieving revenue targets or facing intense market competition. This makes it challenging to focus on long-term environmental goals. With the competitive market intensifying, businesses must consider multiple factors to chart the correct course for development.

As the field of sustainable practices is ever-changing, businesses are required to keep abreast of the latest standards, certifications, and technologies to remain compliant and efficient.

International and regional regulations: Environmental protection and sustainable development policies not only differ between countries but also have distinct differences between regions such as the EU, the US, and Asian markets. For example, regulations in the European Union (EU) for marketing green products require companies to meet stringent environmental standards and product certifications, while in other countries like the US or Southeast Asian nations, these standards may not be as strict or uniform.

Government incentives for sustainable businesses: Many countries have policies that incentivize businesses to adopt sustainable practices, such as tax credits or reduced taxes for companies with environmental initiatives. However, not all countries have clear or strong policies to support businesses in implementing green digital marketing strategies. Small and medium-sized enterprises (SMEs), in particular, often struggle to find financial support to adopt green technologies or energy-saving initiatives, which makes it difficult to implement green digital marketing strategies.

Ensuring transparency and reducing greenwashing: Regulations regarding certification and transparency in promoting green products can be very strict, requiring businesses to clearly prove that their products have a positive environmental impact. Failure to comply with these standards can result in heavy fines or damage to the company's reputation. However, achieving these certifications can be costly and complicated, especially for smaller businesses. The lack of a unified global certification system makes it challenging for businesses to build and maintain customer trust.

Investment in technology and infrastructure: Energy-saving technologies, green data storage, and eco-friendly digital advertising technologies often require significant investments in infrastructure and finances. Many countries do not have strong enough policies to encourage businesses, particularly small and medium-sized enterprises, to invest in green technologies. Therefore, these businesses may face difficulties when trying to implement green digital marketing strategies.

**2.2. Research method**

To examine Green Digital Marketing effectively, the following methods are proposed:

Case Study Analysis: Examining the digital marketing strategies of companies like Patagonia and Google to understand the practical implementation of green initiatives.

Survey and Consumer Insights: Conducting surveys to gather data on consumer perceptions and preferences related to sustainable practices in digital marketing.

Comparative Analysis: Comparing traditional and green digital marketing approaches to evaluate their efficiency, cost-effectiveness, and impact on consumer behavior.

Environmental Impact Assessment: Utilizing tools to measure the carbon footprint of digital marketing activities, such as energy consumption in web hosting or the ecological costs of digital ads.

These methods provide a comprehensive understanding of the effectiveness and challenges associated with green digital marketing.

The table below summarizes case studies from companies such as Patagonia, Google, and consumer behavior data in Vietnam, which help clarify how green digital marketing strategies deliver environmental benefits, increase customer

loyalty, and create sustainable competitive advantage.

## III. RESULTS AND DISCUSSION

### 3.1. Case Studies

Companies are acknowledging the need to incorporate sustainable practices into their online marketing strategies. They strive for commercial success while also fostering sustainability-driven innovation and contributing to a greener future, aligning with the United Nations' Sustainable Development Goals and the 2030 Agenda for humanity (Table 2).

**Table 2: Case studies of green digital marketing**

| Company | Key Strategy | Results / Insights |
|---|---|---|
| **Patagonia** | "Don't Buy This Jacket" campaign on Black Friday. | Promoted mindful shopping, emphasizing reuse and recycling of garments. |
| | "Worn Wear" initiative encouraging clothing repairs and trade-ins. | Built a community loyal to the brand by using social media to highlight environmental issues like climate change, plastic pollution, and recycling. |
| **Google** | Carbon-neutral since 2007 and 100% renewable energy since 2017. | Optimized data centers using AI, reducing electricity consumption by 30%. |
| | Promotes eco-friendly products through Google Ads and raises awareness through YouTube. | Supports small businesses in promoting green products and services through digital platforms. |
| **Vietnam Consumers** | 72% of Vietnamese consumers are willing to pay more for green and fitness products. | Green consumption demand in Vietnam has increased by 15% per year from 2021-2023. |
| | 86% of consumers prefer brands with a positive environmental and social impact. | 80% of consumers are concerned about the long-term harmful effects of artificial materials. |
| **Global Consumer Trends** | 85% of UK consumers made more sustainable purchasing choices in 2023. | A shift towards eco-conscious consumerism, with sustainability now influencing brand trust and loyalty. |
| | 78% of consumers consider sustainability in purchase decisions. | 73% of consumers will switch brands to support companies with strong environmental commitments. |
| **Consumer Motivation** | 70% of consumers are willing to switch brands for superior quality. | Product quality (durability, aesthetics, sustainability, and energy efficiency) is a key deciding factor in brand loyalty. |
| | 51% of global consumers consider environmental sustainability more important today. | Younger consumers (18-34) are more likely to avoid animal products for environmental reasons. |

In addition, Google actively promotes green digital marketing. The Google Ads program enables small businesses to advertise eco-friendly products and services. Concurrently, Google leverages YouTube to disseminate information on sustainability efforts and to raise awareness about the benefits of renewable energy.

A 2022 study by IBM and the National Retail Federation (NRF) found that 71% of consumers are willing to pay more for brands that are transparent and committed to sustainability. Notably, 49% of these consumers said sustainability was a deciding factor when choosing a product. The study, which involved 16,000 consumers from various countries, reflects a clear shift in global consumer behavior and attitudes.

According to a 2020 Capgemini Research Institute report, 79% of consumers said they had changed their purchasing preferences to align with sustainability criteria, while 53% had switched to products from brands with sustainability commitments in the past 12 months. This was confirmed by a real-world test involving 7,500 consumers in 12 countries, demonstrating that sustainability is becoming an indispensable factor in consumers' purchasing decisions.

In a recent study by the Harvard Business Review, brands with sustainable positioning grew 4 to 6 times faster than

conventional brands. A key takeaway was that consumers today not only care about being "green," but also value authenticity and a brand story. This suggests that companies need to be transparent and truly committed to sustainability values to gain the trust and loyalty of their customers.

A real-life example of sustainable marketing success is Unilever's campaign. In a campaign in the UK and the Netherlands, Unilever found that products with sustainable branding grew 69% faster than conventional products (Figure 1). Brands such as Dove, Seventh Generation, and Ben & Jerry's have made a significant difference through their strong environmental and social commitments, demonstrating that when brands implement truly sustainable strategies, they are embraced and trusted by consumers.

To further consolidate your data and better understand consumer behavior, you can conduct A/B tests to test the effectiveness of your sustainable marketing strategy. In this test, you can split your consumer groups into Group A and Group B. Group A will be exposed to regular product ads, while Group B will be exposed to ads that emphasize sustainability (such as using recycled materials or reducing environmental impact). You can then measure metrics like click-through rate (CTR), conversion rate (CVR), and cost per acquisition (CPA) to see how sustainability influences your customers' purchasing decisions.

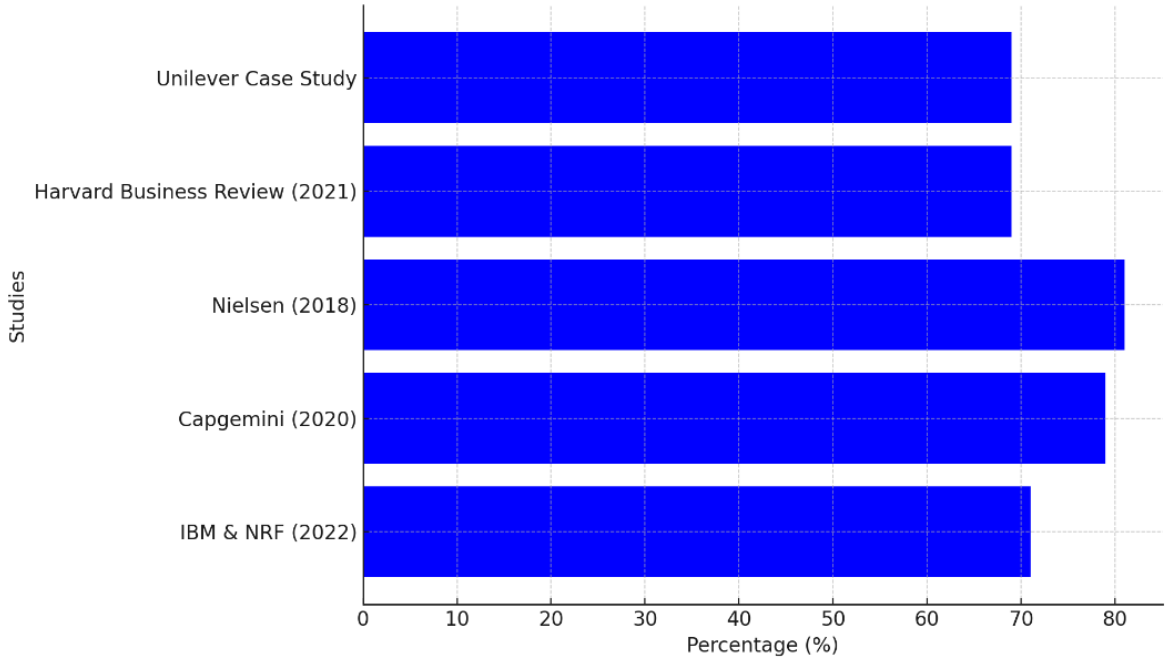



**Figure 1: Consumer Sustainability trends from various studies**

### 3.2. Lessons Learned

Through the examples of the aforementioned businesses, companies aiming to integrate sustainability into their long-term digital marketing strategies should take note of the lessons these businesses have provided. Honesty in sustainability commitments is crucial to avoid greenwashing - making false sustainability claims. Transparency is key to building customer trust and loyalty. Moreover, creatively leveraging digital platforms can amplify the message's impact.

Digital solutions like AI, Big Data, and renewable energy can reduce operational costs and enhance efficiency. Companies should invest in energy management and resource-efficient platforms. As demonstrated by Patagonia and Google, cultivating a sustainable customer community is vital. It involves actively addressing social and environmental issues and delivering genuine value through products and services.

Companies should focus beyond products to establish sustainable supply chains and operational processes. Partnering with like-minded organizations can broaden the positive impact. The experiences of Patagonia and Google offer successful frameworks and highlight that Green Digital Marketing is a continuous process that demands innovation and dedication.

### 3.3. Key Strategies for Green Digital Marketing

In digital marketing, companies have the opportunity to use diverse strategies, tools and channels to promote awareness of environmental, social, and economic challenges, thereby educating and involving the public in sustainable initiatives.

Incorporating sustainability into digital marketing strategies is crucial for companies seeking to resonate with contemporary consumer values and make a positive environmental impact. Sustainable content creation is a key element, with brands disseminating eco-friendly messages, such as sustainable living tips and their own environmental impact reduction efforts. Businesses can also diminish digital waste by focusing on durable, evergreen content that remains pertinent. This tactic reduces excess while fine-tuning media to decrease server load, boost website performance, and save energy.

Energy-efficient website optimization is another vital aspect. Firms can opt for green web hosting services powered by renewable energy sources, significantly cutting their digital carbon footprint. Enhancing website speed and efficiency not only improves user experience but also reduces the energy used during extended data processing. Through these practices, companies can seamlessly integrate sustainability into their marketing, attracting eco-aware consumers and fostering a more sustainable future.

To promote sustainability in digital marketing, companies can implement eco-friendly social media campaigns. By advocating for practices like using recyclable materials, reducing waste, and backing environmental projects, brands can showcase their dedication to sustainability. Engaging interactive content, such as infographics, videos, and captivating posts, can effectively communicate messages of social responsibility, increasing awareness and prompting action. Partnering with influencers or environmental advocates can also enhance these initiatives, using their influence to endorse eco-friendly habits and motivate the audience.

In the realm of sustainable email marketing, limiting the number of emails sent ensures that the content remains significant and impactful, preventing superfluous digital waste. Employing segmented email lists to customize communications for distinct audience segments boosts relevance and interaction. Moreover, designing emails for mobile optimization reduces file sizes, facilitating efficient transmission and lowering the energy required for email distribution. These strategies, when combined, form a comprehensive approach to sustainable marketing, nurturing customer loyalty and advancing ecological objectives.

Businesses can adopt sustainable digital advertising practices by focusing on targeted and efficient campaigns that reduce unnecessary impressions and clicks. Concentrating on specific audiences helps brands cut down on the energy consumption from excessive ad placements. Moreover, robust Search Engine Optimization (SEO) strategies can enhance organic search visibility, lessening the dependence on energy-heavy paid advertising, which not only reduces environmental impact but also boosts long-term cost savings.

Transparency is essential for trust-building, and businesses can promote carbon footprint transparency by demonstrating their dedication to sustainability. Showcasing the eco-friendly practices of their suppliers and partners underlines the commitment to a sustainable supply chain. Additionally, investing in carbon offset programs shows accountability and a proactive approach to reducing environmental impact. These strategies collectively establish businesses as responsible and progressive, attracting consumers who are mindful of the environment.

Businesses can enhance their sustainability efforts by actively endorsing green initiatives. For example, pledging to donate a share of profits to environmental organizations or projects not only showcases corporate social responsibility but also appeals to eco-aware consumers. Moreover, obtaining and displaying green certifications on websites and digital platforms indicates adherence to environmental standards, fostering trust and credibility.

In terms of data privacy and ethical marketing, transparency is crucial. Companies should be explicit about their methods of collecting, utilizing, and storing customer data, thereby nurturing trust and accountability. Minimizing excessive tracking not only addresses privacy concerns but also curtails superfluous resource use, in line with sustainable practices.

Furthermore, embracing green analytics allows businesses to monitor the ecological impact of their digital marketing endeavors. Analyzing metrics like website energy use, ad impressions, and email open rates can pinpoint improvement opportunities and help fine-tune strategies to reduce environmental footprints. Through these measures,

companies can pursue growth while upholding responsibility, aiding in the pursuit of a sustainable future.

While the steps above provide a solid foundation, a deeper discussion about how companies can implement GDM authentically is invaluable. Authenticity in Green Digital Marketing (GDM) is vital. Consumers are increasingly aware of greenwashing, where companies falsely claim sustainability efforts. To genuinely implement GDM, companies must ensure that their sustainability practices are transparent, measurable, and backed by credible data. This can include showcasing the actual reductions in energy use, carbon emissions, or waste generated through their digital marketing activities.

Patagonia is widely regarded as a pioneer in Green Digital Marketing (GDM). The company has built its reputation by not only producing eco-friendly products but also by embedding sustainability into its digital marketing campaigns. One of the most notable examples is its "Don't Buy This Jacket" campaign, which urged consumers to buy less, promoting the idea of responsible consumption and reducing unnecessary purchases. This campaign gained massive attention, with 2.4 million people visiting the company's website in the first 24 hours alone.

Patagonia also uses its digital platforms to share environmental issues, such as the impacts of climate change, and advocates for using recycled materials. On social media, the company regularly posts infographics, videos, and interactive content that not only raise awareness but also provide practical advice on reducing environmental footprints. This has helped them grow a loyal customer base of eco-conscious consumers who are increasingly interested in sustainable living. Patagonia's sustainability messaging on digital channels resonates strongly with millennials, as 60% of millennials are willing to pay more for sustainable products.

Google has been at the forefront of integrating sustainability into its digital marketing and operations. Since 2007, Google has been carbon-neutral and committed to running its operations entirely on 100% renewable energy. In 2017, the company reached its goal of running all data centers and offices on renewable energy sources, reducing its digital carbon footprint.

In terms of Green Digital Marketing, Google promotes sustainable practices through Google Ads, which supports businesses that are committed to environmental goals. For instance, Google's "Google Green" initiative encourages advertisers to promote eco-friendly products. One of its major achievements is optimizing its data centers to use 50% less energy than traditional data centers, significantly reducing the environmental impact of its services.

Through initiatives like this, Google not only demonstrates its environmental commitment but also helps thousands of advertisers reach audiences interested in sustainability. Google Cloud, for example, offers energy-efficient storage solutions that contribute to sustainable digital marketing practices by reducing the energy demands of clients' operations.

Unilever, the multinational consumer goods company, is another example of a brand that integrates sustainability into its digital marketing efforts. Unilever has made sustainability a core element of its advertising strategy. The company's Sustainable Living Brands – such as Dove, Seventh Generation, and Ben & Jerry's – have generated significant consumer interest and loyalty. According to their 2020 report, these brands accounted for 70% of Unilever's total growth.

Unilever's sustainable digital marketing campaigns often feature interactive content that educates consumers about issues like climate change, water conservation, and ethical sourcing. For instance, Dove's #ShowUs campaign aimed to challenge beauty standards while promoting positive environmental actions. This campaign reached over 3 billion people across digital platforms. Unilever also works with Google and Facebook to target eco-conscious consumers more effectively, using data to tailor ads to people interested in sustainability.

IKEA has embraced sustainable e-commerce practices, ensuring that sustainability is embedded into both its digital marketing and operational strategies. IKEA has pledged to become climate positive by 2030, aiming to reduce more carbon than its value chain emits. To promote this, IKEA runs digital campaigns that focus on recycling, reusing, and reducing waste.

For example, their "Circular IKEA" campaign highlights their efforts to encourage customers to buy sustainable products and recycle old furniture. IKEA's online platforms feature content designed to educate customers about sustainability in home decor. In 2020, IKEA launched a campaign that showed consumers how to upcycle old furniture

to reduce waste. This initiative alone led to a 20% increase in consumer engagement with IKEA's sustainability section on its website.

IKEA's digital sustainability efforts also include offering products with eco-friendly certifications, such as FSC-certified wood, through its e-commerce platforms. Moreover, IKEA has committed to climate-neutral delivery options for its customers, aligning with its sustainability goals. 25% of customers in Sweden, for example, choose carbon-neutral delivery when ordering online.

Microsoft has set a bold goal to become carbon negative by 2030, meaning the company plans to remove more carbon than it emits. The company's digital marketing efforts focus on promoting its eco-friendly technologies and its progress toward carbon neutrality. In addition to running its operations on renewable energy, Microsoft supports sustainable development goals through its Azure Cloud services and products like Microsoft Teams, which help reduce physical travel and emissions related to business operations.

Microsoft uses its digital platforms to share insights on sustainability technology and promote initiatives such as AI for Earth, which uses artificial intelligence to address climate change and protect biodiversity. By focusing on eco-friendly digital solutions, Microsoft helps its customers reduce their environmental impact, making digital transformation a central part of sustainable marketing.

### 3.4. Scientific and practical significance

#### 3.4.1. Scientific significance

**Contributing to the theoretical basis of Green Digital Marketing**

This research plays a crucial role in developing and systematizing the concept of Green Digital Marketing, clarifying related concepts such as "green marketing" and "sustainability marketing." Understanding the differences between these concepts helps shape marketing strategies that align with consumer trends and corporate sustainability goals in the digital era.

**Integrating sustainability elements into digital marketing**

The study analyzes practical strategies that businesses can apply, such as optimizing content, minimizing digital waste, and using environmentally friendly technology. These findings not only expand the scope of digital marketing but also guide future research on the relationship between digitalization and sustainable development.

**Assessing the environmental impact of digital marketing**

One highlight of the research is the provision of tools and methods to measure carbon emissions and energy consumption in digital marketing activities. This helps raise awareness of the environmental impact of marketing campaigns, thereby driving businesses towards strategies that minimize negative impacts and improve sustainability.

**Providing an empirical research framework**

Through analyzing real-life cases such as Patagonia and Google, the study has built a valuable empirical frame of reference. These cases illustrate how leading businesses have successfully integrated sustainability into their digital marketing strategies, thereby creating a useful reference platform for other businesses and researchers.

#### 3.4.2. Practical significance

**Support businesses in building sustainable strategies**

Research provides practical solutions, such as using green web hosting and optimizing environmentally friendly content and emails. These measures help businesses not only reduce costs but also minimize negative impacts on the environment. These strategies improve business efficiency and enhance competitiveness in a market that prioritizes sustainability.

**Enhance consumer loyalty**

As more consumers become concerned about environmental issues, applying green marketing strategies helps businesses build trust and loyalty from customers. The study highlights that businesses can leverage sustainability as a tool to differentiate themselves and maintain long-term relationships with customers.

**Promote Innovation and Competition**

Research indicates that green digital marketing not only aids businesses in adhering to environmental regulations but also fosters innovation in products and services. These enhancements help businesses bolster their competitive edge, especially as consumers become increasingly stringent about sustainability criteria.

**Green Economic Development in Vietnam**

With data showing that 72% of Vietnamese consumers are willing to pay more for green products, the study provides strategic guidance for local businesses to capitalize on sustainable consumption trends. This approach not only yields economic benefits but also contributes to the country's sustainable development goals.

**Policy Planning Support**

By offering practical information on effective green marketing strategies, this research can assist authorities in formulating policies to encourage the growth of green digital marketing. These policies will play a crucial role in steering Vietnamese businesses towards environmental protection and sustainable development goals (Table 3).

**Table 3: Effective of green marketing strategies**

| Strategic Elements | Specific Strategy | Benefits and Impact |
|---|---|---|
| Technological innovation | - Optimize sustainable content (create environmental content and reduce digital waste). | - Minimize waste of digital resources.<br>- Improve website performance and speed, save energy. |
| | - Use green web hosting (hosted on servers that use renewable energy) | - Reduce the carbon impact of running websites and digital platforms. |
| | - Optimize email campaigns (limit sending unnecessary emails, optimize file size) | - Minimize energy consumption during email transmission and distribution. |
| Consumer Engagement | - Building sustainable communities (engaging consumers in environmentally friendly actions). | - Increasing customer engagement and loyalty.<br>- Creating a community of shared sustainable values. |
| | - Promote green consumption habits (create campaigns that emphasize the importance of recycling and using sustainable products) | - Encourage consumers to participate in environmental protection actions. |
| | - Create interactive media campaigns (such as infographics, videos on environmental issues). | - Attract consumers' attention and create changes in consumer behavior. |
| Regulatory Compliance | - Ensure transparency in sustainability claims (no greenwashing). | - Build customer trust and loyalty.<br>- Ensure compliance with environmental and advertising regulations. |
| | - Achieve green certification (e.g. carbon-neutral certification or use of renewable energy). | - Increase brand credibility and reputation.<br>- Meet legal requirements and international standards for environmental protection.. |
| | - Ensure compliance with national and international environmental standards (e.g. ISO 14001 on environmental management). | - Ensure that the business operates within the legal framework, minimizing legal risks and protecting the environment. |

## IV. CONCLUSION

Green Digital Marketing is not just a new trend in the marketing industry; it's an essential strategy for businesses to adapt to the digital age's challenges and opportunities. As the world grapples with severe environmental issues like climate change, resource depletion, and global pollution, businesses must not shirk their responsibility to protect the planet. Adopting a green marketing strategy helps businesses align with increasing consumer sustainability expectations, yielding long-term economic benefits and strengthening their brand.

Case studies from companies like Patagonia and Google show that integrating eco-friendly digital strategies can lead to significant economic and social advantages. Patagonia has cultivated a devoted customer base by promoting sustainability through innovative campaigns. Google has demonstrated how technology can reduce energy use and

carbon emissions, encouraging other companies to embark on the green path. These instances underscore that embracing sustainable practices is not just ethically sound but also a smart business move.

Nevertheless, implementing Green Digital Marketing comes with its set of challenges. Businesses might confront hurdles such as upfront investment costs, consumer misconceptions about green claims, or the intricacies of adhering to environmental regulations across different nations. However, surmounting these obstacles can yield immense rewards, aiding businesses in becoming more adaptable and inventive, and generating enduring value for society and the environment.

To thrive on this journey, businesses must embed green practices throughout their entire operation, from product creation and service provision to promotional tactics. This necessitates substantial investment in technology, innovative marketing content, and stakeholder collaboration. Moreover, educating employees and fostering an understanding of sustainable principles will not only enhance operational efficiency but also disseminate the company's vision and mission to the community.

Green Digital Marketing not only addresses environmental issues but also creates new avenues for brand development, fosters innovation, and ensures sustainable growth. In an era of swift digital transformation and escalating consumer expectations, the synergy between technology and ecological stewardship will become a critical success factor for businesses. By embracing a green approach, companies position themselves as industry leaders and catalysts for positive change, contributing to a more sustainable future for forthcoming generations.

**Recommandations for Businesses**

To achieve sustainable development, businesses need to develop a long-term strategy that incorporates environmentally friendly activities throughout their operations, from production, distribution to marketing. Important steps include switching to recycled materials, adopting energy-saving technologies and reducing waste. Businesses should also set internal environmental standards such as reducing paper use and implementing energy management systems at production facilities. These initiatives not only reduce the ecological footprint but also enhance the company’s reputation for social responsibility, attracting environmentally conscious consumers.

To improve research on green digital marketing, one point that needs to be clarified is the distinction between the application of this strategy to large corporations and small and medium-sized enterprises (SMEs). Large enterprises often have resource advantages, including large budgets, teams of experts, and advanced technologies, which make it easier for them to implement green digital marketing strategies. They can invest in technologies such as artificial intelligence (AI), blockchain, or expensive digital platforms, while maintaining sustainability initiatives at scale.

Engaging stakeholders is crucial for amplifying the effects of sustainability strategies. Businesses can garner support from non-governmental organizations (NGOs), suppliers, and partners committed to sustainable practices. For instance, partnering with NGOs can aid in executing environmental projects or engaging in public awareness efforts. Concurrently, sourcing from suppliers that prioritize eco-friendly materials can assist companies in developing a sustainable supply chain. Moreover, collaborating with peers in the industry can lead to collective actions, such as resource sharing or joint ventures aimed at cutting down carbon footprints. Such collaborations not only enhance business value but also reinforce their role in the worldwide endeavor for environmental conservation.

To enhance the practical application of green digital marketing, digital tools and platforms such as artificial intelligence (AI) and blockchain can play an important role. AI helps optimize marketing campaigns by analyzing consumer behavior and predicting green consumption trends, thereby personalizing advertising messages and minimizing resource waste. AI also supports the automation of tasks in marketing campaigns, helping to save energy and reduce environmental impact. Meanwhile, blockchain enhances transparency in the supply chain, helping consumers verify the origin and environmental impact of products, and providing electronic certification for green products. Blockchain also enables the use of smart contracts to automate transactions related to green marketing, helping to reduce costs and increase sustainability.

The strategies discussed emphasize the importance of adopting green practices, training employees, and collaborating with stakeholders. These steps are crucial for businesses to not only attain sustainability but also to preserve a competitive edge in today's market.

To effectively implement green digital marketing, businesses need a practical framework or clear roadmap. Here are some key recommendations:

| | |
|---|---|
| **Phase 1: Assessment and Planning** | - Assess the environmental and sustainability goals the company aims to achieve (carbon reduction, energy savings, waste reduction).<br>- Identify key performance indicators (KPIs) such as CO2 emission reduction, renewable energy usage, and resource consumption reduction in marketing campaigns. |
| | - Assess the company's current resources (budget, technology, human resources) to implement the green digital marketing strategy.<br>- Differentiate strategies for large businesses and small businesses, and adjust plans |
| | - Build a detailed roadmap for green digital marketing strategies, including technology selection, digital platforms, and specific implementation steps.<br>- Ensure the plan is long-term and sustainable, helping the company achieve environmental goals within 3-5 years. |
| **Phase 2: Implement Green Technologies** | - Transition to green web hosting and platforms that use renewable energy.<br>- Optimize SEO and AI to reduce energy consumption in online advertising campaigns. |
| | - Implement blockchain to track the supply chain and certify eco-friendly products, increasing transparency and consumer trust. |
| | - Create evergreen content to save resources and reduce digital waste.<br>- Use AI tools to analyze and optimize advertising campaigns, minimizing resource and energy waste.. |
| **Phase 3: Training and Awareness Building** | - Organize workshops or training sessions to raise employee awareness about the importance of green digital marketing and necessary skills..<br>- Create a network of employees to share sustainable initiatives and help employees become change agents in the community. |
| | - Provide tools and policies to support employees in implementing sustainable actions in their daily work, such as reducing paper use or increasing the use of online tools. |
| **Phase 4: Collaboration and Strengthening Relationships** | - Seek environmentally committed partners (such as NGOs, suppliers of eco-friendly materials) to build a sustainable supply chain.<br>- Collaborate with international organizations and other businesses in the industry to share resources, improve processes, and reduce carbon emissions. |
| **Phase 5: Measurement and Improvement** | - Set up a system to measure effectiveness (using metrics such as carbon footprint, energy consumption, consumer engagement).<br>- Publicly disclose results of the green digital marketing strategy, including reduced emissions, renewable energy use, and environmental protection initiatives. |

**Developed Economies: High Consumer Awareness and Digital Penetration**

In developed economies such as the United States, European Union, and Japan, consumers tend to have high levels of environmental awareness and are increasingly looking for brands that align with their values. These regions are also characterized by advanced digital infrastructure, allowing for a more sophisticated application of Green Digital Marketing (GDM).

Sustainability Certifications & Transparency: In markets like the EU, where environmental standards are strict, businesses can benefit from eco-labels and sustainability certifications (e.g., EU Ecolabel, Fair Trade). For instance, companies in these regions often use digital platforms to showcase carbon-neutral status or eco-friendly product lines, which are highly valued by consumers.

Digital Campaigns Focused on Education: Businesses in developed economies can run detailed, data-driven digital campaigns that educate consumers about specific sustainability issues. For example, Patagonia and Unilever use their digital platforms to provide in-depth content on the importance of climate action, recycling, and ethical sourcing.

**Emerging Economies: Growing Eco-Consciousness and Developing Digital Infrastructure**

In emerging economies such as India, Brazil, and South Africa, the level of consumer environmental awareness is growing, but it may not be as widespread as in developed countries. Digital infrastructure is improving, and smartphones are becoming increasingly popular, making digital marketing an ideal channel to promote sustainable practices. However, challenges related to affordability and access to sustainable alternatives still exist.

Localized Sustainable Messaging: Brands can tailor their green marketing campaigns to address local environmental concerns. For instance, in India, issues like water scarcity, plastic pollution, and air quality are major environmental concerns. Brands can create educational content on how their products or services help address these issues, such as offering water-efficient or pollution-reducing products.

Cost-Effective Sustainability Initiatives: Many consumers in emerging markets are still focused on price sensitivity, so businesses need to balance sustainability with affordability. Offering products that reduce long-term costs, like energy-efficient appliances or recyclable packaging, can be a compelling strategy. IKEA, for example, has launched affordable sustainable products in countries like China and India, promoting them through targeted digital ads and social media content.

Mobile-First Marketing: In countries with large mobile user bases like Brazil and India, mobile-first marketing strategies are essential. Businesses can leverage WhatsApp, Facebook, and other social media platforms to engage consumers with simple, informative campaigns on sustainable products or services.

**Low-Income Economies: Limited Resources and Focus on Basic Needs**

In low-income economies, such as those in parts of Sub-Saharan Africa or Southeast Asia, the primary focus for consumers is often on basic needs such as food, water, and shelter. However, there is a growing interest in sustainability, particularly among urban populations and youth.

Sustainability as a Value Proposition: In low-income economies, green marketing campaigns need to emphasize the long-term value of sustainability. For example, affordable products that reduce waste, lower utility bills (like energy-efficient lighting), or help with waste management can be marketed as solutions that improve quality of life, even on a budget.

Partnering with Local Organizations: To reach consumers who may have limited access to digital platforms or high-end green products, businesses can partner with local NGOs or community organizations to promote sustainable products. These partnerships can help build trust and awareness in communities that might be skeptical about the benefits of sustainability.

**Cross-Cultural Adaptation and International Markets**

As globalization continues to expand, multinational corporations must consider cross-cultural factors when implementing GDM strategies. While sustainability may be a top priority in some regions, it may not hold the same weight in others.

Cultural Sensitivity: When implementing Green Digital Marketing across multiple countries, businesses need to adapt their messaging to resonate with local cultures and values. For example, what works in Europe (where environmental concerns are highly prioritized) may need to be adjusted for regions where economic growth and job creation are more pressing concerns.

Global Campaigns with Local Messaging: Brands like Coca-Cola and Nestlé have successfully implemented global sustainability campaigns by customizing messages for different markets. Coca-Cola, for instance, ran a global recycling campaign, but its messaging varied to highlight different environmental issues depending on the country, such as water scarcity in India or plastic waste in the U.S.

By understanding the specific economic contexts in which they operate, businesses can better adapt their Green Digital Marketing (GDM) strategies to local realities. In developed economies, companies can focus on highly sophisticated sustainability messaging through digital channels that emphasize eco-friendly certifications and long-term benefits. In emerging markets, businesses may need to balance affordability with sustainability and focus on mobile-first marketing. In low-income economies, marketing must focus on the long-term value of sustainability and partner

with local organizations to reach more people.

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# APPLICATION OF ARTIFICIAL INTELLIGENCE IN EVALUATING RICE BRANDS ON MULTIMEDIA COMMUNICATION NETWORKS IN THE DIGITAL ERA

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**ABSTRACT**

Artificial intelligence (AI) has now become a transformative technology, serving as a vital assistant for all activities in the modern world. The application of AI across various industries is no longer unfamiliar, including its use in agriculture in Vietnam. Notably, as Vietnam is currently the third-largest rice exporter globally, numerous rice brands, both large and small, have emerged. However, the evaluation of these brands' quality remains limited and lacks standardized methods, making it difficult for consumers to choose suitable products. Therefore, this study aims to present a method that applies AI to search, analyze, and provide periodic evaluations of Vietnamese rice brands. This approach seeks to help consumers make informed decisions more easily while enhancing the competitiveness and quality of Vietnamese rice brands.

*Key words:* "rice brands evaluation", "vietnamese rice brands", "artificial intelligence (AI)", "AI applications"

## I. INTRODUCTION

### 1.1. The Current Situation of Rice Industry Brands in Vietnam

For many generations, rice has been one of the closely considered staple foodaresthe life of Vietnamese people. As a country with a long history in agricultural cultivation, up to the specialty of rice farming, Vietnam holds an advanced position among the top countries in both exporting and importing large quantities of rice in tandem with the domestic and foreign markets. This has contributed to building a solid financial foundation for the whole nation and the agricultural sector in particular. However, this robust development has posed significant challenges. An increasing number of rice brands have appeared in the domestic market, ranging from small-scale operations to major brands. This has left consumers confused when trying to find reliable and suitable products.

Undeniably, branding has a key role in the growing phase of the rice industry's distribution and production setup. Trust and goodwill generated in the minds of consumers are additional benefits that enhance the reputation of business partners and the general community. With a good brand image, it becomes very easy to draw the attention of organizations and other forms of investment for reinforcing infrastructural production and improving product quality. Moreover, a robust brand enables businesses to expand their distribution networks and establish long-term relationships with customers, creating opportunities to boost sales and achieve sustainable growth. Finally, an outstanding brand also serves as a crucial foundation for businesses to enter international markets, thereby elevating the status of Vietnam's rice industry on the global stage. Therefore, investing in brand building and development is not only a core element but also a long-term strategy to ensure the solid growth of enterprises in this sector.

The process of building a brand for the rice industry involves numerous issues that need attention. According to industry expert Mr. Pham Thai Binh, Chairman of the Board of Directors of Trung An Hi-Tech Joint Stock Company (Cần Thơ City), "Building a brand for Vietnamese rice should not stop at the element of delicious quality but must meet various other criteria. Developing a brand for each type of rice and rice variety should focus on the diverse demands and tastes of international consumers. Most importantly, the rice must meet green, clean, and food safety standards, which are currently the top priority" (Tam, K., Quoc, C., and Dau, B., 2023).

### 1.2. Challenges of Vietnam's Rice Industry

As mentioned in the previous section, Vietnam's rice industry is currently facing numerous significant challenges. One of these is the fierce competition among domestic brands. While each brand strives to create its unique identity,

consumers often struggle to differentiate between the quality and pricing of various products. Additionally, climate change severely affects rice production and quality, increasing market volatility. Uneven product quality remains an unresolved issue, causing confusion and eroding consumer trust. These challenges underline the urgent need for a transparent and comprehensive evaluation system to help consumers choose the best products while encouraging enterprises to improve production standards.

However, Vietnamese consumers tend to buy rice based on experience and pay little attention to branding. Changing consumer awareness and habits is a long and challenging process. Exploiting this gap, many businesses imitate the names of established rice brands to profit, disregarding consumer health.

The proliferation of brand imitation has become more severe since 2019, when Vietnam's ST25 rice, developed by Mr. Ho Quang Cua and his company, earned the title of "World's Best Rice." According to Tien Phong Daily, on April 5, 2024, the Hanoi Market Management Department launched inspections across six rice trading locations in Hoang Mai District, Hai Ba Trung District, and Hoai Duc District. Inspection results revealed signs of trademark violations involving Ong Cua Rice products at certain establishments (Tuyen, P., 2024).

The issue of counterfeit and imitation rice brands is not only prevalent in major cities like Hanoi and Ho Chi Minh City but has also spread to provinces and localities across the country, including Soc Trang, the birthplace of the ST25 rice variety. Exploiting the brand's reputation, many individuals and businesses have arbitrarily labeled their packaging with the ST25 name without ensuring a clear origin. This undermines consumer trust and causes severe damage to the reputation of legitimate businesses.

This issue not only diminishes the value of Vietnamese rice brands on the international stage but also hinders businesses from expanding their markets. Addressing this problem requires close coordination among stakeholders. The government needs to intensify inspections, strictly penalize violations, and support intellectual property rights protection. Businesses should adopt anti-counterfeiting technologies such as QR code labels, while consumers should raise awareness and prioritize products with clear origins to help eliminate counterfeit and imitation goods (Tam, K., Dau, B., and Manh, T., 2021).

### 1.3. The Absence of a Rice Brand Evaluation System

Currently, the evaluation of rice brands in Vietnam remains limited, with no official and comprehensive tool publicly available. Most evaluations are conducted using manual methods such as surveys, industry workshops, or programs like "Building a National Brand for Vietnamese Rice" (Tam, K. and team, 2024). The evaluation of rice brands in Vietnam is still under development. The ASEAN-Japan Center (AJC) has collaborated with experts to share branding experiences for agricultural products, including rice (Dung, H. T., and Quoc, C., 2024). Additionally, policies aimed at enhancing the value and position of Vietnamese rice brands are being promoted by the Ministry of Agriculture and Rural Development (Khanh, N., 2024).

In this context, amidst the rapid development of social media and artificial intelligence (AI) technology, the application of AI in evaluating rice brands is a highly promising solution. This is the first study to apply AI in assessing rice quality, while all previous studies or evaluation methods have been limited to traditional quantitative and statistical tools. AI applications can not only measure the effectiveness of indicators on social media—where consumers can easily access, use, and trust information—but also provide objective and comprehensive evaluations of the quality, reputation, and competitiveness of rice brands in the digital era. This will create greater transparency and reliability within the industry, effectively meeting the needs of consumers and stakeholders.

### 1.4. Methods for Evaluating Rice Brands

In modern society, trust and reputation are built brandwise, which put businesses or organizations in a strong good place. For rice trading enterprises branding is not only a tool for enhancing competitiveness but also a bridge that can attract customers. Currently, the evaluation of rice brands in Vietnam primarily relies on traditional and manual methods, with no specialized tools available for assessing specific rice brands.

As one of the world's leading rice producers, Vietnam regularly organizes quality rice evaluation competitions to honor outstanding rice varieties and promote the development of the rice production industry. One notable example is the "*Vietnam Delicious Rice Contest*", periodically organized by agricultural associations, organizations, or related

entities. The contest is to find out the best rice varieties in Vietnam which will increase the value of Vietnamese rice brands both at home and abroad because it will be held in two categories including fragrant rice and glutinous rice. Participating rice varieties must be developed in Vietnam, officially circulated or tested, with a purity level of ≥98%, and free from poor-quality grains (*e.g., yellow, damaged, immature, or red-striped grains*) (Hai, T., & Phien, C., 2022).

On the international stage, one of the most prominent events for evaluating rice quality is the "World's Best Rice Contest," organized annually by The Rice Trader. This event allows countries to showcase their finest rice varieties and assert their positions in the global market. In recent years, Vietnamese rice brands have consistently achieved high awards, demonstrating significant advancements in quality and farming techniques. Notably, the ST25 rice variety made a strong impression by winning first prize twice, in 2019 and 2023 (Tam, K., and Dung, H. T., 2023). .It confirms not only the quality of rice but also raises the reputation and credibility of Vietnamese agricultural products in the world market.

Also, the International Rice Research Institute (IRRI) holds yearly contests and awards to celebrate great research and development in the rice field. In Southeast Asia, the ASEAN Rice Trade Forum is a yearly event that looks at helping and checking rice quality throughout the region.

Overall, evaluation criteria in both domestic and international competitions are based on: *flavor, stickiness, fluffiness, grain shape, color, and nutritional quality*. These criteria are built on the physical properties of rice grains, such as milling rate, whiteness, shape, and chemical characteristics, including nutritional content, protein levels, and aroma, to comprehensively assess quality. Such events and competitions help identify and honor rice varieties that meet high-quality standards. However, being recognized as delicious does not necessarily mean the rice is distributed by a reputable brand. Therefore, additional methods are needed to directly evaluate brands. Brand evaluations primarily rely on third-party services, as there is no direct and efficient tool for businesses or users to perform this independently. This measurement process is typically conducted by companies specializing in brand evaluation services. In Vietnam, companies such as Mibrands and Nielsen Vietnam are reputable providers of market survey and brand analysis services.

For Mibrands, this is a company highly active in the field of market research and marketing services, providing solutions to help businesses better understand their market and customers. Mibrands focuses on delivering market research solutions to evaluate brands across four main groups: *1. Market Potential and Trend Research (Market Census):* Identifying opportunities and prominent trends*; 2. Contextual Research (Positioning Context):* Evaluating brand positioning within a competitive context; *3. Customer Psychology and Behavior Research (Customer Usage & Attitudes):* Understanding customer needs and habits; *4. Communication Campaign Effectiveness Evaluation (Communication Efficiency Score):* This set of solutions makes Mibrands stand out as it includes an index system co-developed by Mibrands and SurveyTrue, in collaboration with professors from RMIT University (Ho Chi Minh City), initiated in 2014 (SurveyTrue, 2022). The indices include: *Ad Recognition (measuring customer reach and recall):* Immediate Recognition Index (Self-awareness index); Clear Recognition with Assistance Index (Ads-prompted awareness index); Unclear Recognition with Assistance Index (Ads-unclear awareness index); *Ad Perception (evaluating customer emotions and opinions):* Campaign Awareness Index (Ads-Perception Index); Campaign Feeling Index (Ads-Feeling Index); Ad-Personal Relevance Index (Ads-Relevant Index); *Ad Impact (measuring influence on purchasing behavior*): Impact on Brand Affection Index (VVOB Love Index); Ad Effectiveness on Behavior Change Index (Perception & Behavior Change Index).

Another company, Nielsen Holdings PLC, was established in 1923 by Arthur Nielsen. It is a global market research and advertising company headquartered in New York, USA. Operating in over 100 countries, Nielsen provides data and analytics to help businesses better understand their customers and consumer behavior. Nielsen utilizes tools like Nielsen Ratings to measure television audiences, conduct consumer surveys, analyze sales data, and track shopping behavior. To analyze the "health" of a brand, Nielsen uses the following measurement indices for market research:

### 1.4.1. Volume Sale & Share / Value Sale & Share

These indices focus on measuring the scale and value of revenue from products or services over a specific period.

Volume Share: Measures the percentage of a brand's goods compared to the total goods in the entire market (Son, T. P., 2016). The formula is defined as:

$$Volume\ Share\ (\%)\ =\ (\frac{Your\ Volume\ Sale}{Total\ Market\ Volume\ Sale})\ \times\ 100 \quad (1)$$

Value Share: Determines the percentage of a brand's revenue within the total market revenue, using the formula:

$$Value\ Share\ (\%)\ =\ (\frac{Your\ Value\ Sale}{Total\ Market\ Value\ Sale})\ \times\ 100 \quad (2)$$

### 1.4.2. Market Share

Market share reflects the extent of a brand's dominance in total revenue or sales across the industry during a specific period (Hayes, A., 2024). The formula is:

$$Market\ Share\ (\%)\ =\ (\frac{Company\ Sales}{Industry\ Total\ Sales})\ \times\ 100 \quad (3)$$

### 1.4.3. Ratings & Share

The Ratings and Share indices are mainly used for measuring media and audience engagement, providing insights into the reach and participation of target audiences.

Rating: The percentage of an audience within the total target group watching a specific program (The VAB., 2024). The formula:

$$Rating\ \%\ =\ Share\ \%\ x\ Households\ Using\ Television\ \%\ (HUT\ \%) \quad (4)$$

Share: Evaluates the dominance of a program compared to the total audience watching TV at that time (The VAB., 2024). The formula:

$$Share\ (\%)\ =\ (\frac{Rating\ \%}{HUT\ \%})\ \times\ 100 \quad (5)$$

### 1.4.4. Consumer Insights

Consumer behavior analysis (Gimasys, 2024) provides detailed data on customer preferences, habits, and trends. Notable indices include:

Purchase Frequency: The frequency of consumer purchases over a period.

Average Basket Size: The average quantity or value of items in each shopping trip.

Customer Lifetime Value (CLV): The estimated value a customer brings to the business throughout their shopping lifecycle.




**Fig 1. Customer Insight (Source: Gimasys)**

These indices are not only tools for evaluating business performance but also help businesses optimize marketing, distribution, and product development strategies based on proven consumer trends through real-world data.

While traditional brand evaluation methods such as direct surveys and interviews are still widely used, they

increasingly reveal limitations in the current context. These methods require significant human and time resources and often lack accuracy, especially when dealing with complex and inconsistent data. Furthermore, the collected data is often not systematically organized or digitized, making it challenging to comprehensively compare and evaluate brands, particularly in the rice industry, a field with growing competition and highly specialized products.

This outdated evaluation approach struggles to keep up with modern trends, where technology and big data play an increasingly critical role. Developing modern evaluation tools that leverage technology and data analytics not only helps rice industry businesses optimize brand strategies but also supports them in improving product quality and building market credibility. Moreover, in the digital era, where social media plays a significant role in shaping consumer perceptions, a reputable rice brand with positive reviews not only fosters customer trust and loyalty but also attracts investment opportunities from financial funds or government entities. This provides a vital competitive advantage, contributing to enhancing the business's position in both domestic and international markets.

## II. MATERIAL AND METHODOLOGY

### 2.1 The Development of Contemporary AI Systems

The year 2024 marks a significant leap in artificial intelligence, where this technology has not only reached new heights but also become a focal point of investment from major corporations worldwide. Renowned models like ChatGPT (OpenAI), Gemini (Google), Claude (Anthropic), and Copilot (Microsoft) have become icons of groundbreaking development, providing effective solutions across various fields. While ChatGPT and Gemini lead in the chatbot domain, text-to-image tools like DALL-E 3 (OpenAI) and Stable Diffusion (Stability AI) have revolutionized digital art creation. Moreover, AI plays a pivotal role in healthcare with applications like IBM Watson Healthcare and Ada Health, offering smarter and more precise healthcare solutions.

Notably, NVIDIA is leading the AI chip manufacturing market with its H100 product line (Hanh, N., 2024), laying the foundation for an intense race in high-tech fields. Advances in AI chip manufacturing not only transform the industry but also drive fierce competition among large and medium-sized corporations globally. This promises to create a dynamic global economy where businesses continually innovate to maintain their positions in a challenging market.

Today, artificial intelligence does not just play the role of a tool but also an inspirational driver behind the creation and improvement of quality life in all sectors. ChatGPT, however, not the first nor the smartest product, has created a media explosion and, because of its fame, blinded people to recognize the true essence of artificial intelligence. With its powerful natural language processing capabilities, ChatGPT effectively supports learning, research, and content creation.

Simultaneously, apart from open-source models, we also evaluate models available via APIs, such as Gemini-1.5-pro and GPT-3.5-turbo, provided by Google and OpenAI. Gemini-1.5-pro is a mixture-of-experts model (Jacobs et al., 1991; Zhang et al., 2021), designed with a structure comprising multiple "experts" (sub-networks). Its unique feature is that only a few experts are activated for each input token, optimizing pre-training performance and accelerating inference processes. ChatGPT, built by OpenAI on the Transformer model platform developed by Google, is based on a deep learning architecture using the self-attention mechanism. This allows the model to capture relationships between words in a sentence without relying on sequential architecture (Anh, T. N., 2024). However, the GPT version only uses a decoder to predict the next word in a text sequence. Concurrently, Claude AI, an equally prominent chatbot, is considered a strong competitor to ChatGPT due to its superior technical specifications. Claude 3.5 Sonnet features a context length of 200k tokens and outputs up to 8192 tokens, while ChatGPT API reaches only 128k tokens and outputs 4096 tokens (Zhu Liang, 2024). Provided by Anthropic through Google’s Vertex AI platform, Claude supports advanced AI application development. Vertex AI helps businesses efficiently build and manage machine learning models (Doan, N., 2024). Claude’s notable APIs include Claude 3.5 Sonnet, Claude 3.5 Haiku, and Claude 3 Opus.

Not to be outdone by other industry "giants," CEO Mark Zuckerberg has heavily invested in the AI technology race. The result is LLaMa 3.1, an AI model developed by Meta Platforms Inc., marking the first release with configurations of up to 405 billion parameters (Meta, 2024). This model was built in collaboration with NVIDIA, leveraging the power of 16,000 H100 GPUs, NVIDIA’s flagship chips (Dang, H., 2024).

On another note, locally-run large language models (LLMs) are becoming a significant development trend due to

advantages such as greater control, lower operating costs, significantly reduced latency, and superior data security (Awan A. A., 2023). These benefits not only help businesses and organizations optimize performance but also offer flexibility for customization to meet specific needs. Recently, several locally-run LLMs in Vietnam have gained attention thanks to exceptional technological advancements and applicability. Notable examples include Phở GPT, introduced at the Vietnam AI Day event organized by VinAI and the New Turning Institute (Dang, N., 2023). Phở GPT offers the PhoGPT-4B model, with 3.7 billion parameters, trained from scratch on a massive Vietnamese dataset comprising 102 billion tokens, a context length of up to 8192, and a vocabulary of 20,000 token types (Nguyen, D. Q.. et al., 2023). Additionally, models like Vistral-7b-chat (Nguyen, C. V. et al., 2023) and VinaLLaMA-7B-chat (Nguyen, Q. et al., 2023) are developed through supervised fine-tuning (SFT) (Xu et al., 2023; Ding et al., 2023) based on open-source models (e.g., LLaMA-2 and Mistral), utilizing Vietnamese language text datasets. Openchat-3.5, developed by Wang et al. (2023), is a fine-tuned version of LLaMA-2 through Reinforcement Learning from Feedback (RLFT) (Ouyang et al., 2022; Rafailov et al., 2023). The research group introduced a Conditional-RLFT technique using an English text corpus with diverse content and mixed quality. They confidently assert that Openchat-3.5 is the first 7B model to achieve performance equivalent to ChatGPT. To optimize deployment, these open-source models have been converted to the Q5_K GGUF format for efficient local operation.

### 2.2. Evaluation Process

The study utilizes two independent models to evaluate the output quality based on the same input dataset: the ChatGPT model and a unique prompt structure called PPN. ChatGPT, a pre-developed AI platform, is accessed directly via API.

Meanwhile, the experimental custom model, developed by Adhightech and built upon the Openchat-3.5-7B framework, is a tailored solution applied in this study. The distinctive PPN prompt structure is designed to filter and extract “positive” (p) and “negative” (n) keywords or phrases from the articles. Each article’s score is determined by the total occurrences of positive and negative elements.

$$E_m^i = \{E\mathrm{p}_m^i;\ E\mathrm{n}_m^i\} = \{\sum_{s=1}^{j} p_s^{ai};\ \sum_{r=1}^{k} n_r^{ai}\} \quad (6)$$

Here, $a_i$ represents the ***i***-th article in the dataset, while ***j*** and ***k*** denote the counts of positive and negative keywords, respectively. The parameter ***m*** indicates the total number of articles in the dataset. The assessment of a brand's sentiment *positive* or *negative* is derived using the following calculation:

$$E_{all} = \{\frac{\sum_{t=1}^{m} Ep_m^{ai}}{m};\ \frac{\sum_{t=1}^{m} En_m^{ai}}{m}\} \quad (7)$$

This method, initially proposed by (Ngo-Ho, A.-K. et al.,2024a), utilizes a large language model (LLM) through a chatbot API to identify and quantify positive and negative keywords (Ngo Ho, A. K., 2021). The formula provides a quantitative relationship between these keyword categories by measuring their occurrences and interrelations. Leveraging OpenAI’s LLM technology, this algorithm has been validated in multiple recent studies focusing on Vietnamese language applications, such as (Ngo-Ho, A.-K. et al.,2024b). Despite its demonstrated effectiveness, this approach remains novel, with limited studies exploring its comparative performance or adaptations.

## III. EXPERIMENT AND DISCUSSION

### 3.1 Evaluation Dataset

The study employs a simple Python script to collect articles related to a specific brand within a defined time frame. This script retrieves data using the Google search engine while excluding content originating from the brand’s official website or associated pages displayed in Fig. 2.

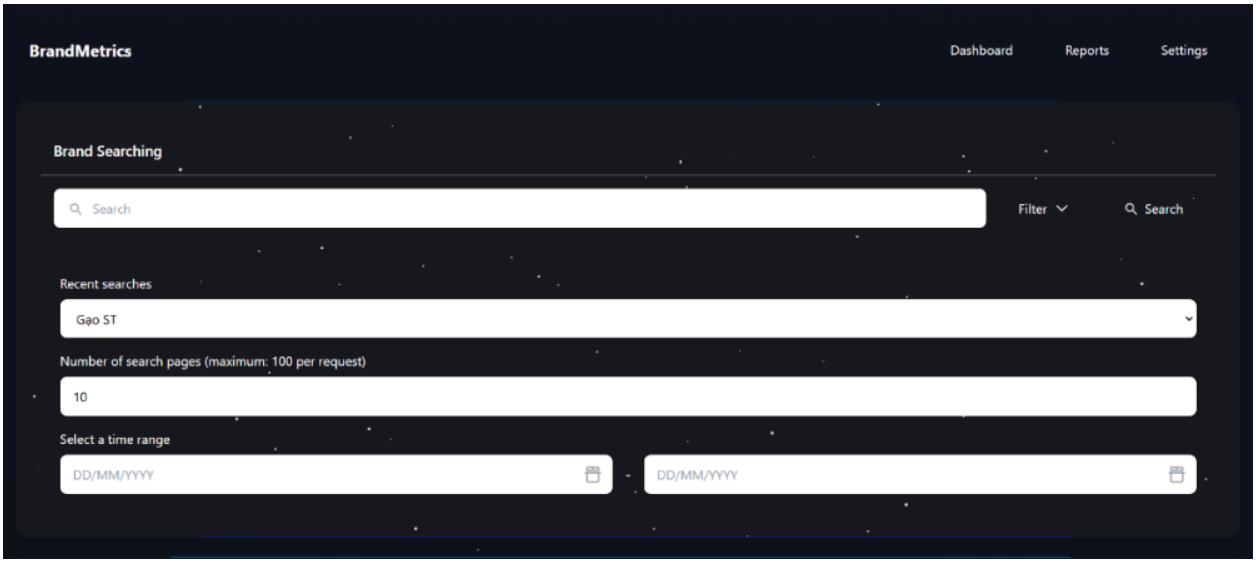



**Fig 2. User interface of the university brand evaluation system (demo)**

Using the brand's name as the primary keyword, the program gathers all links returned by Google, accesses each link, extracts text content, and filters out advertisements or irrelevant information. The processed content is saved as text files (.txt) without including images or charts. This method ensures comprehensive data collection about the brand within the specified time period. The workflow is clearly depicted in the sequential diagram in Fig. 3.

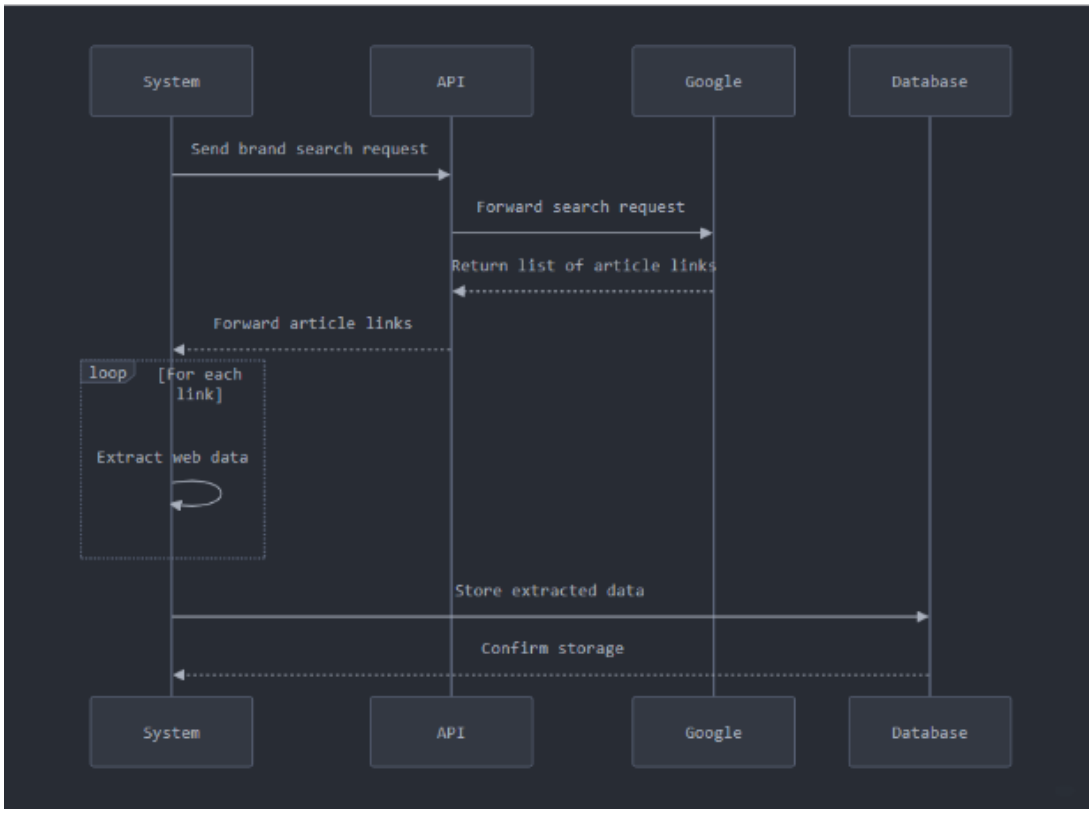



**Fig 3. Sequence Diagram of system**

### 3.2 Case Study

To illustrate the research findings, the study employs a representative case study comparing the "ST Rice Brand" and the "Hat Ngoc Troi Rice Brand" on social media platforms. The database for this case study is derived from the program outlined in section 3.2, Evaluation Process. This case study relies on the retrieval of all posts about these two brands during a six-year period, spanning from January 1, 2019, to December 1, 2024. The evaluation dataset comprises 200 articles on the "ST Rice Brand" and the "Hat Ngoc Troi Rice Brand," sourced based on Google indexing results. The trial run of the evaluation tool yielded the following results in Fig 4:




**Fig 4. Test results for the keywords “ST Rice” and “Hat Ngoc Troi Rice”**

It is evident that the results, though complex in reflecting positive and negative sentiments for a particular brand, have been simplified into practical, identifiable ratios (Fig 5.):

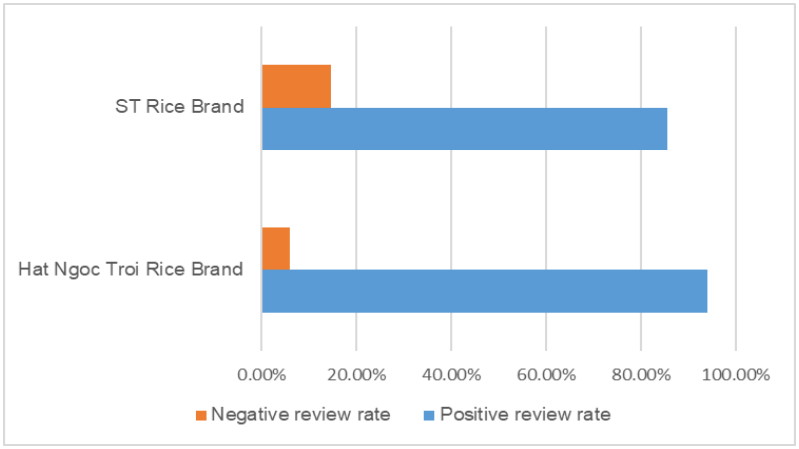
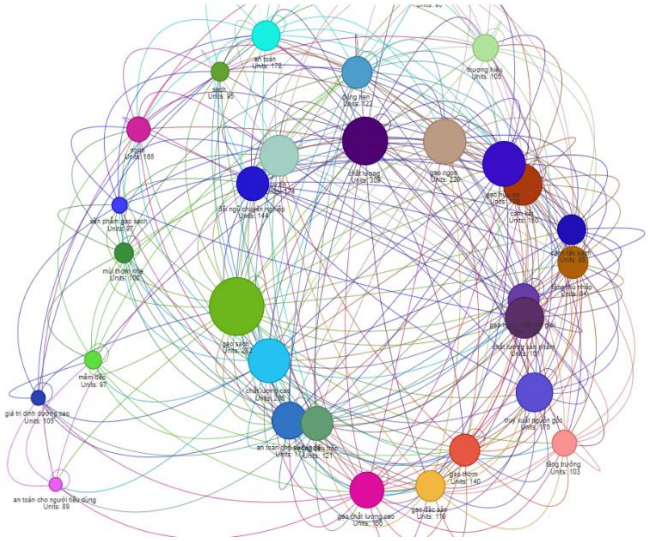



**Fig 5. Comparison test results for “ST Rice” and “Hat Ngoc Troi Rice”**

The study acknowledges that these results remain rudimentary, as they do not yet account for the severity or weight of specific positive and negative keywords/phrases. The assessment currently relies solely on their frequency of appearance on multimedia platforms. A more sophisticated system is under development to address these limitations.



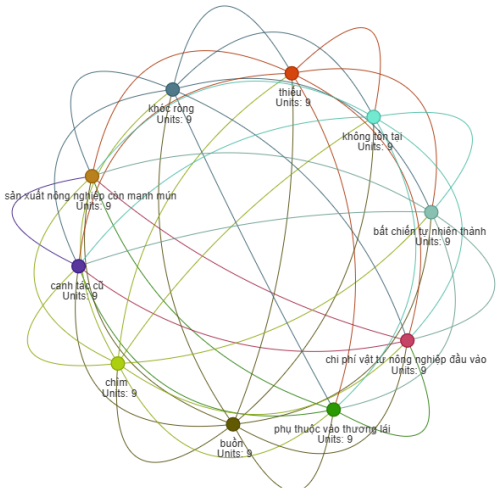



**Fig 6 Positive Keyword Chart (Example: AAn Rice)** **Fig 7 Negative Keyword Chart (Example: Gạo A An)**

Results from additional keyword testing, within a specified time frame, are presented below. It is noted that these do not represent a comprehensive evaluation of the entire study period (Table 1):

**Table 1. Brand evaluation of some rice-brands in Vietnam (randomly selected)**

| Rice brand | Positive Rate (%) | Negative Rate (%) |
|---|---|---|
| ST Rice | 85.47 | 14.53 |
| AAn Rice | 93.31 | 6.69 |
| TigiFood Rice | 87.22 | 12.78 |
| Hat Ngoc Troi Rice | 94.05 | 5.95 |
| Jasmine Rice | 85.26 | 14.74 |

Currently, there is no specific evaluation tool designed to comprehensively analyze and measure rice brands, especially on social media platforms. Assessing rice brands predominantly relies on specialized brand evaluation firms and market research companies employing traditional methods such as direct surveys and individual interviews. While these methods provide valuable data, they are often time-consuming, labor-intensive, and costly. Additionally, they struggle to accurately reflect the rapid changes in consumer trends and opinions in the online environment. This underscores the urgent need for a modern tool capable of leveraging big data and analyzing social media information to provide comprehensive, accurate, and timely evaluations.

## IV. CONCLUSION

In conclusion, this study is the first in Vietnam to apply artificial intelligence (AI) technology in evaluating rice brands on social media and communication platforms. This approach is not only an inevitable trend but also brings significant practical value. In the context of Vietnam's rice industry facing challenges such as counterfeit products and consumer confusion, AI has introduced a novel approach, surpassing traditional evaluation methods. With its ability to collect, process, and analyze vast amounts of data from diverse sources, AI provides comprehensive, objective, and timely evaluations. The research findings also reveal that modern AI models not only assist in detecting fraudulent activities but also enhance brand credibility by delivering reliable information to consumers. This not only helps Vietnamese rice brands improve their communication strategies but also contributes to building trust and confidence among customers. Currently, the study primarily focuses on extracting information from Google data. In the future, the research will aim to expand by incorporating more data from social media platforms such as Facebook, X (formerly Twitter), TikTok, and Shopee to increase the accuracy of evaluations. Overall, AI is not just a tool but a strategic solution for protecting and developing rice brands in the digital era.

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# DIGITAL INNOVATION AND CHANGING CONSUMER BEHAVIOR: A PATHWAY TO SUSTAINABLE SMES GROWTH IN RURAL VIETNAM

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**ABSTRACT**

The rapid advancement of digital technologies has transformed global business landscapes, emphasizing the need for enterprises to adopt innovative practices. In Vietnam, small and medium-sized enterprises (SMEs), particularly in rural areas, face unique challenges in digital transformation due to disparities in infrastructure, digital literacy, and socio-cultural dynamics. Addressing these issues is critical to fostering equitable and sustainable economic growth. This study aims to identify the key factors influencing digital adoption among Vietnamese SMEs, with a specific focus on rural contexts. Guided by the Unified Theory of Acceptance and Use of Technology (UTAUT), the research integrates complementary frameworks such as the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Technology-Organization-Environment (TOE) to provide a holistic understanding of individual and organizational adoption behaviors.The findings highlight significant barriers, including infrastructural constraints, cultural resistance, and skepticism toward digital platforms. At the same time, enablers such as community-driven trust-building, localized content, and performance-enhancing digital tools are identified as pivotal in overcoming these obstacles. The study emphasizes the importance of tailored strategies that align with the socio-cultural realities of rural Vietnam.Looking forward, this research underscores the need for investments in digital infrastructure, targeted digital literacy programs, and longitudinal studies that explore the evolution of digital adoption behaviors. By advancing UTAUT's application in resource-constrained environments, this study contributes actionable insights to bridge the rural-urban digital divide and support sustainable growth for Vietnamese SMEs in the digital economy.

*Keywords*: "Community-Driven Strategies", "Digital Literacy", "Digital Transformation", "Rural Technology Adoption", "UTAUT Framework*"*

## I. INTRODUCTION

### 1.1. Digital Innovation landscape

Since the 2010s, the Fourth Industrial Revolution has profoundly transformed various aspects of human life. During this period, the concept of "digital innovation" and its applications has gained significant attention, becoming a key global focus for nations and enterprises (TM Anh, 2021). According to Kagermann (2015) and Pink (2005), digital innovation has been marked by swift technological advancements, including the widespread use of mobile devices, increased internet access, and the incorporation of artificial intelligence and machine learning. These developments undeniably exert profound effects on individuals and businesses (Rogers, 2003; Davis, 1989).

This evolving consumer landscape underscores the imperative for corporations to reevaluate their business strategies and embrace digital transformation (Hewavitharana, T., 2021; Mihardjo et al., 2019). Digital transformation, which involves leveraging digital technologies to alter business models and operations fundamentally, aims to create new value and opportunities (Fitzgerald et al., 2014; Frank et al., 2019; Crupi, et al., 2020). In the context of Industry 4.0, digital transformation has become a necessity rather than an option, as corporations face competition from new market entrants offering innovative business models (Mihardjo et al., 2019). By adopting digital tools, businesses can enhance customer engagement, broaden their market reach, improve operational efficiency, and reinforce their competitive advantages in this dynamic market (Boratyńska, K., 2019).

### 1.2. Outlook in Vietnam

In Vietnam, the outlook for digital transformation is more promising than ever. The robust development of internet infrastructure, coupled with the increasing prevalence of mobile device usage, has significantly enhanced the country's

readiness for digital transformation.On November 19th, 1997, Vietnam entered its technological era with the introduction of internet access to its citizens. After nearly three decades, by 2023, the country's internet penetration rate reached 79%, placing it 39th globally, with approximately 77.93 million people online (Adtima & RMIT University, 2023; Group M, 2024a; Statista, 2025). Furthermore, internet infrastructure in Vietnam has also rapidly evolved, improving both in speed and cellular data capabilities. As of February 2023, Vietnam also ranked 39th globally in fixed internet speed Group M, 2024. The development of cellular data has progressed significantly through the generations from 1G to the latest 5G technology, which offers speeds 40 times higher than 4G and twice that of current 5G technologies (Group M, 2024a). On the other hand, mobile internet usage in Vietnam has seen substantial growth, with an estimated 81 million users in 2023, accounting for about 80.7% of the population (Statista, 2025). The Vietnamese government aims for universal smartphone usage by the end of 2024. (EdTech Agency, 2023).

This interconnected progression has made the internet become an integral part of daily life in Vietnam, with individuals spending an average of 6.4 hours online per day in 2023, ranking the country 26th globally in internet usage (Adtima & RMIT University, 2023). While activities such as social networking, chatting, entertainment, and information-seeking remain prevalent, there has been a notable shift in consumer behavior. The adoption of online shopping increased from 55% to 66%, and the use of e-wallets rose from 39% to 45%, highlighting a growing preference for digital purchasing methods (Group M, 2024a). Vietnam's e-commerce market is projected to grow by 25% in 2023, with revenue surpassing $20 billion, and expected to double, reaching $40 billion by 2025. With an annual growth rate of 20%, Vietnam has been ranked among the top five countries globally for e-commerce growth by eMarketer. Furthermore, this growth trajectory is anticipated to continue, with the number of e-commerce users projected to grow at a Compound Annual Growth Rate (CAGR) of 9.93%, increasing from 17.3 million in 2018 to 44.6 million by 2028 (Group M, 2024b). This trend highlights substantial opportunities for Vietnam's e-commerce sector. Additionally, numerous studies indicate that digital innovation has altered consumer purchasing decisions. According to Deloitte's 2021 Vietnam Consumer Survey report, while traditional marketing channels like word of mouth and TV still hold significant sway over consumer buying decisions, digital and social media channels are rapidly gaining traction, influencing around 55% of purchases across all product categories. Similarly, Adtima's 2023 Rural Playbook (2023) confirms that social platforms are the second most influential source of information affecting purchasing decisions among rural consumers in Vietnam. Noticeably, in these rural areas, the role of community dynamics in shaping trust and influencing digital adoption significantly impacts the purchasing decisions of customers. They tend to value personal recommendations more than corporate messages, with 79% of rural online shoppers making purchases based on influencer endorsements.

Consequently, word-of-mouth, local influencers, and community approval are particularly impactful, offering trusted and relatable information that resonates with rural consumers (Group M, 2024a & 2024b) Faced with these changing customer behaviors, Vietnamese businesses feel a pressing need to embrace digital transformation. This shift aims to enhance customer experiences through improved understanding of customer information, innovation in business models, and the integration of advanced technologies (VA Ta & CY Lin, 2023). Small and Medium Enterprises (SMEs), which constitute approximately 98% of all enterprises in Vietnam, play a pivotal role in the national economy. They contribute around 48% of the country’s GDP, 20% of export value, and provide employment for 77% of the labor force (Thi Nhung, Gan & Hu, 2015). For SMEs, prioritizing the customer journey is essential. By delivering a positive and impactful experience, they can foster customer loyalty, thereby achieving their broader objective of improving business efficiency and competitiveness (Setia et al., 2013).

Understanding the essential role of digital transformation in sustaining economic growth and prosperity, the Vietnamese government has made significant efforts to promote and regulate various aspects of the digital economy (Cameron et al, 2019). However, a report by IDC in 2020 “Asia Pacific SMB Digital Maturity Study” found that Vietnam was still in the very early stages of digital transformation maturity, ranking last out of 14 APAC countries. This disappointing result shows that while awareness and promotion of Industry 4.0 within Vietnam are encouraging, technology adoption remains low, underscoring the need for a better approach to support the national transformation.

Hence, this study aims to address two primary questions: (1) "What are the key factors influencing digital adoption at both individual and organizational levels, particularly for small and medium-sized enterprises (SMEs) in Vietnam?"

and (2) "What are the barriers to digital adoption for SMEs in Vietnam, especially in rural contexts?". This focus is informed by the acknowledgment of significant differences between rural and urban areas, including disparities in cultural contexts, infrastructure, digital skills, educational access, and levels of investment (Asia Foundation, 2021; Nguyen et al., 2023b; Vietnam Economic Impact Report, 2023). These substantial gaps may lead to variations in digital transformation readiness between rural and urban enterprises, highlighting the need for tailored and effective strategies to facilitate digital transformation across the entire nation.

To understand and address these challenges, theoretical models provide valuable frameworks for analyzing digital adoption behaviors. Models such as the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Theory of Planned Behavior (TPB), and Technology-Organization-Environment (TOE) framework offer insights into the interplay of individual, organizational, and environmental factors. The study will then explore how factors beyond perceived usefulness and effort expectancy influence digital transformation in underdeveloped areas. This approach aims to deepen the theoretical understanding of digital transformation in rural settings. The findings indicate that conventional models, which mainly emphasize usefulness and effort expectancy, might miss crucial influences relevant to underdeveloped areas. It highlights the need to incorporate trust-based variables into models evaluating technology adoption in these regions and suggests that future models should broaden to include trust elements, offering a more comprehensive framework for analyzing digital adoption in rural environments. Additionally, this study will also preveal barriers to digital adoption, providing actionable recommendations for policymakers, SMEs, and researchers to advance equitable digital transformation across Vietnam.

## II. MATERIAL AND METHOD

This study employs a systematic literature review methodology, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Moher et al., 2009). The review focuses on understanding technology adoption among Vietnamese SMEs, especially in Rural areas, by synthesizing key theoretical frameworks, identifying adoption barriers and enablers, and providing insights. The conceptual model is derived from the Unified Theory of Acceptance and Use of Technology (UTAUT), which explains user behavior through constructs like performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). Complementary frameworks, including TAM, TPB, TRA, and TOE, are also considered to provide a comprehensive understanding of adoption behaviors at individual and organizational levels.

The PRISMA framework ensures rigor and transparency through its four stages: identification, screening, eligibility, and inclusion. In the identification stage, 450 records were retrieved from databases such as Scopus, Web of Science, and Google Scholar as well as reports from the World Bank, organizational white papers, and Vietnamese government authorities. After removing duplicates and screening for relevance, 220 studies were retained based on criteria such as their focus on rural SMEs and their alignment with key theoretical frameworks. Following eligibility evaluations, 95 studies (80 peer-reviewed articles and 15 reports) were included in the final review were included, synthesizing theoretical insights, contextual factors, and practical applications for SMEs.

The review highlights significant findings: UTAUT is particularly relevant for addressing rural adoption challenges, emphasizing facilitating conditions and social influence. Key barriers include infrastructure limitations, low digital literacy, and skepticism toward digital platforms, while enablers such as trust-building strategies, community-driven initiatives, and localized digital content promote adoption. These findings provide actionable recommendations for policymakers to improve infrastructure and digital literacy, for SMEs to adopt community-centric strategies, and for researchers to explore longitudinal studies on adoption behaviors in rural contexts.

## III. RESULT AND DISCUSSION

### 3.1 Models and Frameworks of Determinants Affecting Digital Adoption at Individual and Corporation Levels.

Research on technology acceptance and usage spans individual, group, and organizational levels, representing a mature domain within information systems (IS) research (Venkatesh et al., 2016; Venkatesh, Davis, & Morris, 2007; Sarker & Valacich, 2010). Technology adoption in rural Vietnamese SMEs requires a holistic analysis of individual and organizational behaviors. Models like the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM),

and Theory of Planned Behavior (TPB) emphasize attitudes, perceived ease of use, behavioral intentions, and control (Fishbein & Ajzen, 1975; Ajzen, 1991). Broader frameworks like the Technology-Organization-Environment (TOE) and Unified Theory of Acceptance and Use of Technology (UTAUT) address environmental and organizational factors (Tornatzky & Fleischer, 1990; Venkatesh et al., 2003).

Contextual challenges, including limited infrastructure, policy inconsistencies, and regional disparities, significantly affect adoption behaviors (World Bank, 2021; Walsh et al., 2023). Individual adoption hinges on perceived benefits, social influences, and facilitating conditions, while organizational adoption focuses on productivity, system integration, and strategic alignment (Ajzen, 1991; Fishbein & Ajzen, 1975). Quantitative methods dominate this field, but mixed-methods approaches are recommended to address nuanced realities and translate theoretical insights into practical strategies for rural contexts (Kumar & Ayedee, 2021). Integrating TRA, TAM, TPB, TOE, and UTAUT frameworks provides a cohesive pathway for advancing technology adoption and sustainable growth in under-resourced settings.

### 3.2 Technology Adoption in Individual Perspective

#### 3.2.1 Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA), developed by Fishbein and Ajzen (1975), is one of the foundational models in adoption research. TRA emphasizes that behavioral intentions are shaped by attitudes and subjective norms that significantly predict intentions to act (Bagozzi et al., 2000). TRA provides a foundation for understanding individual decision-making processes, particularly in Vietnam rural contexts where social norms heavily influence technology adoption (Ng, 2020; Albarracín et al., 2001; Armitage & Conner, 2001). Attitude toward behavior refers to an individual's positive or negative evaluation of performing the targeted behavior, shaped by their salient beliefs regarding its outcomes and the evaluation of those outcomes (Hewavitharana et al., 2021, Fishbein & Ajzen, 1975; Bagozzi et al., 2000). Subjective norms, on the other hand, reflect the influence of external social pressures, shaped by nominative beliefs and motivation to comply with these pressures (Hale, J., 2002, Bagozzi et al., 2000). These factors combine to predict behavioral intention, which in turn influences actual behavior, assuming minimal external constraints. However, TRA does not account for external conditions such as opportunities, skills, or resources, which are critical for technology adoption (Fishbein & Ajzen, 1975).

#### 3.2.2 Technology Acceptance Model (TAM): An Enhanced Perspective

Building on the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), proposed by Davis (1989), simplifies the conceptualization of technology adoption by introducing two key constructs: perceived usefulness (PU) and perceived ease of use (PEOU). PU represents the extent to which technology improves performance, while PEOU reflects the effort required to use it (Surendran, 2012; Hewavitharana et al., 2021). These constructs are influenced by external factors, including social, cultural, and political dimensions. Social factors encompass language, skills, and facilitating conditions, whereas political influences include governmental policies and political stability (Khan, Saleh, & Quazi, 2021).

User attitudes, as defined in TAM, refer to the evaluation of employing a specific technology, while behavioral intention measures the likelihood of adopting the technology (Chen et al., 2017). This model has been extensively applied in customer adoption studies, particularly in rural contexts where simplicity and perceived utility are pivotal for technology acceptance (Taylor & Todd, 1995; Pathak et al., 2019).

Despite its wide application, TAM has limitations in addressing external influences such as cultural and environmental factors. To overcome these gaps, recent studies have integrated additional dimensions into the model. For instance, Jan, Alshare, and Lane (2022) incorporated Hofstede's cultural dimensions to examine the role of societal norms in technology adoption. Similarly, Granić (2022) demonstrated the value of combining TAM with models like the Unified Theory of Acceptance and Use of Technology (UTAUT) to enhance its explanatory power. Research by Javier et al. (2023) and Pathak et al. (2019) in rural settings underscored the importance of including cultural and environmental factors, emphasizing their critical role in shaping adoption behaviors.

By addressing these limitations, TAM has evolved into a more comprehensive framework for analyzing technology adoption, particularly in diverse contexts such as rural areas. This expanded approach enables researchers and

practitioners to better understand the interplay between individual, cultural, and environmental factors, ensuring a more holistic analysis of adoption behaviors.

### 3.2.3 Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB), introduced by Ajzen (1991), extends the Theory of Reasoned Action (TRA) by incorporating perceived behavioral control, addressing the role of external barriers and internal resources in shaping adoption intentions. TPB posits that an individual's behavior is influenced by three key components: behavioral beliefs, normative beliefs, and control beliefs. These components reflect attitudes toward behavior, the influence of external parties, and the degree of control over performing the behavior, respectively (Ajzen, 1991).

TPB has proven particularly effective in understanding technology adoption in rural and resource-limited environments, where infrastructure challenges and digital literacy often serve as barriers (Aubert et al., 2012; Salemink et al., 2017). Alam et al. (2020) have shown that psychological factors and socio-psychological norms significantly influence technology adoption behaviors. In such settings, perceived behavioral control is critical, as individuals' intentions are shaped by both internal capabilities and external constraints (Sniehotta, Presseau, & Araújo-Soares, 2014; Thomas, Singh, & Gaffar, 2013). Similarly, institutional trust has been shown to influence adoption intentions by affecting attitudes and perceived behavioral control, validating TPB's applicability in rural contexts (Li et al., 2022).

Recognizing the limitations of standalone models, researchers have combined TPB with the Technology Acceptance Model (TAM) to create the C-TAM-TPB framework. This integrated model incorporates subjective norms and perceived behavioral control, allowing a more nuanced understanding of the variation between intention and actual behavior. This flexibility makes the model applicable to both technologically experienced individuals and novices, offering better insights into technology acceptance (Taylor & Todd, 1995; Kammani et al., 2014).

While TPB offers a more comprehensive framework than TRA by addressing external barriers and internal resources, it has limitations. A significant critique is its lack of consideration for human emotions, which can influence behavioral intentions and actions (Ajzen, I.,2011; Thomas, Singh, & Gaffar, 2013). Moreover, the model's reliance on rational decision-making processes may not fully capture the complexity of behavioral dynamics in diverse contexts. The Theory of Planned Behavior extends TRA by adding perceived behavioral control, making it a robust framework for analyzing behavior in technology adoption, particularly in rural and resource-constrained environments. Its integration into models like C-TAM-TPB enhances its explanatory power, providing a comprehensive lens for understanding the interplay of individual, social, and environmental factors. However, addressing its limitations, such as omitting emotional influences, could further refine its application in diverse adoption contexts.

## 3.3 Technology Adoption in Organizational Perspective

While TRA, TAM, and TPB focus on individual adoption behaviors, the Technology-Organization-Environment (TOE) framework, developed by Tornatzky and Fleischer (1990), shifts the focus to organizational adoption by analyzing the interplay of technological, organizational, and environmental factors. The TOE framework is particularly relevant for SMEs in rural Vietnam, where limited infrastructure, resource constraints, and external policy environments present unique challenges and opportunities for digital transformation (Tornatzky & Fleischer, 1990; Lutfi et al., 2022). Recent studies have emphasized the adaptability of the TOE framework across various contexts, particularly in developing economies. For example, Loo et al. (2024) highlighted that leadership support, resource availability, and external pressures such as government policies and market dynamics play pivotal roles in shaping SMEs' readiness for digital transformation. Similarly, Lutfi et al. (2022) underscored the importance of technological compatibility and infrastructure, noting that these factors significantly influence the adoption of advanced digital solutions like big data analytics in resource-constrained environments.

These findings highlight the necessity of tailoring the TOE framework to account for the unique structural and cultural challenges faced by SMEs in rural settings. However, the applicability of the TOE framework is not without limitations. Studies reveal that SMEs' limited resources and less developed technological infrastructures differentiate them significantly from larger firms, requiring a nuanced understanding of how TOE factors interact in smaller organizational contexts (Sun et al., 2020; Wahab et al., 2021). Furthermore, environmental factors, including governmental support, regulatory frameworks, and competitive pressures, are particularly impactful in rural Vietnam,

where businesses often lack the capacity to independently drive digital adoption initiatives (Yoon & George, 2013; Alharbi et al., 2022). Critically, the framework must integrate external cultural and environmental factors, such as community trust, societal norms, and region-specific infrastructure challenges, to provide a comprehensive analysis of SME adoption behaviors. This holistic perspective is especially pertinent in rural Vietnam, where evolving customer demands for digital adaptation necessitate innovations not just in technology but also in organizational processes and leadership approaches (Nguyen et al.,2023a). By leveraging the TOE framework, policymakers and SME leaders can develop targeted strategies that address the structural, cultural, and policy-related challenges unique to rural Vietnam. Such strategies should align organizational innovation with shifting market trends, ensuring that SMEs can meet the demands of digital adaptation while fostering sustainable growth.

**3.4 Synthesizing using Unified Theory of Acceptance and Use of Technology (UTAUT): A Comprehensive Model**

The Unified Theory of Acceptance and Use of Technology (UTAUT), proposed by Venkatesh et al. (2003), integrates elements from prior models such as TRA, TAM, TPB, and TOE, providing a comprehensive framework for understanding technology adoption. UTAUT identifies performance expectancy, effort expectancy, social influence, and facilitating conditions as primary determinants of behavioral intention and technology usage. While extensively validated in developed economies, UTAUT's application in resource-constrained settings, such as rural Vietnam, remains under-explored (Hewavitharana et al., 2021; Venkatesh et al., 2016). This gap presents a significant opportunity for adapting UTAUT's constructs to address the unique challenges faced by SMEs, such as limited digital infrastructure, socio-cultural influences, and policy inconsistencies.

UTAUT has been applied to study technology acceptance across various user groups, including employees, consumers, and citizens (Hong et al., 2011; Zhou, Lu, & Wang, 2010; Chang et al., 2007). For instance, studies have focused on specific types of users, such as teachers (Pynoo et al., 2011) and physicians (Chang et al., 2007), as well as diverse organizational types like hospitals, government agencies, and schools (Pynoo et al., 2011; Gupta et al., 2008). Additionally, UTAUT has been employed to analyze a variety of technologies ranging from general tools, such as the Internet (Gupta et al., 2008), to specific applications like mobile banking, e-government services, and digital-learning contexts (Hong et al., 2011; Zhou et al., 2010). These studies demonstrate UTAUT's versatility in evaluating technology adoption across different tasks, including medical diagnosing, income tax filing, and decision-making in technology design (Brown et al., 2010; Chang et al., 2007).

One of UTAUT's strengths lies in its ability to incorporate moderating factors, such as age, gender, experience, and voluntariness. However, many studies have primarily focused on the main effects, with limited exploration of these moderating factors, particularly in non-Western settings like Vietnam (Gupta et al., 2008; Al-Shafi et al., 2009). This lack of empirical evidence restricts the generalizability of UTAUT's constructs and their applicability to rural SMEs (Venkatesh & Zhang, 2010; Im, Hong, & Kang, 2011).

Researchers have extended UTAUT to integrate additional mechanisms and constructs to address contextual and theoretical gaps. For instance, new exogenous mechanisms, such as charismatic leadership, have been shown to enhance performance expectancy and social influence (Nguyen et al.,2023a; Neufeld et al., 2007). Similarly, endogenous mechanisms, like behavioral expectation, have enriched the explanatory power of UTAUT (Venkatesh et al., 2008). Furthermore, moderating mechanisms, including cultural differences (e.g., Korea vs. USA), and organizational-level factors (e.g., facilitating conditions) have been added to account for specific contexts (Park, Lee, & Yi, 2011; Im et al., 2011). These extensions highlight the need to adapt UTAUT to diverse environments, particularly in resource-constrained regions like rural Vietnam.

To summarize the theoretical contributions, Table 1 outlines the focus areas, key constructs, and major studies associated with each model and framework.

| Theory | Focus | Key Constructs | Key Studies |
|---|---|---|---|
| **TRA** | Individual/Customer behavior | Attitude, Subjective Norms | Fishbein & Ajzen (1975); Adrian et al. (2005); Ng (2020); Bagozzi et al. (2000) |
| **TAM** | Individual/Customer | Perceived Usefulness, Perceived | Davis (1989); Taylor & Todd (1995); Pathak et |

| | | | |
|---|---|---|---|
| | behavior | Ease of Use | al. (2019); Surendran (2012); Hewavitharana et al. (2021);Jan, Alshare, & Lane (2022); |
| **TPB** | Individual/Customer behavior | Attitude, Subjective Norms, Perceived Behavioral Control | Ajzen (1991); Salemink et al. (2017); Alam et al. (2020); Li et al. (2022); Sniehotta et al. (2014) |
| **TOE** | Organizational behavior | Technological, Organizational, Environmental Factors | Tornatzky & Fleischer (1990); Lutfi et al. (2022); Sun et al. (2020); Wahab et al. (2021) |
| **UTAUT** | Integrated (Individual & Organizational) | Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions; Behavioral Expectation (endogenous mechanism), Cultural Contexts (moderating mechanisms) | Venkatesh et al. (2003); Alharthi et al. (2024); Hewavitharana et al. (2021);Neufeld et al. (2007); Venkatesh et al. (2008); Park, Lee, & Yi (2011); Gupta et al. (2008); Zhou et al. (2010); Hong et al. (2011); Al-Shafi et al. (2009); Im, Hong, & Kang (2011); Al-Gahtani et al. (2007); Brown et al. (2010); |

Synthesizing TRA, TAM, and TPB insights, UTAUT bridges individual and organizational adoption behaviors, making it particularly relevant for rural SMEs striving for digital transformation. Facilitating conditions, such as resource availability and infrastructure, are particularly impactful in aligning UTAUT with TOE's organizational and environmental dimensions (Tornatzky & Fleischer, 1990). However, researchers have noted UTAUT's limitations in addressing higher-level contextual factors, such as socio-cultural dynamics and regional disparities, which are pivotal in shaping adoption behaviors (Paul & Rosado-Serrano, 2019).

Future research should focus on extending UTAUT through a contextualization approach. This includes exploring new constructs, such as community trust and regional infrastructure challenges, better to understand the interplay between technology adoption and local conditions. Additionally, incorporating cross-level associations and cultural dimensions could further enhance UTAUT's applicability in rural settings (Al-Gahtani et al., 2007; Venkatesh & Zhang, 2010). For example, research on mobile banking and e-government services in rural Vietnam could benefit from examining user behavior across adoption stages (i.e., initial use vs. post-adoptive use) (Zhou et al., 2010; Venkatesh et al., 2008).By adapting UTAUT to these specific contexts, it is possible to create a robust framework that explains adoption behaviors and guides practical interventions. This synthesis underscores the importance of localized research and the need for UTAUT adaptations that align with rural Vietnamese SMEs' socio-economic and cultural realities, fostering both technological integration and sustainable growth.

### 3.5 How These Models Be Reflected in Vietnam's Rural Context?

The adoption and effectiveness of technological frameworks such as TRA, TAM, TPB, TOE, and UTAUT in rural Vietnam depend on addressing the socio-cultural, infrastructural, and behavioral dynamics unique to these regions. These models, developed in predominantly urban or developed contexts, require adaptations to align with rural consumers' preferences, SMEs' capabilities, and the broader community-driven culture of Vietnam's rural areas.

#### 3.5.1 Community-Driven Adoption

In Vietnam, rural consumers' purchasing decisions are heavily influenced by community norms, word-of-mouth (WOM), and social validation. Studies highlight that 58% of rural consumers rely on recommendations from friends, family, and community leaders rather than traditional advertising (Adtima, 2023; Kantar, 2023). This underscores the critical role of trust-building strategies, such as partnerships with local influencers and WOM campaigns, in driving digital adoption. 43% of rural consumers prefer reputable online sellers, and 58% opt for familiar brands, reflecting strong brand loyalty and community-driven trust (Adtima, 2023). Furthermore, 82% express reluctance toward unknown brands, emphasizing the importance of trust-based decision-making (Deloitte, 2023).

Frameworks like TRA and TAM, which emphasize attitudes and subjective norms, can be adapted to include community validation as a key construct. Facilitating conditions from UTAUT ensures that SMEs have access to resources, digital infrastructure, and training to address local demands. Localized content—such as ads in rural dialects or featuring cultural references—has been shown to boost engagement by up to 25% (Asia Foundation, 2021).

Policymakers and SMEs can amplify digital adoption by leveraging community structures, including local leaders and cooperatives. Collaborations with trusted community influencers to endorse digital platforms have proven effective in establishing trust networks and increasing e-commerce adoption (Nguyen et al., 2023a).

Vietnam's reliance on WOM and community recommendations contrasts with urban areas where direct advertising is more impactful. Similar community-based initiatives, such as training programs and cooperatives promoting digital tools, have succeeded in countries like India and Indonesia, adapted to their unique social contexts (Cameron et al., 2019; Deloitte, 2023).

### 3.5.2 Behavioral and Trust Factors

Trust plays a pivotal role in rural Vietnam, where skepticism toward digital platforms often slows adoption. Surveys reveal that 70% of rural consumers prioritize payment security, and 65% value responsive customer service, highlighting concerns such as product authenticity and secure payment systems (Nguyen et al., 2023b). These preferences align with the social influence construct in the UTAUT model, which emphasizes the importance of peer validation and facilitating conditions.

Rural SMEs can leverage UTAUT's facilitating conditions by implementing secure, localized digital tools and creating customer-centric experiences. Leveraging trusted community influencers and local leaders to endorse digital platforms enhances credibility and addresses consumer skepticism (Nguyen et al., 2023b). For example, SMEs using localized advertisements in rural dialects or featuring cultural references have reported increased customer engagement and reduced barriers to digital adoption (Asia Foundation, 2021).Vietnam's e-commerce market, projected to reach USD 40 billion by 2025, presents opportunities for SMEs to integrate trust-centric strategies. By focusing on behavioral and trust-building measures, SMEs can overcome digital hesitancy and foster sustainable digital adoption (Group M, 2024; Statista, 2025).

### 3.5.3 Infrastructure and Digital Literacy

Infrastructure limitations and low digital literacy are significant barriers in rural Vietnam. Studies reveal that 53% of SMEs lack the necessary skills to effectively adopt digital tools, while 45% face connectivity issues (Vietnam Economic Impact Report, 2023). To overcome these barriers, the TOE framework, which addresses technological, organizational, and environmental factors, can guide targeted interventions. This includes investments in community Wi-Fi programs, digital literacy initiatives, and training tailored for rural SMEs. By addressing infrastructure gaps and enhancing technical skills, SMEs can better leverage digital transformation to expand their market reach and operational efficiency.

### 3.5.4 Localized Adaptations of UTAUT

The Unified Theory of Acceptance and Use of Technology (UTAUT) offers a robust framework for understanding technology adoption, particularly through constructs like social influence and facilitating conditions. However, rural Vietnam presents unique socio-cultural dynamics, requiring contextual adaptations to enhance UTAUT's applicability.

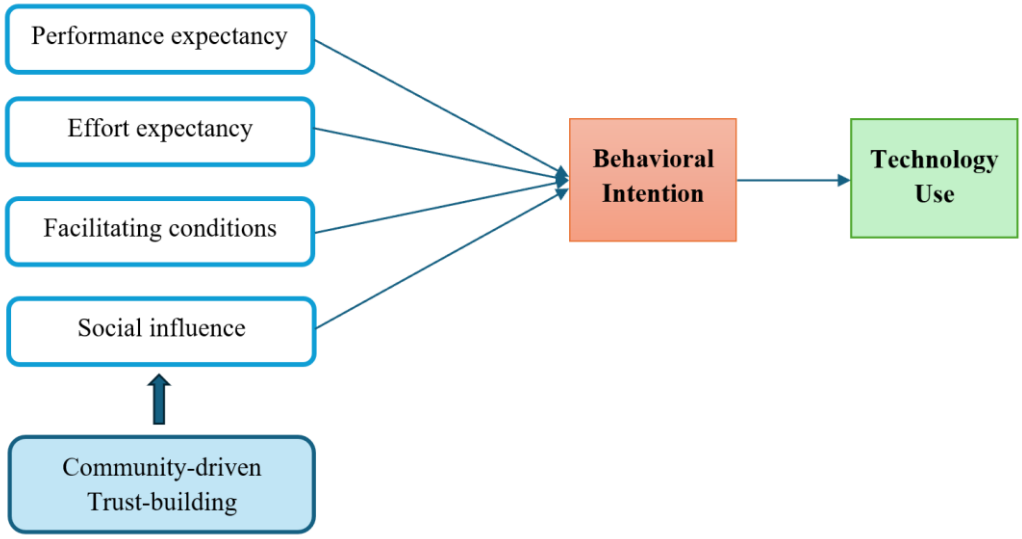
In rural contexts, community-driven trust emerges as a critical factor in technology adoption, complementing UTAUT's social influence construct. Recommendations from local leaders, family, and peers significantly shape perceptions, with word-of-mouth (WOM) and community endorsement outweighing direct advertising. Strategies include:

- Leveraging Local Influencers: Engaging respected community figures to promote digital platforms.
- Peer Validation Mechanisms: Building trust through shared community experiences and endorsements.
- Localized Campaigns: Creating culturally relevant content in regional dialects to foster familiarity and credibility.

These adaptations emphasize community trust as essential for building collective acceptance, aligning with rural Vietnam's reliance on social validation.

For facilitating conditions, trust networks, such as cooperatives, serve as infrastructure. Embedding training within community groups and aligning customer support with local expectations further enhances adoption. Community trust could be a new construct or a moderating factor in UTAUT, amplifying the impact of existing constructs like social influence and facilitating conditions. Tailored strategies ensure UTAUT's relevance in addressing rural adoption

barriers, and fostering sustainable digital transformation. Tailored adaptations, such as localized mobile banking and e-government services, can address distinct adoption stages (initial use vs. sustained engagement), ensuring long-term trust and usability. By embedding community trust into UTAUT, the framework becomes more relevant for rural Vietnam, bridging adoption barriers and promoting sustainable digital transformation.




### 3.5.5 Government Support

According to Nguyen et al, (2023b)A successful digital transformation necessitates significant investment, coordinated efforts, and strategic direction across society. Firstly, at the national level, a unified strategy is crucial to align government agencies, businesses, and individuals under a shared vision. This involves setting objectives, defining responsibilities, and ensuring synchronized implementation, with government support providing infrastructure, policies, and resources for thriving in the digital economy. Secondly, while data sharing and integration are fundamental to advancing digital transformation, the development and utilization of national and private-sector databases in Vietnam remain slow, limiting the potential of digital technologies. Hence, the government should promote the intergration and digitalisation of information system facilitating seamless data exchange to optimize decision-making and drive innovation at both national and private-sector. Thirdly, digital literacy initiatives and tailored training programs for SMEs should also be prioritized to bridge the skills gap and enhance digital adoption. Since education and vocational training reforms are crucial for developing a digitally competent workforce, the government should facilitate the transition from a theory-based education system to practical, technology-driven training that aligns with industry demands. Strengthening digital literacy programs, expanding vocational training opportunities, and promoting university autonomy will equip young people with the essential skills needed to actively participate in and contribute to the digital economy.

### 3.5.6 Vietnam’s rural digital transformation in global context

The study explores the impact of digital transformation on rural SMEs, with a focus on Vietnam, offering insights into the global digital transformation landscape. Vietnam faces challenges common to many developing nations, such as infrastructure limitations and low digital literacy. In response, the Vietnamese government has implemented various initiatives to promote digital transformation, focusing on infrastructure development and digital literacy enhancement, similar to India's Digital India program (G. Narsimulu, 2024). Similarly, in China, the digital divide and skill gaps remain significant obstacles to rural digital adoption. To address these barriers, scholars suggest investing in digital infrastructure, implementing targeted training programs, and fostering technological awareness to encourage positive attitudes toward digital adoption (Hou, 2024). In developed countries, such as the United Kingdom, a survey of 189 rural companies identified broadband capacity constraints, a lack of digital skills within the workforce, and internal resistance to change as the most significant challenges in the digitalization process (Wishart & Roper, 2021). In response, the UK government has undertaken substantial efforts to accelerate digital adoption. By comparing Vietnam's strategies with those of other countries, best practices and innovative solutions can be identified and adapted to diverse contexts, contributing to the sustainable growth of SMEs in rural areas worldwide.

## IV. CONCLUSION AND FUTURE OUTLOOK

This study highlights the pivotal role of digital transformation in fostering sustainable growth for Vietnamese SMEs, with a particular focus on rural areas. It underscores the importance of integrating theoretical frameworks, especially the Unified Theory of Acceptance and Use of Technology (UTAUT), to analyze and address the key factors influencing digital adoption. While UTAUT constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions provide a strong foundation, this research identifies community-driven trust-building as a critical dimension of digital transformation. This dimension emphasizes leveraging local trust networks, such as community leaders and cooperatives, to mitigate skepticism and foster digital engagement.

Significant barriers remain, including infrastructure limitations, low digital literacy, and cultural resistance, which require targeted interventions. Policymakers should prioritize investments in digital infrastructure and literacy programs tailored to rural SMEs. SME leaders are encouraged to adopt trust-building strategies that resonate with local cultural contexts, such as community-driven endorsements and localized campaigns. These approaches align with rural socio-cultural dynamics and have the potential to significantly enhance digital adoption.

Moreover, the scalability of community-driven trust-building strategies offers significant potential for adaptation in other developing countries with similar socio-cultural dynamics. By addressing these localized and systemic challenges, Vietnam can bridge the digital divide, unlock the transformative potential of digital innovation, and drive equitable, sustainable growth in the digital economy.

This study acknowledges certain limitations that require further research. As a literature review, this research does not incorporate primary quantitative data. Instead, it synthesizes a diverse range of secondary data from reputable academic and industry sources to enhance the reliability of its findings. While every effort has been made to ensure objectivity and rigor in data selection and analysis, future studies should incorporate empirical research to validate confirm the interaction between community-driven trust variables and their significance in different contexts. We would explicitly focus on operationalizing community-driven trust-building as either a new construct or a moderating factor within the UTAUT framework. Longitudinal and comparative studies are essential to examine adoption behaviors across rural and urban SMEs, identify disparities in digital readiness, and explore how constructs like community trust can be scaled or adapted for other resource-constrained settings. Investigating emerging technologies, such as artificial intelligence and blockchain, within this localized framework could provide innovative pathways for adoption.

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# EFFECT OF POVERTY AND ECONOMIC GROWTH ON VIETNAM'S HUMAN DEVELOPMENT INDEX IN POST-COVID 19

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**ABSTRACT**

Social sustainability is one of the critical pillars of the global sustainable development framework, ensuring quality of life while promoting equality and social justice. Poverty alleviation and human development require more concern in a VUCA world (Volatile, Uncertain, Complex, and Ambiguous), as a high Human Development Index (HDI) partially reflects the achievement of economic development aimed at advancing human well-being. This study focuses on whether poverty and economic growth affect the human development index (HDI) in Viet Nam during Covid-19 and post Covid-19. By using the panel data from 63 provinces of Viet Nam in the 2019-2021 period., the results documented that poverty has a negative impact on provincial human development index. Moreover, during COVID-19, the higher the economic growth rate of the province the lower is the level of the human development index. Furthermore, there was no causal relationship among the three economic growth, poverty and human development index at the provincial level. These novel findings would help policymakers of sustainable development better understand the role of poverty and economic growth on human development. In addition, the study provided some recommendations to increase provincial human development and improve the human development index of Viet Nam in general.

*Keywords*: "economic growth", "poverty", "HDI", "Vietnam"

## I. INTRODUCTION

Human beings are the center of social sustainability, which means that all of a country's activities must be made for the goal of enhancing their achievements, freedoms, and capabilities. It is the life quality people have that is of intrinsic importance, not the commodities or income that they happen to possess. In the past, economic development traditionally measured by GDP per capita was considered to be of utmost importance to the development of a country. However, this was a poor predictor of social achievements as GDP takes into account material well-being but provides no information on how a country's wealth is converted into basic needs. Thus, based on Amartya Sen's idea of functioning and capabilities (Sen, 1985), in 1990, the United Nations (UN) proposed a protocol to measure a country's overall degree of development. The 1990 UNDP Human Development Report (UNDP,1990) was the first major attempt to rank the levels of human development of nations. It emphasized that development is about freedom, both human choice and participatory process, underscoring the fact that human development, because of its breadth and generality, pertains to all countries. Therefore, the Human Development Index (HDI) constructed of three dimensions including a long and healthy life, knowledge and a decent standard of living was composited by UNDP to reorient the assessment of development levels away from income to more broadly based measures.

In 1990, Viet Nam was categorized in the group of low human development countries with the HDI of only 0.483 (UNDP,1991). In an eight-year time from 1990 to 1998, Vietnam's HDI has continuously increased to reach medium development group with 0.567 in 1998. The upward trend continued despite the outbreak of COVID-19 pandemic. In 2020, the HDI of Viet Nam has increased steadily and recently moved to high development group with a level of 0.706 point (UNDP, 2021). This indicates that human development has always been one of the main concern of Viet Nam government. It has been claimed that the economy of Vietnam is associated with social development, implying that economic growth must be accompanied by social progress with human development as the premise (Nguyen, 2021). The government's spending on human development areas such as health, education and science and technology has been prioritized in recent years, reflected in the increasing trend of investment expenditure (Hoang, 2018). Constantly improving the life quality of people and ensuring social justice are the long-lasting goals of our government even during

the period of the COVID-19 global epidemic.

However, the HDI ranking of Viet Nam still low with 7th place in the region, 119th place in the world. In addition, the growth in the HDI has shown signs of slowing down over the past few years. Meanwhile, during this period, the economic growth rate has decreased significantly along with the growing poverty rate. A question was raised about the link among raising the human development index and other development goals such as economic growth or poverty reduction. The purpose of this paper is to examine the effects of economic growth and poverty in Viet Nam in the context of the COVID-19 pandemic, thereby making policy recommendations to promote economic growth and poverty reduction in order to increase human development index, contributing to the sustainable growth of the country.

The structure of the paper is organized as follows. Section 2 presents the literature review. Section 3 describes the theoretical framework and hypothesis development. Section 4 explains the methodology. Section 5 presents the research results and discussion and section 6 concludes the paper.

## II. LITERATURE REVIEW

### 2.1. Human development and Economic growth

The relationship between human development and economic growth was indicated through the significant correlation between social expenditure ratios and income distribution (Suri et al., 2011). Various studies show that increases in the national income level resulting from economic growth contribute to better human development outcomes. According to Strauss & Thomas (1995), Case et al. (2002), and Haddad et al. (2003), improvements in income result in higher health and educational achievements. At the household level, an increase in income enables families to spend more on food consumption, access to clean water and good hygiene, effective health care and child care arrangements. Whereas greater income, at the community level, will eventually lead to higher quality of health care centers, water and sanitation systems. Meanwhile, Cutler et al. (2005) argue that advances in technology, which results from higher income and education level, contribute to reductions in mortality and improvements in life expectancy. As the flow of health-enhancing knowledge and technology continues to thrive, there are enormous incentives for the development of new drugs and medical treatments. Moreover, people with higher income are prepared to pay more for longer lives and people who live longer are willing to pay more to cure diseases. Empirical research has been conducted to testify the relationship between economic growth and HDI as a measurement of human development with data from Pakistan, Zambia, Indonesia and India by Khan et al. (2018), Chikalipah & Makina (2019), Syofya (2018) and Tilak (1992) respectively. Their results indicate that, in these countries, economic growth patterns and HDI share a correlation.

Although economic growth does affect human development, it is not the only causal factor (Aturupane et al.,1994). This statement was also advocated by Ranis et al. (2000), there is an iterative process between the ultimate objective improvements in human development and economic growth as necessary but not sufficient conditions for achieving such improvements. The research also claimed that economic and social policy tend to focus on achieving favorable preconditions for economic growth and human development must await such economic growth. However, human development is considered to be not only an end-product of the development process but also a means to future economic growth. Therefore, the relationship between economic growth and human development should not be misspecified through the unidirectional view that economic growth simply results in human development improvements as the ultimate goal.

Interestingly, there is an opposite view from the literature of the endogenous theory, with education enhancing incomes and growth, but having no utility value per se with the exceptions of studies by Aghion & Howitt (1998), Blackburn & Cipriani (1998) and Grossman (1972). That education is both a consumer good produced by economic growth and an investment good that enhances future growth has been recognized in an earlier generation of development economists including Bowman & Anderson (1963) and Lewis (1955). As education can substitute for other inputs into economic growth, investments in education are vital to economic growth, but not essential for sustaining economic growth (Lucas, 1988). Each of the components of human development has a distinct impact on economic growth (Ulas & Keskin, 2017; Zhang,2019). The interactive relationship between human development and economic growth was also advocated by Ranis (2004). He further concluded that human development affects growth

when greater freedom and capabilities improve economic performance, while economic growth enhances human development as increased incomes will increase the range of choices and capabilities enjoyed by households and governments.

Aside from this, the two-way causality between human development and economic growth has also been discussed by Morand (2005) who focuses on health and growth, and Baldacci et al. (2008) who take into account the role of education and health spending on education, health, investment, and growth. The result of the latter study indicates that the complete impact of expenditure on education only became apparent after a period of 10 to 15 years whereas the effects of health spending are more immediate. In summary, while human development has long been viewed both as an input into and as an outcome of the development process, the feedback and dual causality between human development and economic growth have not yet been fully taken into account. In Vietnam, little research has been made on the relationship between human development and economic growth specifying its pattern during the period of COVID-19 pandemic.

**2.2. Human Development and Poverty**

Poverty was one of the biggest social problems in the twentieth century and has continued to be so in the twenty-first century (Wagle, 2018). The proportion of the population not able to attain the specified level of expenditure is segregated as poor (Bhagawati, 1988). These basic needs commonly include clean and fresh water, nutrition, health care, education, clothing and shelter. According to Laderchi et al. (2003), several approaches may be taken to poverty measurement such as the monetary approach, capability approach, social exclusion and participatory methods, which will suggest different policy implications for the government. In Viet Nam, there are two parallel approaches to poverty measurement using the national poverty line. The first approach, developed and led by the Ministry of Labor, Invalids, and Social Affairs (MOLISA), is based on income and is used primarily for targeting social programs. The second was developed by the General Statistical Office and the World Bank, is based on consumption and is used chiefly for monitoring poverty over time (Demombynes & Hoang Vu, 2015).

The relationship between poverty and human development has been the main topic of various studies. According to Celemín & Velázquez (2018), deficiencies in access to education, healthcare services, sanitation and quality of housing decrease the level of well-being. Living in such substandard conditions, most of the poor are undernourished, with poor disease resistance, physical and intellectual development. This research also indicates a negative correlation among HDI and poverty (associated with unsatisfied basic needs) with intermediary data collected in Buenos Aires, Argentina. This is also the conclusion of Sen (1995), Singh (2012) and Syofya (2018) who studied the cases of America, India and Indonesia respectively. Singh (2012) also clearly revealed the profound influence of HDI and per capita income on poverty reduction. Furthermore, Arief & Pratiwi (2017) concluded that HDI's indicators have negative relationships and significant effect on poverty reduction statistically.

Poverty prevails everywhere and poverty alleviation has been the main concern of human development. Although eliminating poverty is just one aspect of human progress, poverty and development remain interrelated; one presupposes and challenges the other (Madan, 2012). Hence, it is important to assess the impact and significance of human development on poverty, which has been attempted in a large number of studies in the past in terms of decomposition exercise (Tendulkar & Jain, 1990, Kakwani, 2000, Jain et. al., 2003). According to Kakwani et al. (2000), the development process does not benefit the poor directly, rather the fruits of development received by them remain proportionately less than that of the rich section of the society. This underlines the need for the expansion of economic activities and educational facilities along with their equitable distribution. It can be concluded that to raise the level of human development efforts at a foundational level, not only towards raising economic resources and developmental opportunities but also to ensure their equal distribution should be made (Klugman et al., 2011). Thus, the human development approach has also been considered to contribute significantly to the measurement of poverty and inequality.

**2.3. Economic growth, poverty and HDI in the context of COVID-19**

While it is difficult to tell exactly the economic damage from the global COVID-19 pandemic, it has had severe negative impacts on the global economy. During 2020, the world's collective gross domestic product (GDP) fell by 3.4

percent. To put this number in perspective, global GDP reached 84.54 trillion U.S. dollars in 2020 – meaning that a 3.4 percent drop in economic growth results in over two trillion U.S. dollars of lost economic output (Statista, 2022). Global growth is expected to slump from 5.7 percent in 2021 to 2.9 percent in 2022— significantly lower than 4.1% that was anticipated in January (World Bank, 2022). It is expected to hover around that pace over 2023-24, as the war in Ukraine disrupts activity, investment, and trade in the near term, pent-up demand fades, and fiscal and monetary policy accommodation is withdrawn. As a result of the damage from the pandemic and the war, the level of per capita income in developing economies this year will be nearly 5 percent below its pre-pandemic trend (IMF, 2022).

The result is that the impact of the COVID-19 pandemic is largest for the world's poorest. The COVID-19 pandemic has caused a human development crisis worldwide. It struck in all aspects of human's lives including in health, education and income with the largest contraction of economic activity since the Great Depression. Drops in HDI values were widespread during the Covid-19 pandemic, with over 90 percent of countries suffering a decline in either 2020 or 2021 far exceeding the number that experienced reversals in the wake of the global financial crisis (UNDP, 2021). While most very high Human HDI countries did not suffer declines on the HDI in 2021, the majority of countries in low and medium HDI and high HDI countries did (UNDP, 2022).

Vietnam is included in the medium HDI countries with the rank of 117 in 2019. The HDI of Viet Nam has increased slightly over the years from 0.682 to 0.703 in the period of 2016 - 2019 and remained at that stable rate even in the middle of the COVID-19 pandemic until now (UNDP, 2022). The poverty rate decreased within the same period while there was a decrease in economic growth with the GDP growth rate falling from 7.15% in 2019 to 2.94% in 2020 and 2.58% in 2021. In 2022, Vietnam's economy is expected to grow 8% this year, beating an official target for an expansion of 6.0%-6.5%.

## III. THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

### 3.1. Theoretical framework

#### Neoclassical growth theories

The consumption of goods and services is frequently seen in neoclassical economics as a function of a person's well-being. Furthermore, it is a widely held belief that the sum of individual levels of welfare can be used to calculate the social welfare function that maximizes "the greatest good for the greatest number." Gross domestic product (GDP), which measures all economic activity, takes into account both current consumption and investments that enable future consumption.

However, contemporary neoclassical economics' utilitarian viewpoint has frequently come under harsh criticism for philosophical, empirical, and conceptual reasons. First, on normative grounds, Rawls (1971) contends that people would choose a social welfare function that maximizes the circumstances of the least fortunate member of society if they hide their abilities, wealth, and social standing. Therefore, maximizing an overall utilitarian welfare function may result in unjust outcomes. This adjustment to the welfare function, among other reasons, can help rule out perverse situations where a traditional utilitarian approach would mandate imposing substantial harm on some members of society significantly if this harm results in larger welfare increases for others, even if these are already better off (Kymlicka, 2001). Second, it has been argued that concentrating on just one indicator, such as aggregated consumption, implies incorrectly perfect substitutability between consumption types with normatively different weights. In this view, the attainment of minimal threshold levels in numerous imperfectly substitutable indicators, such as access to food, shelter, democratic rights, and other factors, for all members of society, is the only way to accurately measure well-being (Doyal & Gough, 1991).

#### Endogenous growth theories

Until now, it has been more than a decade that economic theory has acknowledged the effect of education on economic growth. Lucas (1988), in his pioneering endogenous growth model, emphasizes the crucial significance of human capital formation for growth and development in a relatively straightforward manner. However, it is paradoxically ignored in this and subsequent growth models that human capital formation as a source of growth is very literally embodied in people. However, only alive and healthy people can offer effective human capital services. As a result, given the widespread acceptance of human capital formation as a source of growth, it is also necessary to take a

closer look at how changes in population health may affect growth and, by extension, overall welfare.

Grossman (1972) claimed that health has a variety of effects on well-being and economic performance. The positive impact of "good health" on labor productivity is particularly significant from the standpoint of growth. However, resources are needed to provide health care. The expansion of the health sector may promote growth through improved population health, and the contraction of the health sector may also free up resources to promote growth through an increase in human capital accumulation activities. As a result, it appears that there is a direct trade-off between health and human capital accumulation. The asymmetries in the productivity traits of health generation and the accumulation of human capital further complicate this trade-off.

In contrast to human capital accumulation activities, which give rise to technologically advanced activities in which innovations, capital accumulation, and economies of scale result in a cumulative rise in output per man hour, Baumol (1967) uses the health sector as an example of a sector that only permits sporadic increases in productivity because there is no substitute for the personal attention of a physician. This implies that, in terms of the growth model, the production of health services was assumed to be characterized by decreasing returns, whereas the accumulation of human capital is typically modeled using increasing returns. Health directly affects welfare, so it should be included in the utility function next to consumption — at least in Western economies — which is another asymmetry between health and human capital that should be acknowledged in the analysis. Thus, there is a direct trade-off between the resources used in the health sector and the sector producing finished goods.

**New growth theories**

According to new theories of growth, economic development and growth will not reach their full potential and improve without the development of human resources (Barro et al., 1996; Benhabib & Spiegel, 1994; Lucas et al., 1992; Romer, 1994; Stiglitz et al., 2009). Both education and training enhance people's skills and capabilities, placing them at the center of a nation's economic development (Agarwal, 2006)

Economic growth can be coordinated with human development, which is essential. In this way, conventional political measures that argue that advancing human development should wait until economic growth picks up seem to be a mistake. Ramirez et al. (1997) examined the connections between economic growth and human development and identified two implications. Spending on social services and education are important associations that determine the relationship between economic growth and human development. One of those is the relationship between economic growth and human development, and the other is the relationship from human development toward economic growth.

### 3.2. Hypothesis development

**A two-way causal chain of economic growth and human development**

Human development was viewed as the central objective of human activity and economic growth was an important instrument for advancing it (Ranis et al. 2000). Simultaneously, achievements in human development can make a critical contribution to economic growth. This model was then adapted by Suri et al. (2011) with several changes. The biggest change was the replacement of GNP to GDP at one end of the chain. In Suri’s model, foreign and domestic investment, technology and openness were also considered to be important inputs into economic growth. Similarly, the private and public allocation of GDP, the distribution of income, and the effectiveness of human development spending decides how economic growth is converted into human development. In each country, the production function relationship and the strength of these links varies depending on its initial conditions, the policy setting and the changing environment.

**From economic growth to human development**

In the chain from economic growth to human development, the different level of income across households and the allocation of expenditure within households affects their propensity to spend the after-tax income on items that directly promote human development in poor countries. This means that, generally, poor households spend a higher proportion of their incomes on human development items than higher-income ones (Apergis et al., 2022). If a country’s level of poverty is high, it is because either per capita income is low or low expenditure of households on human development. Meanwhile, the spending of households on human development items is strongly affected by the rate of poverty reduction. Additionally, an increase in family income is believed to have positive effects on child schooling,

particularly the enrollment rate of schools (Holme, 2022)

Concerning the government, the distribution of resources to improve human development is a function of overall public sector expenditure, how much of this flows to human development sectors, and how it is allocated within these sectors. This is expressed in three ratios: the public expenditure ratio, the human development allocation ratio, and the human development priority ratio, which is defined as the proportion of total human development-sector expenditure that goes to priority sectors. Some human development expenditures are much more productive in terms of achieving advances in human development than others. For example, basic education, particularly at an early stage of development, is widely acknowledged to have a greater impact on human development than tertiary education (Swanson, 2022). Each of these ratios varies greatly among countries, implying that the same level of GDP may be associated with extremely diverse levels of government spending on human development priorities. The degree of government decentralization influences these three ratios: true decentralization tends to enhance total revenue available (Sohail et al., 2021). It frequently boosts the human development allocation ratio; and almost always improves the human development priority ratios.

**From human development to economic growth**

The second chain starting from human development to economic growth implies that higher levels of human development affects the economy by enhancing people's capabilities and consequently their creativity and productivity. People contribute more to economic growth as they become healthier, better nourished, and educated, while certain key aspects of human development, such as making the lives of the terminally sick tolerable, do not immediately result in greater productivity (Cohen & Flood, 2022). Thus, the health and education of a population are among the key determinants of the composition and growth of output and exports, and form a crucial factor in a system's capacity to borrow foreign technology efficiently (Ma et al., 2022). Greater income equality influenced by improvement in education is also likely to favor higher growth rate (Wienk et al., 2022). Low-income people, as education becomes more broadly based, can be able to seek out economic opportunities. In addition, education may impact per capita income growth via its impact on population growth.

Although high levels of sustained growth can not be guaranteed solely by high rates of saving and investment, there is still a positive relationship between investment and growth, with its strength depending on environmental policies, the quantity and quality of human resources, the availability of technology choices and the flexibility of the institutional framework (Liu et al., 2021). Domestic investment and direct foreign investment are both influenced by a country's degree of human development, notably the workforce's education and skill levels. However, inequalities in economic growth across societies are caused not only by the amount of inputs but also their purpose and effectiveness. Economic policy incentives have a significant impact. Another originates from people's goals and behavioral patterns.

Accordingly, the first hypothesis is:

**Hypothesis H1:** Economic growth has a positive effect on the human development index

According to Angelsen & Wunder (2003), the definition of poverty alleviation is the process by which individuals move above a notional poverty line and reducing poverty results in greater human development. The statement "poverty is both a cause and a consequence of deficiencies in human development" has captured the connection between human development and the reduction of poverty (UNDP, 1991). A serious effort to alleviate poverty, which remains at the top of the development agenda for most countries, will undoubtedly highlight human beings as the main beneficiaries of development.

Adnan et al. (1996) claimed that poverty has given several causes that are related to human development. Firstly, there is a lack of intrinsic human development, which includes poor health, inadequate nutrition, a lack of intellectual and practical skills, and a lack of drive to improve oneself. Secondly, there is a people-resource imbalance, or increased access of the poor to productive assets like land, credit, and other natural resources, which is exacerbated by population growth and natural or man-made disasters. Finally, there are factors that prevent the poor from participating in development, such as structural adjustments. These elements place restrictions on the poor's capacity to develop their skills and market their labor. These lessen the poor's ability to participate in the development process even more. Human development will undoubtedly be enhanced by poverty alleviation that removes restrictions and corrects

imbalances caused by any unintentional negative effects on the poor.

**Hypothesis H2:** Poverty has a negative effect on human development index

## IV. METHODOLOGY

### 4.1. Data

This research used panel data of gross regional domestic product growth rate, poverty rate and the HDI of 63 provinces in Viet Nam from 2019 to 2021 with a total of 189 observations. These are secondary data archived from legitimate sources including the General Statistics Office of Vietnam (GSO), the Ministry of Planning and Investment (MPI), The Ministry of Labor - Invalids and Social Affairs (MOLISA).

Panel data (also known as longitudinal or cross-sectional time-series data) is a dataset in which the behavior of entities is observed across time. There are at least three factors contributing to the geometric growth of panel data studies: (i) data availability, (ii) greater capacity for modeling the complexity of human behavior than a single cross-section or time series data, and (iii) challenging methodology (Hsiao, 2007).

Panel data give the advantage of more accurate inference of model parameters. Panel data usually contain more degrees of freedom and more sample variability than cross-sectional data which may be viewed as a panel with T = 1, or time series data which is a panel with N = 1, hence improving the efficiency of econometric estimates (Hsiao, 1995). Panel data allows control for variables that cannot be observed or measured; or variables that change over time but not across entities. With panel data variables at different levels of analysis can be included which is suitable for multilevel or hierarchical modeling.

From the official websites and publicized documents of the abovementioned sources, the authors used MS Excel software to synthesize observations, then process and classify the collected data. After that, STATA 15 was utilized to process and analyze the data used in solving the research problem.

### 4.2. Model

From the collected datasets, the authors proposed the research model for the research as follow:

$$PHDI = f(GRDP, PPVR)$$

To analyze the dependent relationship of human development index on the economic growth and poverty in 63 provinces of Vietnam, the author uses three econometric models to process panel data including: pooled regression model (Pooled OLS), random effects model (REM) and the fixed effects model (FEM).

With PHDI as the dependent variable, PPVR and GRDP as two independent variables, the general formula for this model is presented as follow:

$$PHDI_{it} = \beta_0 + \beta_1 GRDP_{it} + \beta_2 PPVR_{it} zz + v_{it}$$

(i = 1, 2, …, N and t = 1, 2, …, T)

$$v_{it} = a_i + u_t$$

Where:

$\beta_0$: The unknown intercept for each entity (n entity-specific intercepts);

$\beta_1$, $\beta_2$: The coefficients of GRDP and PPVR;

it: The indices that varies in both space and time;

i: The indices that varies in time, not in space;

$u_t$: An unobservable factor that affects the dependent variable but does not affect the independent variables, satisfying the OLS hypothesis.;

$a_i$:An unobservable factor that does not change over time but can have an impact on the independent variables, thereby affecting the dependent variable.

## V. RESEARCH RESULTS AND DISCUSSION

The panel data consisting of 189 observations of human development index by province, gross regional domestic product and provincial poverty rate were processed by STATA 15. Table 1 shows the regression results of Pooled OLS

model, FEM and REM.

**Table 1. POLS, FEM, REM results**

| Variable | POLS | | FEM | | REM | |
|---|---|---|---|---|---|---|
| | **Coef.** | **P>t** | **Coef.** | **P>t** | **Coef.** | **P>z** |
| GRDP | 0.00007 | 0.912 | -0.0002 | 0.003 | -0.00023 | 0.008 |
| PPVR | -0.00528 | 0.0000 | -0.00043 | 0.000 | -0.0005 | 0.000 |
| _cons | 0.7185 | 0.0000 | 0.69510 | 0.000 | 0.6954 | 0.000 |
| Prob > F | 0.000 | | 0.000 | | 0.000 | |
| R-Squared | 0.4002 | | 0.2352 | | 0.3579 | |
| Obs | 189 | | 189 | | 189 | |

*Source: Authors' calculation with Stata 15*

As can be seen from the results, all of the models have (Prob > F) = 0.000< 0.05, indicating that these models are significant as there is at least one independent variable having an impact on the dependent variable. In the POLS model, only provincial poverty rate (PPVR) has significant influence on HDI as its p-value (0.000) is lower than 0.05. In contrast, despite having positive coefficient, gross regional domestic product (GRDP) with a p-value (0.912) greater than 0.05 shows no effect on HDI.

In the FEM and REM, both of the independent variables (GRDP, PPVR) were proved to have significant impacts on the dependent variable (HDI) with p-values lower than 0.05. Interestingly, in both models, gross regional domestic products (GRDP) was found to be negatively correlated with HDI. The provincial poverty rate (PPVR), as expected, shares a negative correlation with HDI. In all three models, PROV is proven to not have statistical significance on the dependent variable, meaning that it does not have any effect on the provincial human development index. The r-squared of the FEM is the smallest (0.2352) indicating that in this model, GRDP and PPVR can explain 23.52% of the variation in the HDI. Meanwhile, in the POLS model and REM, variance in the HDI is explained at the rate of 40.02% and 35.79% respectively. To select the most appropriate model for the research data, three tests were adapted including the F-test to choose between POLS and FEM, Breusch–Pagan Test to compare POLS and REM and Hausman Test to decide between FEM and REM.

**5.1. Negative impact of economic growth on the human development index**

Interestingly, the result of the model does not comply with hypothesis *H1: Economic growth has a positive effect on the human development index.* Instead, the growth rate of gross regional domestic product (GRDP) was shown to have a negative effect on the HDI with the regression coefficient of -0.0002353. This negative impact was also found in a study by Wang et al. (2018). They further explained that this was due to the fact that this research was conducted using data from Pakistan. Although, in the last few years, this country experienced a rising economic growth, it was among the lowest in access to education and rate of primary schooling completion. Other reasons for this peculiar correlation were believed to be the lack of investment in health and education as well as the shift of production structure from agriculture. Another research conducted with data from Nigeria by Abraham & Ahmed (2011) also presented similar results. The study's findings suggest that while growth-promoting policies might short-term harm human development, long-term equilibrium will be restored by HDI adjusting to correct the equilibrium error. This suggests that macroeconomic policies aimed at achieving sustainable economic growth should be continued because it is believed that it promotes human development.

With reference to the two previous studies, it can be concluded that the negative impact of provincial economic growth on the HDI in Viet Nam in the period of 2019-2021 was due to the COVID-19 pandemic's effect on the economic growth pattern. Due to the heavy impact of the COVID-19 epidemic, industrial production nationwide and most localities decreased rapidly, greatly affecting the ability to fulfill development targets of industry and the whole economy nationwide and locally. The prolonged situation of COVID-19 caused many businesses to go bankrupt, some others have to temporarily suspend their businesses or conduct businesses in moderation due to inefficient business or loss in very difficult business conditions, many of them cannot develop due to the production of non-essential items, and circulation is restricted during the implementation of social distancing. This led to the decrease in economic growth

of almost all provinces of Viet Nam during this period. Meanwhile, the provincial HDI in the majority of provinces continues to rise steadily. Another reason for this negative result might be the lack of investment on human development despite a positive trend in economic growth at provincial level. The below tables list ten provinces with the highest GRDP growth rate in 2019, 2020, 2021 and their HDI rankings from highest to lowest.

Although economic growth was shown to have a negative impact on human development at provincial level, its influence is relatively small with the coefficient of only -0.0002. This is due to the fact that despite decreases in economic growth rate and insufficient investment on human development in some provinces, Viet Nam is still making progress in various aspects of human development. According to the United Nations Development Programme (UNDP), in Viet Nam, all three dimensions of the HDI have been improved significantly since the 1990s. This rate of increase in the HDI has slowed down over the past decade, mainly because Vietnam has become a richer country with life expectancy and education level is relatively high compared to income level. Improvement has also been seen in Vietnam's Gender Inequality Index (GII), which measures the decline in human development due to inequality between men and women.

Moreover, Viet Nam also does well in terms of reducing maternal mortality, increasing girls' schooling, and women's labor force participation, but women's representation in parliament remains low. Therefore, the negative impact of economic growth on the HDI is expected to be short-term due to the disturbances caused by COVID-19. In the long term, economic growth is still believed to have a positive influence, which is a premise for human development and raising the HDI in Vietnam. The long-term positive impact of economic growth on HDI was proven in various previous studies by Tilak (1992), Syofa (2018), Khan et al. (2018) and Chikalipah & Makina (2019). The unexpected results of this research suggest that there may be some other hidden factors that affect the HDI such as political stability, corruption, and governance which can be potential areas that need to be investigated in future studies.

### 5.2. Negative impact of poverty on the human development index

In the case of poverty, the result of the model supported for hypothesis *H2: Poverty has a negative impact on the human development index.* The regression coefficient of the provincial poverty rate (PPVR) is -0.0005 at the significant level of 5% implying a negative influence of poverty on the HDI in Viet Nam from 2019 to 2021. In general, at the province level, poverty has a negative impact on the HDI. These results are compatible with previous studies by Sen (1995), Singh (2012), Pratiwi (2017), Celemín & Velázquez (2018).

Poverty will make people's quality of life uncertain. The poor cannot afford meals with adequate nutrients leading to lack of energy and malnutrition (FRAC, 2017). Moreover, poor people and poor households often take advantage of all that they can exploit to serve the needs of life. As a result, because of immediate needs, they can kill rare animals and directly destroy the environment (Le, 2001). Poverty is also one of the main causes of the increasing crime rate. The poor and unemployed will try to find ways to make a living by engaging in illegal activities such as drug trafficking, fraud and theft. On the other hand, the poor are also the weak ones whose desire to escape poverty has been used by human traffickers to lead them to commit crimes or sell them across the border. In particular, illegal human trafficking is a major problem not only in Vietnam but also in other Southeast Asian countries.

## V. CONCLUSION

Economic growth, poverty and human development are three major development goals of all countries worldwide. Therefore, research on the relationship among these factors is extremely essential, especially during the time that countries are facing heavy losses in all aspects due to the COVID-19 pandemic. The study has provided an overview of research on the effect of economic growth and poverty on the human development index. At the same time, a theoretical framework along with a research model were conducted in order to examine the dependent relationship among these three factors.

During the period of COVID-19 and post COVID-19, the provincial economic growth has a negative effect on the human development index. This was due to the fact that the economic growth rate by province has been seriously influenced by the consequences of the epidemic. Meanwhile, the provincial human development index still continued to rise as progress has been made in all aspects of human development. However, the negative impact of economic growth on human development is considered to be temporary and in the long-term, economic growth will still positively

influence the human development index as proven in various previous studies. Therefore, social development indicators must be used to regularly and strictly regulate the economic growth process. Moreover, it is essential to associate the goals of economic growth and increasing human development index in governmental policies in order to promote the comprehensive development of the country

Poverty has a negative impact on the human development index, which is in line with the conclusions of previous research. The emergence of COVID-19 has slowed down economic development, causing a sharp increase in re-impoverished households in many provinces of Viet Nam. Additionally, COVID-19 has made the gap between the rich and the poor become wider, causing greater disparity among regions. The remote mountainous and ethnic minority areas have to suffer the most from the consequences of the pandemic. This shows that urgent measurements should be taken to enhance socio-economic development in remote areas and ethnic minority areas. At the same time, it is necessary to have policies and plans to financially support and create jobs for the poor, giving them a chance to escape poverty and have a better life.

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# LEGAL AND ECONOMIC IMPLICATIONS OF AI-DRIVEN LABOR MARKET TRANSFORMATIONS: BALANCING DIGITAL INNOVATION AND SUSTAINABILITY IN VIETNAM

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**ABSTRACT**

This study focuses on assessing the rapid and explosive development of Artificial Intelligence (AI) and its impact on Vietnam's labor market, particularly concerning unskilled workers and traditional, low-skilled sectors. To clarify these issues, the author employs documentary research, comparative legal analysis, and policy evaluation. The findings indicate that AI significantly elevates the risk of unemployment in labor-intensive industries characterized by repetitive tasks, while simultaneously exerting pressure to enhance workers' digital competencies. The current legal framework lacks explicit regulations regarding AI-induced labor substitution, which has led to various shortcomings in retraining programs, financial support, and oversight of corporate labor planning and employee welfare.

Drawing on the experiences of several leading countries in AI application, such as Germany, Japan, the United States, South Korea, and Singapore—the study proposes improving relevant legislation, establishing a career-transition support fund, mandating retraining prior to workforce reductions, and enhancing regulatory supervision. These measures aim to safeguard the right to employment, while fostering sustainable and equitable economic development amid the rapid expansion of AI.

*Keywords*: "Artificial Intelligence (AI)", "Labor Market Transformation", "Legal Gaps in Labor Policy", "Retraining and Transition Support", "Sustainable and Equitable Workforce".

## I. INTRODUCTION

### 1.1. Research context

Rapid advances in the Fourth Industrial Revolution (Industry 4.0) and digital transformation have led to substantial negative repercussions for global labor markets, heightening the risk of contract termination due to AI-driven job displacement. According to McKinsey (2021), nearly 400 million workers could be replaced by automation and AI worldwide by 2030, particularly in sectors with repetitive tasks such as manufacturing, logistics, and finance. In Vietnam—a socialist-oriented market economy experiencing rapid growth and deep international integration—the increasing adoption of AI has already resulted in 50,000 job losses in 2022, and forecasts indicate that 1.8 million current positions may vanish by 2028 (JobTest, n.d.).

Despite the urgency of this situation, Vietnam's labor legislation remains imprecise regarding the protection of workers' rights when AI-driven job displacement leads to contract termination. Existing regulations neither define nor address dismissals arising specifically from AI-related technological changes, leaving employer obligations—such as mandatory retraining, severance, or workforce reallocation—unclear. Furthermore, enforcement mechanisms fall short of ensuring effective safeguards, as they lack explicit provisions to mitigate risks before layoffs occur or to guarantee that employers provide adequate support to affected workers. Although Article 35 of the 2013 Constitution of Vietnam reaffirms the right to work as a fundamental right of citizens (National Assembly of the Socialist Republic of Vietnam, 2013), it does not fully account for the unprecedented challenges posed by AI's disruptive capacity. Consequently, current legal frameworks require significant revision and stronger enforcement to protect workers' rights in a rapidly evolving technological landscape.

By contrast, advanced AI-adopting countries such as Japan, Germany, Singapore, and South Korea have introduced comprehensive policies to safeguard workers facing job losses or imminent risks of termination due to automation. These jurisdictions have also adapted their legal frameworks, accordingly, setting practical precedents for Vietnam to

consider. In this context, Vietnam remains in need of more robust legislative reforms and enforcement mechanisms to ensure a balanced approach that both promotes sustainable economic development and preserves workers' rights in the AI era.

### 1.2. Research Questions and Objectives

**Research Objectives**

**RO1**: Critically examine the escalating threat of AI-induced labor replacement in Vietnam, giving particular attention to vulnerable worker groups most at risk of sudden job loss.

**RO2**: Pinpoint and scrutinize urgent legislative gaps in Vietnam's labor laws concerning contract termination due to technological shifts—especially AI—and determine the extent to which these gaps undermine workers' rights.

**RO3**: Draw on actionable insights from nations at the forefront of AI adoption (e.g., Japan, Germany, Singapore, South Korea) to identify decisive policy strategies that protect workers against AI-driven displacement.

**RO4**: Propose robust legal reforms and rigorous enforcement mechanisms to safeguard labor rights, mandate effective retraining, and bolster sustainable economic progress in Vietnam's rapidly evolving AI era.

**Research Questions**

**RQ1**: How does AI intensify the risk of large-scale labor displacement in Vietnam, particularly for low-skilled and unskilled workers, and what are the far-reaching repercussions for the labor market?

**RQ2**: To what degree do Vietnam's current labor regulations address dismissals prompted by AI-driven technological changes, and which policy and legal shortcomings remain unresolved?

**RQ3**: What concrete lessons can Vietnam derive from countries with advanced AI ecosystems to fortify workers' rights and foster comprehensive retraining programs?

**RQ4**: Which legal and policy interventions can most effectively counter AI's adverse impacts, preserve fundamental labor rights, and sustain Vietnam's economic vitality amid accelerating AI adoption?

## II. Material and Methodology

### 2.1. Theoretical foundation

In order to address the aforementioned research questions, this study draws on the following theoretical frameworks to clarify the ways in which artificial intelligence (AI) reshapes labor-market structures and to identify policy interventions that align with both sustainable development and Vietnam's economic competitiveness in the AI era.

**Segmented Labor Market Theory**

This theory maintains that labor markets are composed of distinct segments defined by skill levels, occupations, or social status (Doeringer & Piore, 1971). Positions in higher-tier segments typically require more advanced qualifications, offer higher wages, and provide greater job stability. In contrast, lower-tier segments often involve low-skilled or unskilled labor and are therefore more susceptible to displacement by automation and AI technologies. This theoretical perspective closely aligns with RO1, which seeks to evaluate AI's impact on Vietnam's labor market, by illustrating how AI disproportionately jeopardizes the lower-tier workforce. It also informs RO2, which investigates gaps in existing labor legislation, as such gaps may fail to protect these vulnerable worker segments. In terms of the research questions, RQ1's focus on the effects of AI on low-skilled workers relates directly to the segmentation principle, while RQ2's inquiry into the sufficiency of Vietnam's legal framework draws upon the theory's emphasis on structural labor-market inequalities.

**Equity Theory**

This theory proposes that workers evaluate the fairness of their employment conditions by comparing their inputs, such as effort or expertise, with the outcomes they receive, including wages, benefits, or professional development (Adams, 1965). Within the context of AI-driven labor displacement, this theory helps explain how workers perceive and respond to potential job losses or changes in working conditions, particularly when such changes appear inequitable. This focus on fairness relates strongly to RO3, which examines lessons from developed nations on managing AI-related

job displacement, and to RO4, which involves formulating equitable policy solutions that address the grievances of displaced workers. Equity Theory is similarly pertinent to RQ3, which investigates how various national policies uphold fair labor practices amid AI adoption, and RQ4, which seeks to identify methods for balancing technological advancement with the protection of workers' rights.

**Sustainable Development Theory**

This theory maintains that economic progress should be harmonized with the protection of social rights, including employment (WCED, 1987; United Nations, 2015). In an AI-driven labor context, this principle demands that the pursuit of innovation not undermine job security or workers' welfare. The theory directly relates to RO1 and RO2 by emphasizing the significance of evaluating AI's labor-market repercussions in conjunction with existing legal frameworks, ensuring that worker protections are not sacrificed in the name of economic growth. In accordance with RO4's objective of proposing comprehensive solutions, Sustainable Development Theory supports the formulation of policies that combine AI-driven innovation with robust labor protections. In addressing RQ1 and RQ2, the theory highlights the necessity of reconciling economic imperatives with the social imperative of safeguarding fundamental labor rights. RQ4 also draws on this perspective in exploring how Vietnam might balance AI adoption with sustainable labor practices that ensure both productivity and worker well-being.

**Corporate Social Responsibility (CSR)**

This theory posits that firms have duties beyond profit generation, including ethical obligations toward their workforce (Adams, 1965; Doeringer & Piore, 1971). In an environment where AI threatens to displace workers, CSR calls for businesses to provide retraining, placement assistance, or fair compensation. This theoretical lens helps address RO3, which seeks to derive actionable insights from international best practices, and RO4, which requires the development of policy measures that incentivize corporate accountability in mitigating the adverse social impacts of AI. From a research-question standpoint, RQ3 looks to CSR-oriented models in advanced AI-adopting countries to discern effective ways of safeguarding labor rights, while RQ4 underscores the importance of aligning technological progress with ethical business conduct that maintains worker protections.

In synthesizing these four theoretical perspectives—Segmented Labor Market Theory, Equity Theory, Sustainable Development Theory, and CSR Theory—the study creates a comprehensive framework to examine RO1 through RO4 and RQ1 through RQ4. The interplay of these theories facilitates a deeper understanding of how AI disrupts labor market structures, how workers perceive fairness amid potential job loss, how sustainability principles must guide legislation, and how corporate entities share responsibility for safeguarding workers' rights. By drawing on these intersecting viewpoints, the research provides a nuanced foundation for assessing current legal shortcomings and for developing strategies to ensure that AI adoption in Vietnam promotes economic advancement without undermining the welfare and rights of the labor force.

### 2.2. Research Methodology

To address the study's research objectives (RO1–RO4) and research questions (RQ1–RQ4), this research adopts a multi-method approach comprising documentary research, qualitative inquiry, policy analysis, and comparative legal analysis. These methods collectively facilitate an in-depth understanding of AI's influence on Vietnam's labor market and the formulation of policy interventions that uphold sustainable development and protect workers' rights.

**Documentary Research Method**

This component underpins RO1 (evaluating AI's impact on Vietnam's labor market) and RO2 (identifying legal gaps) by systematically gathering and examining secondary data from authoritative sources, including academic publications, legal documents, and governmental or international organization reports. Principal data were drawn from the Ministry of Labor, War Invalids, and Social Affairs (MOLISA), the General Statistics Office of Vietnam, and the International Labour Organization (ILO). Through this documentation, the study addresses RQ1 (assessing AI's effect on vulnerable workers) and RQ2 (analyzing the efficacy of current legal frameworks) by elucidating the ways AI reshapes job structures and highlights areas in which existing regulations may be inadequate. In addition, the study references policy insights from jurisdictions such as Japan, Germany, and Singapore, which directly inform RO3 (drawing lessons from developed nations) and RQ3 (identifying international best practices for safeguarding

employment).

**Qualitative Research Method**

In-depth interviews and content analysis were employed to gain expert perspectives on AI-driven changes in the workforce, thus reinforcing RO1 (evaluating labor-market implications) and offering practical insights toward RO3 (drawing international lessons). This approach clarifies the specific legal challenges confronting Vietnamese workers (RQ1) and illuminates deficiencies in the labor policy framework (RQ2). By investigating expert recommendations, the study also addresses RQ4 (balancing AI adoption and labor rights) and supplies preliminary input for RO4 (proposing policy solutions) by identifying how targeted legal or institutional adjustments could better protect workers while maintaining economic competitiveness.

**Policy Analysis Method**

Policy analysis plays a vital role in assessing RO2 (determining legal gaps) and RO4 (developing policy remedies to limit AI's adverse outcomes). By systematically examining existing labor legislation, particularly regarding job security and the right to retraining when faced with AI-induced changes, the research aligns with RQ2 (evaluating the sufficiency of current laws) and pinpoints areas for revision or expansion. The method further responds to RQ4 (balancing AI-based innovation with labor rights) by formulating evidence-based proposals that integrate international best practices with Vietnam's specific legal context, ultimately contributing to sustainable economic development.

**Comparative Legal Analysis**

A comparative legal lens strengthens RO3 (extracting lessons from other jurisdictions) by examining how countries such as Japan, Germany, and Singapore approach AI-related labor issues. This cross-national perspective informs RQ3 (learning from advanced AI-adopting nations) and clarifies which legal mechanisms effectively mitigate job displacement risks or hold employers accountable for retraining obligations. By comparing these frameworks, the study refines policy proposals aimed at addressing RQ4 (balancing economic development with worker protections) and thereby provides insights tailored to Vietnam's socio-legal context.

Through this integrated methodology—encompassing documentary research, qualitative inquiry, policy analysis, and comparative legal analysis—the study synthesizes robust data sources, expert perspectives, and cross-jurisdictional policy lessons. The resultant findings not only illuminate AI's immediate labor-market impacts but also facilitate the development of targeted legal reforms and institutional strategies that protect workers' rights while bolstering Vietnam's economic resilience.

## III. RESULTS AND DISCUSSION

### 3.1 The Impact of Artificial Intelligence (AI) on Vietnam's Labor Market

Artificial Intelligence (AI) is exerting a profound influence on Vietnam's labor market, particularly within the ongoing process of digital transformation and the broadening application of technological innovations. Industries that rely heavily on low-skilled labor—such as textiles, processing, transportation, and assembly manufacturing—are among the most exposed to AI-driven automation. According to a report by the International Labour Organization (ILO, 2021), approximately 70% of workers in these industries in Vietnam may be replaced by automated systems and AI within the next ten years. Repetitive, low-complexity, or low-creativity tasks are especially vulnerable.

For instance, a study by THT Textile (2021) indicates that the textile industry, which contributes 15% of Vietnam's GDP and employs nearly 3 million workers, has experienced workforce reductions of up to 30% in several large factories located in Bình Dương and Đồng Nai due to automation. Automated systems have taken over repetitive tasks such as sewing and fabric cutting, while also performing more precise quality checks. Although these technological advances enhance productivity and lower production costs for enterprises, they simultaneously force substantial numbers of low-skilled laborers into unemployment.

AI's impact also extends beyond immediate job losses; it reshapes the skill profiles required by future labor markets. Specifically, prospective jobs demand workers capable of operating and managing automated systems, equipped with digital competencies, and adaptable to rapid technological evolutions. This shift imposes considerable pressure on low-skilled laborers, who frequently lack access to training programs focused on digital or technical skills.

Furthermore, the proliferation of AI in the workforce has induced clear labor-market segmentation. Highly skilled workers, those specializing in AI programming, big data analytics, or automated system design, reap significant benefits from heightened industry demand. Conversely, low-skilled employees and individuals without specialized capabilities face the greatest likelihood of adverse outcomes, exacerbating income disparities and limiting career progression.

### 3.2. Legal Gaps in Vietnam's Labor Code Regarding AI-Induced Workforce Reductions

The 2019 Labor Code provides overarching guidance on terminating labor contracts in cases of structural or technological change (Articles 42 and 44). However, it lacks specificity concerning circumstances under which AI replaces human workers, thereby creating significant legal voids.

**Ambiguities Surrounding "Technological Changes"**

Although the Labor Code classifies "technological changes" as including new production processes, machinery, equipment, and technologies, it does not clarify whether the substitution of human labor by AI or automation constitutes such a change. This omission leaves room for employers to reduce their workforce without adequate safeguards. According to a 2022 report by the Vietnam Chamber of Commerce and Industry (VCCI), more than 60,000 manufacturing workers lost their jobs due to the adoption of robots and AI. One electronics assembly firm in Bắc Ninh replaced over 1,500 employees with automated production lines in 2021, yet did not introduce a labor reallocation plan or any career transition support.

**Lack of Retraining and Skill-Development Provisions**

While the Labor Code requires employers to provide severance compensation (Article 44), it does not impose any obligation for retraining or upskilling. This regulatory gap disproportionately impacts low-skilled workers, who lack the qualifications needed to thrive in an evolving labor market. In the textile sector alone, data from the Vietnam Textile and Apparel Association (VITAS, 2022) show that approximately 38,000 workers lost their jobs due to automation. Only 10% benefitted from retraining support, while the remainder faced protracted unemployment due to insufficient technical skills.

**Inadequate Enforcement and Oversight Mechanisms**

The Labor Code mandates that enterprises develop labor utilization plans when implementing technological changes (Article 42), yet compliance remains superficial. Many businesses merely issue formalized layoff announcements without offering any tangible support for affected workers. A 2022 report by the Vietnam General Confederation of Labor notes that only 20% of surveyed enterprises met the requirement to submit labor utilization plans; the rest either ignored the provision or fulfilled it in a perfunctory manner, leaving workers unprotected.

**Absence of a Labor Transition Fund for Displaced Workers**

Vietnam's legal framework lacks any provision for establishing a labor transition fund to assist workers displaced by AI and automation. In the absence of financial aid or retraining opportunities, these workers often endure prolonged joblessness and economic instability. By contrast, countries such as Germany and Japan maintain robust labor transition funds. In Germany, a Labor Transition Fund—financed by corporate and government contributions—enables laid-off employees to pursue vocational training free of charge. Consequently, approximately 65% of displaced workers successfully transitioned into new roles within 12 months. According to a 2022 report by the International Labour Organization (ILO), without similar retraining initiatives, 40% of employees in Vietnam's manufacturing and service sectors risk being pushed out of the labor market over the next five years as AI's capabilities expand.

In summary, Vietnam's labor laws lack clarity on defining AI-driven workforce reductions as "technological changes," do not mandate retraining or skill development, exhibit weak oversight mechanisms, and fail to provide a transition fund for displaced employees. These legal omissions render many workers vulnerable to adverse labor-market shifts, highlighting the need for targeted reforms to protect workers' rights and ensure an equitable, resilient labor market under ongoing AI-driven advancements.

### 3.3. International Experiences in Safeguarding Employment Amid AI Development

**Germany: Establishing and Operating Labor Transition Funds**

Germany has pioneered a mandatory "Labor Transition Fund" to support workers affected by automation and AI.

This fund obliges businesses to contribute alongside government financial assistance, thereby funding retraining programs and facilitating the transition of displaced workers into new roles. When companies introduce AI or automated systems resulting in workforce reductions, they must submit labor utilization plans and make contributions to the training fund. The German government, acting as a mediator, collaborates with vocational institutions to offer free or subsidized courses focused on digital skills, system maintenance, and high-tech operations.

According to a report by the Federal Ministry of Labour and Social Affairs (BMAS, 2022), over 65% of workers displaced by automation found new employment within 12 months through this initiative. A salient example is Germany's automotive industry—its most automated sector—where thousands of workers successfully transitioned into maintenance technician and AI operations supervisor positions.

**Japan: Implementing New Skill Training Programs**

Japan enforces a policy under which enterprises must offer skill training programs to workers prior to downsizing for technological reasons, grounded in the principle of "human development." Employers are required to draw up training plans and promptly inform employees of skill-development opportunities. To support this initiative, the Japanese government has introduced programs such as "Skills for the Future," emphasizing information technology, AI system management, and automated machinery operation. The HelloWork system, a public employment agency, matches retrained workers with companies seeking specialized personnel. For instance, in electronics manufacturing, large entities like Toyota and Panasonic combine production-line automation with in-house training initiatives, enabling employees to transition into roles such as maintenance technicians or automated system supervisors. This proactive approach has kept the unemployment rate for workers replaced by AI below 3% (Ministry of Health, Labour and Welfare, n.d.).

**United States: Implementing the Trade Adjustment Assistance Program (TAA)**

The United States employs the "Trade Adjustment Assistance" (TAA) program to assist workers adversely affected by globalization and automation. TAA integrates financial assistance, vocational training, and job search services. Displaced workers receive unemployment benefits during enrollment in training programs tailored to high-demand fields such as information technology, digital engineering, and automated system maintenance. Local employment service centers then provide counseling and connect these workers with prospective employers. According to a 2020 report by the U.S. Department of Labor, 75% of TAA participants found new jobs, and over 50% secured wages equal to or exceeding their previous earnings. Detroit, where the automotive sector has seen significant AI-driven changes, illustrates TAA's effectiveness: it has retrained thousands of workers, enabling them to assume roles as industrial robot operators and technicians.

**South Korea: Early Notification and Digital Skill Training**

South Korea has enacted legal provisions compelling businesses to inform workers in advance of planned technological adjustments and associated staff cuts. Additionally, companies must provide appropriate compensation and introduce measures to support affected employees. Concurrently, the government has rolled out digital skill training programs, notably "K-Digital Training," which target programming, data analytics, AI management, and system operations. These courses receive governmental subsidies, and collaboration between enterprises and educational institutions is strongly encouraged to ensure the relevance of short-term training. In shipbuilding and steel, for example, many workers have been retrained to serve as automated systems engineers or maintenance specialists, allowing them to adapt to newly introduced production technologies (MOEL, 2021).

**Singapore: Implementing the SkillsFuture Initiative**

Singapore's national "SkillsFuture" initiative advances the objectives of lifelong learning and workforce skill enhancement, particularly in response to rapid AI and automation developments. The policy encompasses two major components: financial support for workers and the design of training programs aligned with industry needs. The government provides SGD 500 to SGD 1,000 in credits to citizens aged 25 and older, enabling them to enroll in vocational courses focusing on data analytics, AI operations, and digital transformation. To ensure program relevance, Singapore also fosters partnerships between businesses and educational institutions. In the hospitality and finance sectors, for example, employees replaced by AI systems can retrain for positions involving smart systems management

or higher-value customer service (SkillsFuture Singapore, 2022).

**Lessons and Implications**

Countries such as Germany, Japan, the United States, South Korea, and Singapore exemplify how coordinated efforts between the corporate sector and government agencies can effectively safeguard workers in the face of AI-induced disruptions. Policies like labor transition funds, skill-development initiatives, and financial support systems not only enable displaced workers to shift into new professions but also foster labor-market stability and sustainable economic development in the context of rapid technological progress.

### 3.4 Recommendations for Improving Vietnam's Labor Law and Enhancing Implementation Effectiveness

**Amend and Supplement Labor Law Provisions on Termination Due to AI Replacement**

Articles 42 and 44 of the 2019 Labor Code reference structural or technological changes as legitimate grounds for contract termination, yet they omit explicit guidance on cases in which AI directly displaces human workers. This omission risks leaving workers unprotected against abrupt job loss. To address this deficiency, the Labor Code should explicitly define AI-induced labor substitution as a technological change, for instance:

"*Technological changes include replacing workers with artificial intelligence (AI), automated systems, or other emerging technologies that result in reduced labor demand.*"

A phased approach to implementation is recommended:

Short-Term Phase (2024–2025). The Ministry of Labor, Invalids, and Social Affairs (MOLISA) conducts a comprehensive review of relevant legal provisions, identifies specific gaps related to AI-induced workforce reductions, and consults stakeholders—ranging from labor unions to industry experts—prior to drafting amendments.

Medium-Term Phase (2025–2026). Revised or supplemental legal instruments explicitly delineate employer obligations when adopting AI, mandating labor utilization plans, retraining initiatives, and appropriate compensation. Pilot projects within AI-intensive sectors (e.g., textiles, electronics, logistics) will inform final policy designs.

Long-Term Phase (Post-2026). Once formally adopted nationwide, local labor authorities are charged with monitoring and reporting on policy compliance. For example, an electronics firm reducing its workforce due to automation would be legally required to submit a justification, outlining retraining or reallocation plans, as well as compensation packages, for thorough review and approval.

**Establish a Mandatory Retraining and Reskilling Mechanism**

Protecting the right to work in an AI-centric labor market necessitates a legal mandate for businesses to provide retraining prior to terminating contracts. Article 44 should thus be refined to stipulate:

*"Businesses must organize retraining or career-transition programs for workers at least six months before terminating labor contracts due to technological changes."*

Implementation should proceed incrementally:

Phase One: Regulatory Development (2024). The government issues detailed guidance on the content, duration, and desired outcomes of retraining initiatives, while encouraging collaboration with vocational training institutions and industry professionals.

Phase Two: Pilot Implementation (2025–2026). Pilot retraining programs in AI-intensive industries receive partial financial support from a state vocational fund. Rigorous monitoring and evaluation identify best practices and areas requiring improvement.

Phase Three: Nationwide Rollout (Post-2026). The requirement becomes mandatory nationwide, accompanied by industry-specific training centers co-managed by government agencies and private enterprises. As an illustration, logistics workers displaced by AI could transition to roles operating or maintaining automated warehouse systems.

**Establish a Vocational Transition Fund**

A vocational transition fund is crucial to buffering workers against AI-driven job displacement. Three principal funding sources are envisioned: (i) mandatory business contributions (e.g., 1–2% of annual revenue when workforce reductions stem from AI), (ii) seed capital from the state budget, and (iii) voluntary donations from NGOs or

international programs. The fund would finance both retraining opportunities and financial assistance:

(2024–2025). Legal foundations and governance structures are developed, informed by proven models (e.g., Germany, Japan).

(2025–2026). Initial implementation targets high-displacement industries, providing subsidized retraining for displaced workers.

(Post-2026). Comprehensive nationwide enforcement begins, managed by MOLISA and local labor agencies. For instance, an automobile firm automating production would allocate contributions to the fund, which would then support retraining in AI operations for affected employees.

**Strengthen Monitoring and Impose Rigorous Sanctions on Non-Compliant Businesses**

Effective worker protection hinges on proactive monitoring and decisive penalties for businesses failing to meet statutory obligations, such as notification requirements, retraining mandates, or adequate compensation. Firms committing significant violations could face fines ranging from 50–100 million VND or 5–10% of annual revenue. This approach relies on a two-phase timeline:

Phase One: Regulatory Amendments (2024). Updated decrees clarify specific violations, establish fines, and outline enforcement procedures, thus deterring non-compliance.

Phase Two: Enhanced Labor Inspections (2025). Labor inspection agencies receive increased resources, authority, and specialized training. In practice, a company in Bình Dương found to have dismissed 500 workers without a retraining plan would be compelled to implement corrective measures and could be subject to a fine proportional to its annual revenue.

**Develop a National Strategy for Lifelong Learning and Digital Skills Development**

Finally, Vietnam must adopt a national framework for lifelong learning that endows workers with the digital and technological competencies essential in an AI-driven economy. Training credits can encourage workers to enroll in short-term programs—delivered online or face to face—in areas such as AI operations, digital analytics, or automated system maintenance.

(2024–2025). Government bodies collaborate with educational institutions to devise relevant curricula addressing digital skills, AI system administration, and broader automation technologies.

(Post-2026). Implementation scales up across the country, supported by both public and private funding. For example, hospitality workers could receive partial government sponsorship to undertake short courses in AI-based customer service applications.

Taken collectively, these five initiatives form a coordinated policy framework designed to uphold workers' rights amid AI-induced transformations. By strengthening legislation, mandating retraining, offering financial safety nets, deploying robust enforcement, and fostering continuous skill development, Vietnam can advance an equitable and resilient labor market in the face of rapid technological change.

## IV. CONCLUSION

Amid rapid advancements in artificial intelligence, Vietnam faces not only significant economic prospects but also profound labor-market challenges, particularly for low-skilled and unskilled workers. The existing legal framework lacks the specificity and comprehensiveness required to secure the right to employment in an era of swift AI adoption. Examining international experiences—such as creating labor transition funds and implementing systematic retraining policies—can inform the development of a more flexible and equitable labor system. Measures including legislative reform, rigorous sanctions against noncompliant businesses, and the promotion of lifelong learning strategies not only enhance worker protection but also foster sustainable development and bolster Vietnam's competitive edge in an AI-driven global economy.

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# AN APPROACH TO BALANCE THE INTERESTS OF COPYRIGHT HOLDERS AND ARTIFICIAL INTELLIGENCE DEVELOPERS

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**ABSTRACT**

Artificial Intelligence (AI) has been emerging as a unique phenomenon in society. Today, AI has been penetrated into many fields: natural and social science, academic studies and daily activities. While it is undeniable that AI technology brings several benefits to society, one of the concerns it creates is copyright issues. AI developers use machine learning algorithms to train AI models, which exploit an enormous amount of input datasets. In the case that such data are copyrighted works, the question is whether AI developers are responsible for paying for that use. There are two kinds of arguments: for and against imposing copyright liability on AI providers. The point is that both reveal shortcomings that would result in unjustified effects. This article's purpose is to look for a balancing approach to solve this copyright dilemma, which can help rightsholders remain their legitimate interests on the one hand and still encourage the development of AI technology for the public benefit on the other.

*Keywords*: "AI", "Artificial intelligence", "balancing interests", "copyright"

## I. INTRODUCTION

Artificial Intelligence (AI) is currently developing rapidly and bringing great benefits to many fields, from natural to social sciences, from academic research to practical activities. However, copyright issues are emerging as one of the most controversial topics in the field of AI development. Specifically, AI applies machine learning techniques that require enormous datasets to train AI models. Several documents in these datasets are copyrighted works. The question is whether AI developers are required to ask permission from and pay royalties to copyright holders for this use. This is a puzzle for policy makers. It creates a dilemma in the field of copyright and AI, which is not easy to solve. In principle, using works must comply with copyright provisions. However, given the characteristic of machine learning techniques that demand innumerable amount of datasets to train AI, imposing copyright liability will create a big challenge for AI developers to overcome. This approach would be detrimental to the advancement of novel technologies.

Recently, a series of lawsuits against the use of AI training data filed in the US further reflects this challenge. [1] AI developers have lamented that imposing copyright liability on AI development would be a fatal blow to this field, thereby threatening the development of AI (Blake Brittain, 2023). This comment is not an exaggeration because, as in the Complaint filed by The New York Times, billions of parameters have been used to train AI (The New York Times's Complaint, paragraph 2). Of course, not all documents in datasets are copyrighted. But imagine, even if only 10-20% of the billions of documents used are copyrighted, for which AI developers are required to pay, it would be a huge financial burden for them. Even if the AI developer finds a way to minimize costs somehow, for example negotiating to buy access to the entire package of documents from each copyright holder, the scenario could not be much better. It is because the required data sources are not only in a handful of content providers but can be scattered everywhere. Furthermore, because copyright is automatically protected, regardless of registration, copyright holders can be any ordinary internet user. As a result, package licenses are not feasible. In addition, the mechanism for requesting permission to use copyrighted works is cumbersome and inefficient.

However, if AI developers are freed from copyright responsibility for the data they use, it would not be justified because AI can now create products that directly compete with authors' works. AI painters might be competitors to artists. AI writers would be a threat to screenwriters. AI news aggregators could directly take jobs from traditional

[1] For example, Authors Guild et al v. OpenAI Inc. et al (September 19, 2023), Chabon v. OpenAI, Inc. (September 8, 2023), Walters v. OpenAI LLC (July 14, 2023), Silverman, et al v. OpenAI Inc. (July 7, 2023), Tremblay v. OpenAI Inc. (June 28, 2023), Getty Images (US), Inc. v. Stability AI, Inc. (October 7, 2023), and The New York Times v. Microsoft et al (December 27, 2023).

journalism. Therefore, it is unfair for copyright owners whose works are freely exploited by AI developers to create works that directly compete with them. In fact, AI providers are currently making a fortune from the AI models they develop.

In short, the traditional copyright regime is in a crisis due to the emergence of AI. This dilemma needs to be resolved by a mechanism that ensures the harmonious interests of all parties. Copyright policies need to have an approach that maintains the interests of copyright owners on the one hand, while still encouraging the development of science and technology, specifically the field of AI, on the other. This also reflects the principle of balancing interests in copyright: balancing the interests of the right holder and the public interest.

## II. LITERATURE REVIEW, THEORETICAL FOUNDATION, AND METHODOLOGY

### 2.1. Literature review

There are currently two arguments, for and against, on the issue of imposing copyright liability on AI training data.

The opposing argument is represented by Sag (2012). Sag (2012) proposes the concept of non-expressive use and argues that the use of AI training data is the use of non-expressive elements, namely, elements that are not protected by copyright. Sag's argument comes from the idea/expression dichotomy, according to which copyright protection only applies to expressions and does not extend to ideas. Sag argues that the way to use data to train AI is only to use ideas, not expressions. Because machine learning is the process that trainers provide input data to AI models, these models will find common patterns in the data and learn from them, then produce human-styled works. Patterns are ideas, not expressions. Sag therefore insists that the use of this data falls within the scope of fair use under Section 107 of the Copyright Act of the US. Further developing Sag's view are the studies of Jenny Quang (2021) and Thomas Margoni & Martin Kretschmer (2022). Both studies argue that because the elements used by AI are ideas but not expressions, this use does not fall within the scope of copyright protection. In other words, the use of AI training works is not subject to copyright. This approach is essentially to eliminate all risks of copyright liability for AI training. It is because the fair use doctrine is full of uncertainties. Courts observing this issue has arrived at contradictory findings. By arguing that AI training should be excluded from copyright, such risks would also be eliminated.

Conversely, some commentators argue that excluding copyright liability for the use of AI training data is unjustified. Grimmelmann (2016) notes that US judicial history has always treated robotic reading as non-expressive use, thus machinery reading is viewed fair use while human reading is subject to copyright. However, Grimmelmann (2016, p. 674-681) opposes this view in the field of AI because he worries that the bias towards AI could lead to consequences that are not beneficial to the future of humanity. Sobel (2017) argues that viewing the use of AI training data as fair use could result in a crisis in copyright. In his view, the purpose of fair use is to secure the public interest. In other words, fair use is only for the majority of readers to encourage learning. However, applying fair use to machine learning could urge the opposite result: the beneficiaries of fair use are a few big techs while the majority of creators are harmed. The reason is that giant companies like Google and Microsoft are the main AI developers, and they exploit big data on their platforms on the internet where each user can be a creator whose copyrighted works are exploited by AI providers without asking for permission or paying a single penny. The approach that grants fair use to the AI provider would reverse the familiar narrative of the fair use doctrine.

The above studies have revealed that both the support and opposition to imposing copyright liability on AI training could create adverse consequences. Prioitizing AI will be unfair to the author. Conversely, supporting the author is a threat to the development of AI, therefore the community cannot enjoy the benefits brought by novel technology. Hence, a fair approach for both is necessary.

### 2.2. Theoretical foundation for research

#### 2.2.1 Theory of public goods

Gordon (1982) makes an insight analysis of intellectual property's nature to insist that creations bear public goods' characteristics including non-rivalry and non-excludability. First, non-rivalry of works is shown in the perspective in which one person's use of the work is not a barrier for other people's exploiting this work simultaneously. In other words, the number of people who can access the same work is unlimited at the same time. Especially, unlike tangible goods, the more people use the work, the more value increases. Non-excludability of works makes it very difficult to

exclude someone from using the work. The cost for this exclusion would be very expensive. Both characteristics raise the free-rider problem in the copyright field, which is a big challenge to copyright policymakers.

The public good nature of works has a great influence on the design of copyright. An effective copyright regime must take into account the social attribute of intellectual goods. Specifically, the scope and level of copyright protection should not be limited because of the impossibility of eliminating social access to works. Further, from the economic perspective, given that the marginal cost of copying an additional unit of intellectual goods is almost zero, together the fact that the work's value do not decrease in spite of how many people use it, imposing an excessive level of copyright protection would make the copyright regime unreasonable and ineffective. Indeed, in a copyright regime that is too strict, people will tend to free-rider the work, thereby making copyright enforcement more difficult.

#### 2.2.2. Principle of balancing copyright holders' interest and the public good

The principle of balancing interests in copyright law is official acknowledged in the preamble to the World Intellectual Property Organization (WIPO) Copyright Treaty*:*

"Recognizing the need to maintain a balance between the rights of authors and the larger public interest, particularly education, research and access to Information, as reflected in the Berne Convention."

The principle holds that the copyright mechanism must secure both individual interest and social benefit. This comes from the duality of intellectual property. Because creative activities are inherited. That is, any creative work is based on previously existing ideas. Therefore, the work always contains two characteristics: social cumulation and individual creativity. The copyright protection mechanism should reflect this duality. The two popular copyright systems in the world are the Civil law, typically France, and the Common law represented by England and the US. The copyright laws of France and continental European countries adopt the natural rights approach. Specifically, the French copyright philosophy is the personality theory, developed from John Locke's labor desert doctrine. Accordingly, the purpose of copyright law is to protect the rights of the author himself because the work is the creator's brainchild. In contrast, the Anglo-American copyright law system, from the Statute of Anne in England to the Copyright Clause in the US Constitution, demonstrates a utilitarian approach. The ultimate purpose of the copyright laws in these countries is not primarily for the author's interest but to promote the public good. In other words, if the French copyright model prioritizes personal interests, in the American copyright model, the social value holds a central stage.

However, according to Carla Hess (2002), both these systems demonstrate a hybrid approach. French and Anglo-American copyright regimes are restricted within a limited time and scope of protection. It is not to mention the exceptions provided by both. Evidentially, any system must take into account the dualistic nature of intellectual property. An effective copyright regime needs to balance individual interests and social benefits.

### 2.3. Methodology

The study applies the following research methods:

First is the theoretical research method. The article conducts research on copyright theories and scientific research of scholars to draw out reasonable factors to support and develop the thesis and research results.

The second method is to analyze and compare legal provisions and case law. The article analyzes legal regulations and precedents of two systems of Civil law, represented by France and the European Union, and Common law, represented by England and the US to clarify the similarities and differences of these systems as a basis for proposals.

## III. RESULT AND DISCUSSION

### 3.1. AI and machine learning

Stryker and Kavlakoglu (2024) define AI as "technology that enables computers and machines to simulate human learning, comprehension, problem solving, decision making, creativity and autonomy." Thus, AI is considered an entity created to simulate human creative activities with the purpose of generating human-styled products. Just like a child, AI needs to be "taught" to be able to perform creativity. AI training is done through machine learning techniques. Machine learning simulates the way humans learn. Particularly, a vast number of datasets are needed to train AI models. AI models will search for common points and patterns among data, then remember them, thereby producing new information and content. There are many types of machine learning algorithms, among which the neural network is the

most popular, which is "modeled after the human brain's structure and function." (Stryker and Kavlakoglu, 2024).

Thus, there are two notable things related to AI. First, AI simulates human creative activities to generate results similar to works created by humans. Second, to do this, AI uses machine learning algorithms which use an enormous amount of data to train the AI. These datasets may contain copyrighted works. The question arises whether AI developers should be held liable for copyright infringement for use without permission and payment of royalties.

### 3.2. Arguments for and against fair use for machine learning

#### 3.2.1. Rationales for exemption AI training data use from copyright liability

Sag (2012) exploits the non-expressive use rationale to argue that training AI falls into the fair use zone under Section 107 of the US Copyright Act. This Section provides four factors to be considered for a fair use case:

"1. The purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;

2. The nature of the copyrighted work;

3. The amount and substantiality of the portion used in relation to the copyrighted work as a whole; and

4. The effect of the use upon the potential market for or value of the copyrighted work."

Sag's argument focuses on the first factor that plays a significant role in determining whether exploitation of works falls within the fair use border. This factor is regularly satisfied in the case of transformative use. Transformativeness is uses that "add something new, with a further purpose or different character, and do not substitute for the original use of the work (The US Copyright Office, 2023). Two landmark cases, Authors Guild v. HathiTrust (2014) and Authors Guild, Inc. v. Google Inc (2015), well demonstrate that robot reading is viewed as transformation. In these cases, the judges held that digitalizing works for searching purposes satisfies the first factor, thereby the defendant, Google, did not infringe copyright. The findings are based on the reasoning that no evidence proves that the author's purpose in writing is to serve searching purposes, therefore machinery uses of works for searching online is transformation (Author Guild Inc. v. Google Inc., p.97).

However, fair use is a doctrine of uncertainties. It is because sometimes the findings do not arrive at the same result despite that their similarities. In Associated Press v. Meltwater U.S. Holdings, Inc. (2013), the defendant used search engines to supply searching online services to customers, like Google in Author Guild (2015) and HathiTrust (2014). However, it is surprising that this use was held to be copyright infringement because the court did not view such use as transformative. Hence, Jenny Quang (2021) and Thomas Margoni & Martin Kretschmer (2022) adjust this approach of supporting AI training by developing the rationale of exemplifying AI training datasets from copyright scope. Specifically, these commentators argue that robots use only patterns lied in works. Patterns are ideas while ideas are not subject to copyright, so training AI should be outside of copyright scope.

Advocates of AI training reason that imposing copyright responsibilities on AI developers in training AI tools would be detrimental to the progress of novel technologies. This argument is not totally baseless. As mentioned above, the scenario in which AI providers are required to pay for their exploitation of AI training datasets would be a huge financial burden. This scenario may threaten the development of AI field. Also, it is undeniable that AI is useful for society. Hindering the progress of novel technologies is incompatible to copyright policies set forth in the Copyright Clause of the US Constitution. Likewise, the Directive on Copyright in the Digital Single Market (CDSM) enacted by the EU in 2019 requires that "relevant legislation needs to be future-proof so as not to restrict technological development." (CDSM, Recital 3)

#### 3.2.2. Arguments for securing copyright holders' interest

While advocates' arguments have some merits, opponents well develop the rationales that insist on the copyright owners' benefits.

Commentators suppose that not all robotic reading is non-expressive use. Sobel (2017) and Opderbeck (2024) point out that machine learning algorithms require reproduction of input datasets, which could amount to copyright issues. Therefore, the non-expressive argument is not justified in all cases. Besides, Sobel (2017, p.88-89) discovers that if machine learning enjoys fair use that would inverse the traditional fair use scenario. He argues that the fair use doctrine

is adopted to secure the public interest, that is, to serve the majority of readers at the expense of the rightsholders' interest. However, given machine learning requires a vast amount of input datasets many of which can be copyrighted. This is meant to be that an unnumerable quantity of authors would be affected by the view that machine learning is fair use. Meanwhile, AI technologies are almost in a handful of big techs such as Google and Microsoft. Consequently, the scenario in which the fair use doctrine is applied to AI training data would reverse the fair use provision's purpose. This would result in an unjustified approach that prioritizes the minority of giant businesses at the cost of the majority of creators' benefits.

In fact, the CDSM of 2019 and the Artificial Intelligence Act of 2024 demonstrate an author-centered approach. The CDSM provides that commercial AI providers can use copyrighted works for training data in the case that they "has not been expressly reserved by their rightsholders in an appropriate manner, such as machine-readable means in the case of content made publicly available online." (Article 4). This is an "opt-out" mechanism that mandates that AI developers have to ask permission from works' authors if these authors expressly reserve their rights. Meanwhile, Article 53.1.d of the AI Act demands AI providers reveal AI training datasets. This is a requirement of transparency, which facilitates authors to carry out their rights.

The CDSM has been criticized by commentators. Karathanasis (2023) supposes that the CDSM approach in favor of authors might be detrimental to the development of AI in EU. Margoni and Kretschmer (2022, p.700) express their concern that this approach may urge AI developers to prioritize outdated data to save costs, thereby to provide biased and low quality AI models. Furthermore, Senftleben (2023, p. 1548) argues that the EU approach discourages AI developers in EU, therefore, they might move to the opponent markets such as the US or Japan. Consequently, the CDSM would create a lose-lose situation in which copyright owners could not only obtain royalties, and AI technology might not also be advanced in EU market.

In sum, commentators are inclined to lament that the approach of favoring authors would hinder the AI development, thus humans could not enjoy huge advantages AI tools brings.

### 3.3. Compulsory licensing: a balancing approach

The analysis of AI pro and cons arguments reveals a copyright dilemma. Neither supporting or nor opposing arguments are justified. Besides, the history of copyright has shown that traditional doctrines are prone to crisis whenever a new technology emerges, then the current laws turn out outdated (Patterson, 1987, p. 10). The era of the recording, broadcasting industry, and the internet has proven that. The phenomenon of AI is now creating a similar challenge. A new technical context of society requires a corresponding legal approach (Rooks, 1995, p. 267). One of the solutions chosen by countries to respond new technologies was to issue a compulsory licensing regime which can be construed to be a compromise approach responsive to new technologies that "has created new uses for which the author's exclusive rights have not been clearly established" (Lee, 1982, p. 209), and "has made old licensing methods for established rights ponderous or inefficient." (Lee, 1982, p. 209). Applying this regime in copyright has been now pervasive globally. A compulsory license for AI training data has recently been suggested by commentators (Opderbeck, 2024, p. 1000-1002). This approach may be a more balancing and rational alternative than the fair use doctrine. Rooks (1995, p. 267-291) cited scholars to point out that there are generally three reasons for adopting compulsory licensing scheme, including "(1) ensur[ing] public dissemination and authors' compensation; (2) market failure-high transaction costs; and (3) enforcement problems due to free riders." Three rationales should not be considered independently but intertwined together to achieve a comprehensive understanding. This subsequent analysis will illustrate that applying compulsory licensing mechanism for AI can meet all these reasons.

#### 3.3.1. Balancing interest issue

The first reason is to strike a balance between the interests of the community and the rights owners (Shapiro, Bernstein, & Co. v. Remington Records, 1959). This equation has two variables that must be satisfied: public goods and private interests of copyright holders. The scope of the exclusive rights that copyright law grants to the right owner entails two aspects: the right to allow use of works and the right to collect royalties for that use. Compulsory licensing is a partly concession, in comparison with fair use doctrine where copyright is completely eliminated, by the rights holder for the common good. When applying the compulsory licensing regime, the user's obligations are reduced by

half: they are obliged to pay for use without needing permission from the copyright owner.

The rationale of the interest balance should be only justified where a three-step test is taken: (1) the use of works essentially facilitate a special industry's operation; (2) that industry is beneficial for social development; and (3) absolutely eliminating copyright liability would be unreasonably detrimental to the right owner's legitimate benefits. While steps 1 and 2 demonstrate social needs that justify the use of works, step 3 prevents that use from falling into the fair use zone.

Step 1 dictates that an industry could be subject to copyright compulsory licenses if use of works is necessary to perform its function. In other words, there is almost no other (feasible or effective) choice for the industry. This step should be taken because if a number of alternatives are ready for their operation, it is unjustifiable to circumvent the rightsholder's interests. Take the recording industry as an example. A broad variety of copyrightable subject matter is frequently needed for making a recording. A full copyright liability scheme can limit accessing works, therefore, bar this industry's development. Likewise, in the context of AI training that vitally needs using a large volume of works, allowing copyright owners to reserve the right to prohibit AI developers from accessing their works would severely threaten the survival of this technology.

Step 2 requires that the industry could be eligible for compulsory licensing regime if it brings great benefits to society. Compulsory licensing regime, in addition to fair use doctrine, establishes an exception for copyright, which aims to satisfy public needs for the cost of individual interests. The social benefits as the industry's outcome must outweigh this cost. The compulsory licenses are granted for cable television industry because it can enhance people's capacity of access knowledge and information to people.[2] In the contemporary digital world, AI has been applied to a wide range of social, art, and technical fields to meet needs of a variety of occupations, from office staff, artists to scientific professionals. People could save time, effort, and money when simple creative tasks are done by robots, such as translation for a meeting, information synthesis or empirical analysis for a report. In addition, Sobel argues that machine learning has an impact on academic research, then restraining it would "impoverish research efforts." (Sobel, 2017, p. 80-81)

While the first two steps point out the benefits of AI and thus the legitimate need for access to AI's work, step 3 demonstrates that a blanket copyright exemption for AI is unjustified. The indefensibleness comes from both theoretical and practical backgrounds, as analyzed above. AI models could operate as "competitors" to the authors whose copyrighted works is used for training these models. From a competition law perspective, absolute exemption from copyright obligations for AI developers is probably unfair for copyright holders.

### 3.3.2. Market failure issue

The concept of market failure can be traced to Gordon (Gordon, 1982). Gordon (1982, p. 1612-1613) argues that copyright law can facilitate a Smithian competitive market where the transaction cost is low. In this market, transferring copyrights between parties is voluntary. However, in case the market does not function adequately, namely, market failure, the Government need adopt such special public policy as compulsory licensing to avoid monopolistic control over certain economic fields or high transaction costs (Gordon, 1982, p. 1613). Giving the need and vastness of input data for machine learning, transaction costs are probably exceedingly expensive. Not to mention the time-consuming process of dealing with a large number of rights holders, thus "private ordering is intractable." From the perspective of competition law, copyright owners act as both the party holding the market dominant position of input data resources and the competitor of outputs in the relevant market. Therefore, rightsholders could abuse their monopolistic position to impose adverse conditions for bargaining or even reserve their rights to refuse copyright transfer. These scenarios can constitute a market failure issue.

### 3.3.3. Free rider issue

The emergence of disruptive technologies helps thrive dissemination of works. However, it also makes copyrighted

[2] This is cited from the testimony of Rex Bradley, Chairman, National Cable Television Association in Hearings on H.R. 2223 before the Subcommittee on Courts, Civil Liberties and the Administration of Justice of the House Comm. on the Judiciary (94th Cong., 1st Sess. 503 (1975).

works more accessible to users through new effective and anonymous use, thus the free rider problem escalates. AI is not an exception case for this. In reality, exactly identifying what data an AI model has used and to what extent they have been exploited is nearly impossible unless the developer publicizes such information. To avoid the free-rider problem, the rights owner can, through compulsory licensing mechanism, seek more effective protection than fair use doctrine (Rooks, 1995, p. 271).

The compulsory licensing regime attracts some criticism, especially concerns about the license fee (Opderbeck, 2024, p. 1002). Outlining a comprehensive legal framework for a compulsory licensing mechanism to fix its inherent flaws is beyond the scope and objectives of this study. However, some points should be kept in mind for designing such a legal scheme. Given the sophisticated nature of the AI training mechanism, which requires an uncountable number of data, the licensing fee should be considered with great care. There are two approaches: (1) a license fee agreed upon by the parties, and (2) a license fee that is prescribed by law. The advantage of the first approach is that it ensures the parties' freedom to agree. However, it probably takes time to reach an agreement, making the mechanism cumbersome and ineffective. Not to mention that in some cases, rights holders who are not willing might "circumvent the law" by imposing an excessively high fee, which would make the compulsory licensing impossible. Therefore, a more feasible approach is to set a statutory fee. This approach may overcome the disadvantage of the first one. Conversely, its shortcoming is that the fee would be fixed, so it is not always reasonable, especially where market conditions change. Therefore, a statutory fee should be designed to achieve the following goals: (1) ensuring the legitimate economic interests of the rights holders but not imposing an undue cost burden on AI providers; (2) the fee must take into account the characteristics of each type of work and the level and extent of use; and (3) the fee frame should be periodically reviewed to be compatible with the new market conditions.

In sum, applying compulsory licensing regime to AI training data seems to be a more balanced approach, and therefore more likely to be accepted by all parties, than the fair use doctrine. However, given the collective nature of intellectual property, any exceptional approach to AI needs to be considered in relation to traditional copyright policies for humans. Otherwise, these policies will lack theoretical basis and fail to ensure their original goals. This issue will be analyzed in the next section.

## IV. CONCLUSION

Given the duality of creative works, that is, any creation bears two characteristics: the private and cumulative attributes, an effective copyright policy is not only to protect authors' interest but also serve social development. In the context of AI training data, therefore, that the approaches prioritize one of the parties, namely, authors and AI developers, might not be justified. Indeed, preference of one side at the expense of the other probably results in bad effects. In favor of copyright holders may disadvantage the progress of AI, a novel useful technology for human life. In contrast, viewing AI training as a fair use could create unfair situations in which AI developers freely use authors' works to create AI tools that would compete with these authors. Hence, compulsory licensing may be an approach balancing interests of two parties. On the one hand, compulsory licensing secures copyright owners' benefits and encourages the development of AI on the other because AI providers are not inhibited from exploiting copyrighted works for training AI models.

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# ENHANCE FOREIGN INVESTMENT ATTRACTION IN SCIENCE, TECHNOLOGY AND INNOVATION DEVELOPMENT IN VIETNAM IN THE CONTEXT OF THE DIGITAL AGE

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**ABSTRACT**

The 2013 Constitution affirmed that: "Developing science and technology is the top national policy, playing a key role in the country's socioeconomic development". Especially in the context of taking advantage of the 4.0 industrial revolutions, Vietnam has identified science, technology and innovation (S&I) as the golden key, the most important strategic breakthrough. To develop S&I, the solution to increase capital attraction is given top priority.Therefore, the article will focus on analyzing (i) The situation of attracting foreign investment in developing S&I in the period of 2020 - 2024; (ii) Solutions to increase foreign investment attraction in developing S&I in Vietnam towards the goal of sustainable development in the context of the digital age.

*Keywords:* "foreign investment", "science", "technology", "innovation", "digital age"

## I. INTRODUCTION

The socioeconomic development strategy for the period 2021-2030 has identified science, technology and innovation as an important content in implementing the strategy. On the other hand, the context of the 4.0 industrial revolution has placed science, technology and innovation at the center. Therefore, Vietnam, as well as other countries in the world, focus on solutions to develop science, technology and innovation, including solutions to increase foreign investment attraction in science, technology and innovation development in Vietnam towards the goal of sustainable development. According to the General Statistics Office (2025), foreign direct investment licensed an economic sector (Accumulated projects valid as of December 31, 2023) for professional activities, science and technology, the number of projects is 4,488.0; total registered capital (tr. USD) is 5,433.3. The number of projects and total registered capital of science and technology activities are ranked 3rd out of 18 sectors receiving foreign direct investment (Statistical Yearbook, 2023). Also, according to the Statistical Yearbook (2023), if only foreign direct investment licensed in science and technology in 2023 is counted, not cumulatively, science and technology activities also attract 414 projects and total registered capital (tr. USD) is 1,437.8. According to the Numbers and Events Magazine (2025), the government is proactively promoting emerging high-tech industries that are in line with world trends. In the semiconductor industry, in a short time, Vietnam has made impressive steps in semiconductor cooperation with countries and economies such as the United States, South Korea, Japan, Taiwan, Europe... and large technology corporations such as Cadence, Intel, Qovor, Apple, Marvell, Samsung, Synopsys. Vietnam was also selected by the United States as one of 6 countries participating in the Chips Act to develop the global semiconductor supply chain. In the field of artificial intelligence (AI), many corporations such as Microsoft, Google, Qualcomm, Meta have increased cooperation in research and application of AI in Vietnam. Domestic corporations such as Viettel, VinGroup, FPT, CMC... have also proactively and actively implemented synchronous projects and research and development activities on AI. Regarding the development of the innovation and startup ecosystem, Vietnam has strongly developed the connection between ecosystem subjects with the leading role of the National Innovation Center, which is considered a strong ecosystem in the region. In 2024, a series of large corporations invested in Vietnam such as Amkor Technology Group invested 1.07 billion USD, LG Group invested 1 billion USD, Hyosung Group invested 700 million USD in the Bio-BDO (Butanediol) bio-fiber factory project, Talway Group invested 700 million USD, Capital Land invested 661 million USD, Foxconn invested 551 million USD in the project on smart entertainment products and smart system equipment... NVIDIA Corporation (USA) officially signed a cooperation agreement with the Vietnamese Government on the establishment of the Artificial Intelligence Research and Development Center (VRDC) and the Artificial Intelligence Data Center in Vietnam (Thu Huong, 2025).

However, the current situation of attracting foreign investment in science, technology and innovation development in the period 2020-2024, besides the results achieved with an impressive number of projects and total investment capital, still has some limitations and shortcomings. For example, the total registered investment capital for science, technology and innovation are still low compared to some other industries, proving that investment attraction is not very effective; few FDI projects have high technology, low technology spillover (Vo Thanh Thu and Tran Thi Trang, 2023); investment attraction is uneven among localities; investment partners are mainly investment partners in Asia, in the top 08 countries investing the most in Vietnam from 2020 to 2024, only the Netherlands is a European country, the remaining 07 partners are in Asia. That means Vietnam's foreign direct investment partners mainly do not come from countries holding source technology such as the United States, EU, Japan but mainly from Asia such as China, Korea (Bui Kieu Anh, 2023); orientation to attract foreign investment by industry and partner are still limited; Although it has attracted many good technologies, it has not achieved the goal of attracting technology and transferring technology (Hoang Anh Minh, 2024). On the other hand, there are still many limitations such as the quality of high-quality human resources, infrastructure, policy mechanisms or management, supervision, inspection, and implementation in management are not yet highly effective.

Research on the topic of attracting foreign investment in science, technology, and innovation development from 2020 to 2024, it can be seen that in Vietnam there are many research works related to attracting foreign investment, such as Vo Thanh Thu and Tran Thi Trang (2023), Recommendations to attract foreign direct investment in Vietnam in the Journal of Development and Integration; Pham Thi Hong My (2023), Current policy mechanism for developing national science, technology, and innovation. Proceedings of the national scientific conference: Developing national science, technology, and innovation: perspectives from stakeholders. National Economics University; Le Nhu Quynh (2022), Policy to attract foreign direct investment in Vietnam to 2030, PhD thesis; Bui Kieu Anh (2023), Foreign direct investment in Vietnam in the new context, PhD thesis... The above research works only study foreign direct investment in general, not focusing on foreign direct investment in the science and technology sector. And this work will focus on foreign investment in science, technology and innovation in the context of the digital age.

Science, technology, and innovation play an important role in economic growth, GDP, enhancing Vietnam's competitiveness and are an important driving force to enhance the overall strength in the fields of socio-economics, national defense and security, promoting dual transformation (digital transformation, green transformation), protecting the environment and responding to climate change, ensuring sustainable development. Therefore, attracting foreign investment in science, technology, and innovation development will create additional capital sources in addition to state budget capital and private capital. Capital is a prerequisite resource for science, technology and innovation development and increased foreign investment will help reduce pressure on investment capital from the state budget. Increasing foreign investment attraction in science, technology and innovation development will help Vietnam narrow the gap with other countries. Foreign-funded R&D centers have made positive contributions to the introduction of international advanced technologies and high-level talents, improving the technological level and scientific and technological innovation capacity. Through attracting foreign investment, Vietnam has the opportunity to access the world's advanced technology to develop economic sectors using modern technology such as precision mechanics, electronics, software industry, post and telecommunications, biotechnology, etc. Attracting foreign investment also contributes to the rapid development of export processing zones and industrial parks with advanced technology levels, enterprises have produced and brought to market many products that we had to import in the past due to the backwardness of domestic technology. In the context of the digital age, digital transformation requires the use of data and digital technology to comprehensively and comprehensively change all aspects of economic and social life. Therefore, science, technology and innovation and digital transformation will have a close relationship with each other. Developing science, technology and innovation will create modern technology that contributes to digital transformation in specific fields. To have many applications of modern digital technology, capital is required, which means attracting foreign investment in science, technology and innovation will help make digital transformation faster and more modern. Because for Vietnam - a developing country, the fastest and shortest way to narrow the gap with developed countries is to attract modern technology from abroad, including through foreign direct investment projects in science, technology and innovation activities.

Therefore, it is very necessary to study the situation of attracting foreign investment in science, technology, and innovation development in Vietnam in the period of 2020 - 2024 in the context of the digital age to propose policies and solutions in the coming time.

## II. MATERIAL AND METHOD

The article uses the research method of analysis, synthesis and comparison based on secondary documents such as legal documents, data reports of the Foreign Investment Agency, articles of domestic experts to clarify the situation of attracting foreign investment in the field of science, technology and innovation, thereby proposing solutions to increase foreign investment attraction.

## III. RESULT AND DISCUSSION

### 3.1. Situation of attracting foreign investment in science, technology and innovation development in the period 2020 - 2024

Attracting capital for science, technology and innovation development is an important solution, so attracting foreign investment is also determined to be implemented. In the period of 2020 - 2024, the situation of attracting foreign investment also achieved positive signs.

**Achievements**: By participating in signing many new-generation free trade agreements, clear and transparent legal regulations, simplified administrative procedures, applying digital transformation and especially implementing many policies to attract foreign investment in national economic sectors such as Vietnam's Human Resources Development Strategy for the period 2011-2020; Science and Technology Development Strategy for the period 2011-2020; Resolution No. 50-NQ/TW dated August 20, 2019, of the Politburo on orientations for perfecting institutions and policies, improving the quality and effectiveness of foreign investment cooperation until 2030 and the Foreign Investment Cooperation Strategy issued by the Government, aiming to focus on attracting quality foreign investment flows, contributing more effectively to economic growth and having a spillover effect on domestic enterprises; Directive No. 01/CT-TTg of the Prime Minister dated January 14, 2020, on promoting the development of digital technology enterprises in Vietnam, Law on Technology Transfer 2017, Law on Investment 2020, Law on Environmental Protection 2020 ; Law on Tax Administration 2019, Law on Intellectual Property 2005, amended and supplemented in 2009, 2019, 2022, Law on Enterprises 2020; Decision No. 29/2021/QD-TTg dated October 6, 2021, of the Prime Minister regulating special investment incentives; Decision No. 667/QD-TTg dated June 2, 2022, of the Prime Minister approving the Foreign Investment Cooperation Strategy for the period 2021-2030; Decree 182/2024/ND-CP regulating the establishment, management and use of the Investment Support Fund ... The State also participates in becoming a member of a series of bilateral and multilateral free trade agreements, creating a boost for attracting a wave of foreign direct investment into the country such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), Vietnam - European Union Free Trade Agreement (EVFTA), Investment Protection Agreement (EVIPA). For example, the Vietnam - EU Free Trade Agreement (EVFTA) has been signed and entered into force. This will further promote the activities of foreign enterprises in Vietnam.

On the other hand, the rapid and strong economic growth of Vietnam is also an opportunity to welcome the wave of foreign investment attraction. In order to grow the economy and attract foreign investment in a sustainable and effective manner, the State has focused on investing in digital transformation and applying green technology to production and business activities to help manage the impact and adapt to climate change. The orientation to shift to green economic development is expected to bring many opportunities and is an important factor for Vietnam to compete to attract investment.

Therefore, in the period of 2020-2024, Vietnam has achieved many achievements compared to the fluctuating international context. Localities have also been proactive and prepared conditions to attract foreign investment in science, technology and innovation development such as completing transport infrastructure, building high-tech zones, etc. For example, Nghe An is a province has promoted administrative reform and improved the provincial competitiveness index; promoting the construction of e-government, digital government, improving the quality of cadres, civil servants and public employees and strengthening coordination between agencies and units are important factors. The province has also actively mobilized resources to develop transport infrastructure, connecting western

Nghe An with the lowlands and promoting the development of high-tech agriculture.

Some typical results in attracting foreign investment capital can be mentioned as

Firstly, attracting foreign investment capital into professional, scientific and technological activities are always in the Top 5 sectors attracting foreign investors out of a total of 21 national economic sectors (manufacturing and processing industry, real estate business, wholesale and retail, electricity production and distribution and professional, scientific and technological activities). Specifically, professional activities, science and technology ranked 5th in the Top 18 sectors receiving foreign direct investment in 2023, in terms of total registered capital. Also in 2023, there were 111 countries and territories investing in Vietnam. There were 114 countries and territories investing in Vietnam in 2024. Bac Ninh took the lead with a total registered investment capital of nearly 5.12 billion USD, accounting for 13.4% of the total investment capital of the country, more than 2.8 times higher than the same period. Hai Phong ranked second with more than 4.94 billion USD, accounting for 12.9% of total registered investment capital, up 42.4% compared to 2023. Ho Chi Minh City ranked third with a total registered investment capital of more than 3.04 billion USD, accounting for nearly 8% of total investment capital nationwide, down 49.4% compared to 2023. Next in line are Quang Ninh, Hanoi, Binh Duong, ... (Ministry of Planning and Investment, 2024). According to the Statistical Yearbook (2023):

**Table 01: Licensed foreign direct investment attraction in the period 2020 - 2023**

| Year | Project Number | Total registered capital (million USD) | Total implemented capital (tr.USD) |
|---|---|---|---|
| 2020 | 2610 | 31045.3 | 19980.0 |
| 2021 | 1818 | 38854.3 | 19740.0 |
| 2022 | 2169 | 29288.2 | 22396.0 |
| 2023 | 3314 | 39390.3 | 23183.0 |

*Source: Statistical Yearbook 2023*

**Table 02: Ranking of licensed foreign direct investment by economic sector in 2023**

| Rank order | Industry |
|---|---|
| 1 | Processing and manufacturing industry |
| 2 | Real estate business |
| 3 | Production and distribution of electricity, gas, hot water, steam and air conditioning |
| 4 | Finance, banking and insurance activities |
| 5 | Professional, scientific and technological activities |

*Source: Statistical Yearbook 2023*

**Table 03: Ranking of licensed foreign direct investment by investment partner in 2023 and 2024**

| Rank order | Investment partners |
|---|---|
| 1 | Singapore |
| 2 | Korea |
| 3 | Japan |
| 4 | China |
| 5 | Hong Kong |
| 6 | Taiwan |
| 7 | Netherlands |

*Source: Statistical Yearbook 2023*

Second, the total registered foreign investment capital in science and technology in recent years has always been above 1 million USD (Table 04). Total newly registered capital, increased capital and contributed capital in 2024 also increased month by month during the year (Table 05).

**Table 04: Attracting foreign investment in professional, scientific and technological activities in the period 2020 - 2023**

| Year | Number of new projects | New registered capital (*tr.USD)* | Number of project adjustments | Adjusted registered capital (*tr.USD)* | Number of capital contributions to buy shares | Value of capital contribution to buy shares *(million USD)* | Total registered capital *(million USD)* |
|---|---|---|---|---|---|---|---|
| 2020 | 376 | 169.30 | 87 | 114.30 | 825 | 1,062.96 | 1,346.56 |
| 2021 | 291 | 143.31 | 87 | 276.55 | 620 | 604.12 | 1,023.98 |
| 2022 | 331 | 249 | 106 | 172.43 | 603 | 867.90 | 1,289.31 |
| 2023 | 403 | 179.64 | 103 | 332.62 | 531 | 772.73 | 1,285.00 |

*( Source: author compiled from annual reports of the Foreign Investment Agency)*

**Table 05: Attracting foreign investment in professional, scientific and technological activities by 2024**

| Month/Year 2024 | Total newly registered capital, increased capital and contributed capital ( *tr.USD)* |
|---|---|
| 1 | 65,198 |
| 2 | 76,353 |
| 3 | 190,165 |
| 4 | 285,191 |
| 5 | 314,392 |
| 6 | 452,411 |
| 7 | 490,598 |
| 8 | 761,907 |
| 9 | 847,077 |
| 10 | 904,136 |
| 11 | 1018,857 |
| 12 | 1268,798 |
| Total | 6.675,083 |

*(Source: Ministry of Planning and Investment, 2024).*

Locally, we can mention the case of Luxshare - ICT Vietnam Company, a member of the Chinese multinational corporation Luxshare - ICT, in November 2023 invested an additional 330 million USD to expand its factory in Bac Giang, bringing the total capital of this company in Bac Giang province to 504 million USD. Luxshare - ICT is a manufacturer of Airpods and many other devices for Apple. Luxshare - ICT also invested 290 million USD in Nghe An with two projects, Luxshare ICT 1 worth 140 million USD and Luxshare 2 worth 150 million USD in VSIP Nghe An Industrial Park (Hung Nguyen), to produce electronic components (Yen Anh, 2024). In Ho Chi Minh City, according to the report of the General Statistics Office, the bright spot in attracting foreign investment to this locality in 2023 is that out of 194 projects with adjusted registered capital, 50 projects were in the field of science and technology, with registered capital increasing by 290 million USD, accounting for nearly 50% of the adjusted registered capital. In addition, out of the total 996 million USD attracted through capital contribution and share purchase, professional, science and technology activities attracted 278 million USD, accounting for 28%, ranking first among the sectors with capital contribution and share purchase (Le Quan, 2023). According to the Management Board of Ho Chi Minh City High-Tech Park, in 2024, 7 projects were started here, including 3 foreign -invested projects with an investment capital of 696 million USD and 4 domestic projects with an investment capital of 4.077 billion VND. The newly started projects all have high technology content, using high-quality human resources such as the Nipro Vietnam Factory Expansion Project; HCMC1 Data Center. The project that is receiving the most attention in Ho Chi Minh City today is the Data Center at Lot T4-3 with an area of 3 hectares in the High-Tech Park. Up to now, there are 7 investors wanting to invest in this project, including 6 famous foreign investors such as Eaton (USA); Evolution under the Warburg Pincus Investment Fund (USA); Hyosung (Korea); NTT Data (Japan) ... (Le Quan, 2024).

Third, according to the Global Innovation Index (GII) Report 2023 (GII 2023) published by the World Intellectual Property Organization (WIPO), Vietnam increased by 2 places compared to 2022, ranking 46/132 countries and economies in global innovation, at the same time, ranking 4th in the ASEAN region and among the top developing economies. Also, according to the Vietnam Innovation and Technology Investment Report 2021 published by NIC, the total amount of venture capital in 2021, in Vietnamese innovative startups reached 1.4 billion USD. Of which, according to the estimate of ThinkZone Ventures Fund, about 90% of this capital is capital from foreign venture capital funds. In 2023, 1.5 billion USD is the capital committed to Vietnamese startups from 41 investment funds from Korea, Japan, Singapore, Indonesia, USA, and Vietnam in the period 2023-2025. According to the GII 2024 Report, Vietnam's innovation index is ranked 44/133 countries and economies, up 2 places compared to 2023. Of which, innovation input increased 4 places compared to 2023, from 57th to 53rd; innovation output increased 4 places compared to 2023, from 40th to 36th (General Statistics Office, 2024).

**Limitations and shortcomings** : After 10 years of implementing Resolution No. 20-NQ/TW dated November 1, 2012, of the 11th Party Central Committee on the development of science and technology to serve the cause of industrialization and modernization in the context of a socialist-oriented market economy and international integration, it has been shown that: The implementation of the Resolution still has some limitations and weaknesses, some aspects are slow to be overcome, and have not met the requirements of industrialization and modernization of the country. The institutionalization is not complete and synchronous; the state management work is slow to innovate, and has not strongly promoted the development of science, technology, and innovation. The capacity of a number of science and technology officials are still limited; the potential and level of national science, technology and innovation are still far behind the group of leading countries in the region. Science, technology and innovation have not really played the role of a leading national policy, a strategic breakthrough, or an important driving force for renewing the growth model and developing the country quickly and sustainably. To clarify this statement, we can see:

Firstly, the total registered foreign investment capital in science and technology is still low compared to other sectors, typically the processing and manufacturing industry and real estate business (Table 02).

**Table 06: Comparison of total registered foreign investment capital in science and technology compared to other sectors in the period 2020 - 2023 (unit: million USD)**

| Year | Professional, scientific and technological activities | Processing and manufacturing industry | Real estate business |
|---|---|---|---|
| 2020 | 1,346.56 | 13,601.09 | 4,184.95 |
| 2021 | 1,023.98 | 18,120.89 | 2,637.42 |
| 2022 | 1,289.31 | 16,801.53 | 4,451.44 |
| 2023 | 1,285.00 | 23,504.98 | 4,665.76 |

*Source: author compiled from annual reports of the Foreign Investment Agency*

Second, according to the Global Innovation Index Report 2023, the aspect of capital investment in science, technology and innovation activities in Vietnam has not improved. The level of investment in research and development (R&D) compared to the GDP of the Vietnamese Ecosystem is still low and tends to decrease. In 2023, the recorded figure for R&D investment compared to Vietnam's GDP was 0.4%, lower than the average of Southeast Asia, ranked 66th globally, down 7 places compared to last year, ranked lower than the ranking in 2021. Meanwhile, countries in the same region have increased capital investment in this activity, and quickly rose in the 2023 rankings such as Thailand: 1.3% (up 4 places), Singapore 2.2% (up 3 places), Malaysia: 1%. The report shows that Vietnamese enterprises still face many obstacles when innovating. 75% of businesses surveyed in the report affirmed that the lack of full awareness of the role of open innovation leads to unclear motivation for realization (Hieu Phuong, 2024).

Third, the situation of attracting foreign investment in science, technology and innovation are not uniform in Vietnam. That is, in terms of investment location criteria, it is clear that foreign investment is concentrated in localities with favorable infrastructure, stable human resources, administrative reform, digital transformation application, high-class services and dynamism in investment promotion such as centrally-run cities such as Hanoi, Ho Chi Minh City, Da Nang, Hai Phong and Can Tho. Can Tho as well as the provinces of Binh Duong, Dong Nai, Long An, Quang Ninh,

Bac Ninh, Bac Giang, Thai Nguyen. For example, Hanoi is a bright spot in the field of science, technology and innovation in the country (leading the country in the local innovation index). In 2023, attracting foreign investment capital to Ho Chi Minh City in professional, scientific and technological activities increased. Of the 194 projects with adjusted registered capital, 50 projects were in professional, scientific and technological activities, with registered capital increasing by 290 million USD, accounting for nearly 50% of the adjusted registered capital. In addition, of the total 996 million USD attracted through capital contribution and share purchase, professional, scientific and technological activities attracted 278 million USD, accounting for 28%, ranking first in the sectors of capital contribution and share purchase (Le Quan, 2023). Meanwhile, it is also attracts foreign investment in science, technology and innovation in the province. In Ha Tinh and Phu Yen, the number of projects and registered capital is too low or non-existent. Specifically, according to the Ha Tinh Provincial Statistical Yearbook (2023), there are no foreign direct investment projects licensed by economic sectors and professional activities in science and technology in 2023. If based on the cumulative number of projects still in effect as of December 31, 2023, the number of licensed projects is 03 and the total registered capital is 13 million USD. According to the Phu Yen Provincial Statistical Yearbook (2023), there are no foreign direct investment projects licensed by professional activities in science and technology in 2023. If based on the cumulative number of projects still in effect as of December 31, 2023, there are no projects in the field of science and technology.

Fourthly, although the activities to support science, technology and innovation have been promoted by localities, statistics show that 32/63 provinces/cities nationwide have established science and technology development funds, contributing to practical support for enterprises in technological innovation. 60/63 localities have issued plans to implement the National Program to support enterprises in improving productivity and quality of products and goods in the period of 2021-2030 (Xuan Dien and Minh Hieu, 2024). This means that the number of localities with development funds is still low and has not been focused on implementation.

Fifth, if we consider the criteria of investment partners, foreign investment partners in developing science, technology and innovation activities in Vietnam are all traditional partners such as Korea, Japan, Singapore, China, etc. This means that they are still not diversified and have not attracted investors from other countries.

### 3.2. Solutions to increase foreign investment attraction in developing science, technology and innovation in Vietnam towards the goal of sustainable development

**For state agencies:**

Perfecting the legal framework to create a foundation for attracting foreign investment: First of all, it is necessary to study and promulgate the Law on Science, Technology and Innovation to replace the current Law on Science and Technology to properly reflect the nature of creating a legal basis for the development of science, technology and innovation as well as unifying the content of innovation that is currently stipulated in many legal documents. The Law on Science, Technology, and Innovation needs to stipulate specifically the concept of scientific research; fully stipulate the legal framework for innovation; state policies on science, technology, and innovation; rights and obligations of organizations and individuals performing science and technology activities, science, technology, and innovation activities in higher education institutions... Perfecting the legal framework is also the basis for creating motivation to attract foreign investors to invest in science, technology, and innovation. It is necessary to perfect legal documents related to investment and transfer of high technology. Intellectual property laws need to be strengthened because intellectual property protection will promote innovation through patents, trademarks, copyrights and geographical indications (Bui Kieu Anh, 2023). Completing the legal corridor on science, technology, and innovation will contribute to promoting the development of this industry, implementing digital transformation, and creating conditions for national socioeconomic development.

Promote foreign investment attraction: Promoting foreign investment attraction will have more and more investment partners in the fields of science, technology, and innovation. Practice has proven that if the state agencies of each province and city is proactive in investment promotion, they will attract more and more foreign investment capital. The experience of the Bac Ninh provincial government has shown that clearly. Therefore, in the coming time, it is necessary to promote investment promotion. Each locality needs to be proactive in communication to attract foreign

investors to invest in science, technology and innovation by preparing infrastructure, factories, high-tech zones, and having clean land funds for foreign investors to learn about. In particular, there should be a specialized working group working with foreign investors to promptly remove difficulties for investors such as administrative procedures... Strengthen learning from the experiences of some countries in the world on policies to attract foreign investment in science, technology and innovation development for flexible application in Vietnam. Strengthen reform of the science and technology management system, improve the efficiency of allocating science and technology factors. Good implementation will contribute to increasing foreign investment attraction. Strengthen propaganda using communication to highlight the role of innovation in the development of enterprises of the national socio-economy. For localities with low foreign investment in science, technology and innovation development, local authorities need to actively prepare infrastructure to create conditions to attract investment capital. Send working delegations to countries to learn about and seek foreign investors to invest in science, technology and innovation in their localities.

High-quality human resource training: High-quality human resources are the golden force for developing science, technology, and innovation. Therefore, when attracting foreign investment capital, it is necessary to have a force that understands the market, the business, the technology... to contribute to the implementation of the investment project. Review and develop training programs that adapt to international standards to create high-quality human resources as a foundation to welcome foreign investment waves. As well as increase contact with foreign investors to understand their needs and desires before investing in science, technology and innovation development, thereby building and adjusting appropriate policies. Clearly define the allocation of foreign investment capital to focus on investment in human development, including investment in developing the scientific and scientific management team, promoting basic research, potential research, technology incubation; investment in basic industries, key fields and strong industries and professions; investment in building and developing an innovation ecosystem...

**For businesses and educational institutions**

Focus on developing human resources as experts for businesses to have a high-quality workforce by "placing orders" with educational institutions and cooperating with educational institutions to train human resources. Be proactive in seeking foreign investors, have close ties with state agencies and associations in investment promotion, such as coordinating with diplomatic agencies or business associations. Improve local marketing activities: create good videos (in different languages), professionally introduce potential investment opportunities in the locality, local strengths, local incentives for high-quality projects: support for land rental, tax exemption and reduction policies (Vo Thanh Thu and Tran Thi Trang, 2023).

It is necessary to develop a mechanism to promote investment in the form of public-private partnership between higher education institutions and businesses. There needs to be coordination, experience sharing and learning between domestic enterprises and universities, academies, research institutes and experts to improve the capacity of science, technology and innovation of domestic enterprises ((Bui Kieu Anh, 2023)..

## IV. CONCLUSION

Developing science, technology and innovation in the context of the digital age is the focus of each country's socioeconomic development strategy, so increasing foreign investment attraction plays a role in contributing to the implementation of that strategy. Opening up to attract foreign investment is one thing, retaining foreign investors for long-term investment in science, technology and innovation are another, as well as ensuring equal investment in localities. Therefore, in the coming time, it is necessary to synchronously implement solutions to further promote the attraction of foreign investment capital into the development of national science, technology, and innovation.

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# INFORMATION TECHNOLOGY PRODUCTION IN THE NORTHERN SUB-REGIONAL PROVINCES AND CITIES, THE RED RIVER DELTA AND POLICY IMPLICATIONS

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**ABSTRACT**

The paper analyzes the current status of the information technology industry in the provinces and cities of the Northern sub-region and the Red River Delta based on data on "readiness to apply information technology" from the Ministry of Information and Communications (MIC) (MIC, 2023), focusing on analyzing the general index of the information technology industry and three component indexes of information technology production, information technology services, and information technology business and distribution of 7 provinces and cities of the Northern sub-region. The article proposes three policy implications for the development of the information technology industry of this sub-region to achieve the economic growth target according to the Socio-economic Development Plan of the Red River Delta for the period 2021-2030 with a vision to 2050.

*Keywords:* "Information technology", "Information technology industry", "Information technology services", "Information technology production".

## I. INTRODUCTION

The information technology industry has been an important economic sector in Vietnam since the Prime Minister issued Decision No. 1755/2010/QD-TTg on the project "Making Vietnam soon become a strong country in information technology and communications" (Prime Minister, 2010); Decision No. 2289/QD-TTg on the "National Strategy on the Fourth Industrial Revolution to 2030" (Prime Minister, 2020); and Decision No. 411/QD-TTg on "Approving the National Strategy for Digital Economy and Digital Society Development to 2025, with a vision to 2030" (Prime Minister, 2022).

The northern sub-region of the Red River Delta, also known as the Northern Key Economic Zone, includes 8 provinces and cities, including the former Ha Tay, according to Decision 148/2004/QD-TTg (Prime Minister, 2004). The Northern sub-region currently includes 07 provinces and cities: Hanoi, Hai Phong, Quang Ninh, Hai Duong, Hung Yen, Bac Ninh, and Vinh Phuc, according to the Socio-Economic Development Plan of the Red River Delta for the period 2021-2030, with a vision to 2050. According to this plan, the Northern sub-region will strongly develop the information technology industry in the direction of developing the high-tech industry, processing, and manufacturing industry with high added value (Prime Minister, 2024). Therefore, the issue of the current status of the information technology industry is raised in this study to clarify the strengths and limitations of the Northern sub-regions information technology industry in contributing to the implementation of the economic growth targets of the Red River Delta according to the Socio-Economic Development Plan of the Region for the period 2021-2030, with a vision to 2050.

The objective of this article is to analyze the current status of the Northern sub-region's information technology industry. The Red River Delta aims to assess the strengths and limitations of the information technology industry of the provinces in the sub-region. From there, the article proposes implications for the policy development of the information technology industry of the sub-region to contribute to the implementation of the economic growth goals of the Red River Delta according to the Development Plan for the period 2021-2030, vision 2050.

## II. MATERIAL AND METHOD

### 2.1. Digital economy and the information technology industry production index

**Digital economy**

The digital economy includes the entire network of economic and social activities built on a digital platform (To Trung Thanh et al., 2020). In Bui Trinh's study, the digital economy is considered an industry; along with industry, agriculture, trade, and services, the digital economy is included in the input-output (I-O) table analysis and the research results show the level of diffusion of the final products of the two groups of industries and the digital economy to the remaining industries of the economy. Bui Trinh's study considers the digital economy, including the core digital economy, the basic digital economy, and the digital economy. In this study, the digital economy includes the ICT digital economy (information technology industry and telecommunications services), the platform digital economy, and the industry digital economy. Bukht & Heeks (2017) consider the digital economy to include a core digital economy, a narrow digital economy, and a broad economy.

In Vietnam, the digital economy includes 1) the ICT digital economy, which is the information technology industry and telecommunications services; 2) the platform economy, which is the economic activity of digital platforms, online systems connecting supply and demand, and online services on the network; 3) the sectoral digital economy, which is digital economic activity in industries and fields (Prime Minister, 2022).

**Information Technology Industry Production Index**

According to the concepts of digital economy, the information technology industry or core digital economy is an important component of the digital economy, contributing to the development of the digital economy in general and spreading to the development of the remaining sectors of the economy. According to the Ministry of Information and Communications (2022), Vietnam's information technology industry index includes three component indicators: information technology production index; IT service index; IT business and distribution index (trade index). The IT production index is the production of hardware, software, and digital content products, including three sub-indicators: IT production revenue, IT product export value, and tax payment from IT production. The IT service index includes three sub-indicators: IT service revenue, IT service export value, and tax payment from IT services. The IT business and distribution index includes two sub-indicators: IT service revenue and distribution and tax payment from IT products and service business and distribution.

### 2.2. Research Methodology

The article uses secondary data sources on the information technology industry index (IT index) of provinces and cities in Vietnam published by the Ministry of Information and Communications in the Report on the Information Technology Readiness Index in Vietnam (ICT Index - Information and Communication Technologies). This data is available in 2019, 2020 and 2022. The data for 2021 is missing due to the impact of the Covid epidemic. At the time of writing this article, the data for 2024 has not been published by the Ministry of Information and Communications.

The information technology industry index is a weighted component index value that is presented as the information technology production index: information technology service index: information technology trade index is 2: 2: 1. This weight is determined to encourage the promotion of information technology production and service activities (Ministry of Information and Communications, 2022). Each component index is the average value of each group of indicators that has been standardized by the Z-score calculation method. The component indexes are then standardized by the Min-Max method to bring them to the value range |0-1| (Ministry of Information and Communications, 2022).

The article uses the method of comparison over time, cross-comparison of provinces and cities in the Northern sub-region and the Red River Delta. The compared indexes are the general index of the information technology industry and three component indexes. The article relies on the synthesis method to determine the strengths and limitations of the information technology industry index in 7 provinces and cities in the sub-region, thereby implying some policies for developing the information technology industry in the Northern sub-region and the Red River Delta.

## III. RESULT AND DISCUSSION

### 3.1. The role of the information technology industry in Vietnam and the Red River Delta

In Vietnam, the National Strategy for Digital Economy and Digital Society Development to 2025, with a vision to 2030 states: “Developing the digital economy helps people become richer, contributing to Vietnam surpassing the low-middle income level by 2025, reaching the high-middle income level by 2030, and reaching the high-income level by

2045" (Prime Minister, 2022). Also, according to the Strategy, the goal by 2030 is that Vietnam will achieve a digital economy ratio of 30% of GDP; in addition, the digital economy ratio in each industry and field will reach at least 20%. Thus, the information technology industry is a constituent element of the digital economy and plays an important role in contributing to the development of the digital economy in Vietnam.

The Red River Delta is planned into two sub-regions: 1) The Northern sub-region includes 07 provinces and cities: Hanoi, Hai Phong, Quang Ninh, Hai Duong, Hung Yen, Bac Ninh, and Vinh Phuc. The development of the Northern sub-region is closely linked to the development of the Hanoi Capital region; 2) The Southern sub-region includes 04 provinces: Thai Binh, Nam Dinh, Ha Nam, and Ninh Binh (Prime Minister, 2024). In particular, the Socio-Economic Development Plan for the Red River Delta region has determined the orientation of the Northern Sub-region to "focus on developing high-tech industry, processing and manufacturing industries with high added value, especially mechatronics, semiconductors, digital technology products, artificial intelligence, robot manufacturing, etc. Developing the dynamic region, including Hanoi city and district-level areas along National Highway 5 and National Highway 18 through the provinces of Bac Ninh, Hung Yen, Hai Duong, Hai Phong city, and Quang Ninh province, in which Hanoi capital is the growth pole" (Prime Minister, 2024). In addition, Hanoi capital, Bac Ninh, Quang Ninh, and Hai Phong are also the 4 growth poles of the Red River Delta region and the whole country. The planning orientation of the Red River Delta region shows that the information technology industry is increasingly playing a key role in the socio-economic development of the region and the whole country.

### 3.2. Status of information technology industry index in the Northern sub-region and Red River Delta provinces

**General index of the information technology industry**

Hanoi is one of the leading localities in the country and the Northern sub-region and Red River Delta in terms of the information technology industry. In 2022, Hanoi rose to first place after two years of being second in the country in terms of the information technology industry index. Bac Ninh is also a strong locality in this field, continuously holding the third position in the three years 2019, 2020, and 2022. Next, Vinh Phuc was ranked third in the Northern sub-region, Red River Delta, and ranked 8th in the country. Vinh Phuc province has achieved a three-rank improvement in 2022 compared to 2020. Ranked fourth in the sub-region and tenth in the country is Hai Phong city; however, in 2022, this locality dropped 5 ranks compared to 2020. Hung Yen is also a locality that is quite developed in the information technology industry, ranked 5th in the Northern sub-region, the Red River Delta region, and 13th out of 63 provinces and cities. In 2022, Hung Yen rose 5 ranks compared to 2019. Ranked 6th in the Northern sub-region and 17th out of 63 provinces and cities is Hai Duong province. Hai Duong's ranking in the 2019-2022 period shows the instability of the development of the information technology industry in this locality. Ranked last in the sub-region is Quang Ninh province with a ranking of 21st out of 63 provinces and cities. Like Hai Duong, Quang Ninh province has not shown stability in the IT industry. In 2019, the province ranked 7/63 provinces and cities, ranked 30 in 2020, and ranked 21 in 2022.

**Table 1: Information technology industry index of the Northern sub-region provinces, Red River Delta region**

| No. | Province/city name | Production index | Service index | Business index | IT industry index | Ranking by year | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 2022 | 2020 | 2019 |
| 1 | Ha Noi | 0.2480 | 1.0000 | 0.9542 | 0,6900 | 1 | 2 | 2 |
| 2 | Bac Ninh | 1.0000 | 0.0424 | 0.0107 | 0,4191 | 3 | 3 | 3 |
| 3 | Vinh Phuc | 0.1452 | 0.0000 | 0.0000 | 0,0581 | 8 | 11 | 12 |
| 4 | Hai Phong | 0.0670 | 0.0122 | 0.0445 | 0,0406 | 10 | 5 | 6 |
| 5 | Hung Yen | 0.0229 | 0.0035 | 0.0379 | 0,0182 | 13 | 14 | 18 |
| 6 | Hai Duong | 0.0065 | 0.0011 | 0.0168 | 0,0155 | 17 | 12 | 21 |
| 7 | Quang Ninh | 0.0006 | 0.0060 | 0.0299 | 0,0086 | 21 | 30 | 7 |

*Source: Mic, 2023*

Analyzing the three components of the IT industry index shows a better picture of the strengths and weaknesses of each locality. Hanoi achieved an absolute score in the IT service index and a near-absolute score in the business index (IT trade), in which the IT service index is a strength in line with the orientation of encouraging the promotion of IT

production and services in Vietnam in the current period. Meanwhile, Bac Ninh is quite different, with its strength being IT production, while its IT services and business are much lower than Hanoi's. Although Vinh Phuc ranks 8th out of 63 provinces and cities in terms of the information technology industry, its information technology production index only reaches 0.1452/1,0000 points, while the other two indexes are both 0. The remaining provinces of Hai Phong, Hung Yen, Hai Duong, and Quang Ninh do not have clear strengths in the component indexes of the information technology industry.

**Information Technology Production Index**

Information technology production is an important component of the information technology industry, which is being encouraged to develop in Vietnam. This index is calculated through three indicators: Production revenue; Production value; State budget contribution. Bac Ninh leads in the production index and continuously holds the top position in this index. Hanoi ranks 4th in the country in terms of production index, but this index score is only ¼ of Bac Ninh's score. More specifically: Hanoi's production revenue and production value are only 11% of Bac Ninh's; Hanoi's state budget contribution from information technology production is only 55% of Bac Ninh's.

Some other provinces and cities in the Northern sub-region have production revenue and production value larger or similar to Hanoi, such as Vinh Phuc and Hai Phong, but have not yet generated state budget contributions from information technology production. Some other localities have also generated revenue from information technology production and paid to the state budget, but the scale is not large, although these provinces are also ranked at a fairly good level compared to the whole country.

**Table 2: Information technology production index of the Northern sub-region provinces, Red River Delta region**

| No. | Province/city name | Production revenue (Million VND) | Production value (Million USD) | State budget contribution (Million VND) | Information technology production index | Ranking by year | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 2022 | 2020 | 2019 |
| 1 | Ha Noi | 151.825.087 | 3.860 | 3.566.766 | 0,2480 | 4 | 4 | 4 |
| 2 | Bac Ninh | 1.369.230.952 | 34.960 | 6.430.008 | 1,0000 | 1 | 1 | 1 |
| 3 | Vinh Phuc | 286.252.000 | 7.399 | 0 | 0,1452 | 5 | 8 | 8 |
| 4 | Hai Phong | 139.299.560 | 3.192 | 0 | 0,0670 | 9 | 5 | 5 |
| 5 | Hung Yen | 15.324.612 | 31 | 383.115 | 0,0229 | 12 | 10 | 9 |
| 6 | Hai Duong | 52.455.288 | 1.571 | 14.834 | 0,0293 | 11 | 9 | 10 |
| 7 | Quang Ninh | 109.781 | 0 | 10.979 | 0,0006 | 25 | 37 | 28 |

*Source: Mic, 2023*

**Information Technology Service index**

**Table 3: Information technology service index of the Northern sub-region provinces, Red River Delta region**

| No. | Province/city name | Service revenue (million VND) | Export value (million USD) | State budget contribution (million VND) | IT service index | Ranking by year | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 2022 | 2020 | 2019 |
| 1 | Ha Noi | 39,591,970 | 0 | 1,524,249 | 1.0000 | 1 | 2 | 2 |
| 2 | Bac Ninh | 925,698 | 0 | 95,879 | 0.424 | 5 | 5 | 15 |
| 3 | Vinh Phuc | 0 | 0 | 0 | 0.0000 | 44 | 44 | 45 |
| 4 | Hai Phong | 934,687 | 0 | 0 | 0.0122 | 13 | 10 | 13 |
| 5 | Hung Yen | 32,555 | 1 | 814 | 0.035 | 22 | 28 | 33 |
| 6 | Hai Duong | 32,003 | 0 | 2,190 | 0.0011 | 27 | 34 | 17 |
| 7 | Quang Ninh | 133,171 | 0 | 13,317 | 0.0060 | 19 | 19 | 4 |

*Source: Mic, 2023*

Same as the information technology production index, information technology services are an important component of the information technology industry, which is being encouraged to develop in Vietnam. Hanoi is the

leading locality in the subregion and the whole country in information technology services with service revenue reaching 39,591,970 million VND and state budget contribution reaching 1,524,249 million VND. However, an easily noticeable weakness of Hanoi, which is also a weakness of all the provinces in the Northern Sub-region and the Red River Delta, is that it has not exported information technology services. Although Vinh Phuc ranks 8th out of 63 provinces and cities in terms of the information technology industry, information technology services are ranked last because they have not generated service revenue, export value, or contributed to the state budget. Hai Duong and Hung Yen provinces are ranked average in terms of information technology services with modest service revenue and state budget contributions, while export value is very low or has not yet arisen.

**Information Technology business and distribution index**

The IT business and distribution index is less important than the IT production and IT service index. Hanoi is still the locality with the highest ranking in this index with business and distribution revenue reaching 109,086,107 million VND; and state budget contribution reaching 1,718,339 million VND. Bac Ninh has quite an advantage in the IT production index but IT business and distribution are not yet developed, ranking 21/63 provinces and cities. Some provinces and cities in the Sub-region are in the top 10 localities in this index such as Hai Phong, Hung Yen, and Quang Ninh, although the score difference is very large compared to Hanoi: in 2022, Hanoi ranked 2nd with 0.9542/1,000 points, while Hai Phong ranked 6th with 0.0445/1,000 points, Quang Ninh ranked 9th with 0.0299/1,000 points; the large difference in scores is also more clearly shown in the large difference in business revenue, distribution and state budget payment of these provinces and cities compared to Hanoi. Vinh Phuc ranked last, 61st in the country in the information technology business due to no business revenue, distribution, and state budget payment.

**Table 4: Information technology business index of the Northern sub-region provinces, Red River Delta**

| No. | Province/city name | Business and distribution revenue (million VND) | State budget contribution (million VND) | Business and distribution index (million VND) | Ranking by year | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2022 | 2020 | 2019 |
| 1 | Ha Noi | 109,086,107 | 1,718,339 | 0.9542 | 2 | 1 | 1 |
| 2 | Bac Ninh | 1,169,870 | 20,141 | 0.0107 | 21 | 11 | 26 |
| 3 | Vinh Phuc | 0 | 0 | 0.0000 | 61 | 50 | 33 |
| 4 | Hai Phong | 10,052,798 | 0 | 0.0445 | 6 | 5 | 11 |
| 5 | Hung Yen | 3,357,454 | 83,936 | 0.0379 | 7 | 19 | 31 |
| 6 | Hai Duong | 3,250,460 | 8,691 | 0.0168 | 14 | 26 | 52 |
| 7 | Quang Ninh | 936,980 | 93,698 | 0.0299 | 9 | 17 | 8 |

*Source: Mic, 2023*

## IV. CONCLUSION

### 4.1. Conclusion of strengths and weaknesses of the information technology industry

**Strengths of the information technology industry**

Analysis of the current status of the information technology industry in 7 provinces and cities in the Northern sub-region and the Red River Delta shows that Hanoi and Bac Ninh are the leading localities in the information technology industry. The index of these two localities is quite stable over the years, showing a sustainable development.

Some provinces and cities in the Sub-region hold lower rankings but have been quite steadily promoted since 2019, such as Vinh Phuc and Hung Yen, showing the right development trend of the information technology industry; ensuring that these localities follow the orientation of the Development Plan of the Northern Sub-region and the Red River Delta, which is to "focus on developing high-tech industry, processing and manufacturing industry with high added value, especially mechatronics, semiconductors, digital technology products, artificial intelligence, and robot manufacturing" (Prime Minister, 2024).

**Weaknesses of the information technology industry**

Hai Duong and Quang Ninh are low-ranking localities in the Sub-region and have not yet confirmed the development trend of the information technology industry according to the orientation of the Northern Sub-region

Development Plan.

Although Hanoi and Bac Ninh are localities with clear strengths in the information technology industry, both localities have not yet had comprehensive development in both information technology production and information technology services. Hanoi is a leader in information technology services and information technology business and distribution but is quite limited in information technology production while Hanoi has high-tech industrial parks, promising potential for developing information technology production. Bac Ninh has great strengths in information technology production but is not strong in information technology services and information technology business and distribution.

Another limitation is that except for Hung Yen province, which exported 1 million USD of IT services in 2022, 6/7 provinces and cities of the Northern Sub-region had an export value of 0. This shows that IT service exports are not yet a strength of the localities.

Finally, the IT industry index of 7 provinces and cities of the Northern Sub-region shows a huge differentiation or gap between Hanoi, Bac Ninh, and the remaining 5 localities in terms of the current status of the IT industry in general, IT production, IT services, IT business and distribution in particular. Moreover, apart from Bac Ninh and Hanoi, other provinces and cities have not yet affirmed their strengths in the IT industry. These findings are a big problem for state management agencies in developing the Northern Sub-region according to the identified socioeconomic development planning orientation.

**4.2. Policy implications**

Firstly, from the perspective of regional and sub-regional development, the 7 provinces and cities of the Northern Sub-region and the Red River Delta share a common strategic perspective and design and implement a policy of cooperation in developing the information technology industry of the Sub-region. In which, Bac Ninh and Hanoi are the two locomotives with core strengths in information technology production and information technology services, which will act as a driving force for the remaining localities. In terms of developing information technology production, Bac Ninh focuses on developing information technology industrial zones, with a focus on policies supporting the construction of research and development centers for information technology products; policies supporting the establishment of infrastructure for the application and development of information technology; policies supporting the incubation of information technology production enterprises, supporting technology transfer, and providing information technology training. Hanoi will combine the model of developing information technology production and information technology services in the near future, focusing on creating an environment that encourages and supports enterprises to participate in the information technology service supply chain.

Secondly, the policy of cooperation in developing the information technology industry of the Northern Sub-region should be built on the existing strengths of the localities in information technology production and services and, at the same time, based on the foundation of the information technology industry supply chain: identifying provinces focusing on information technology industry production; provinces focusing on information technology industry services; provinces focusing on business and distribution of information technology services. With its position as a leader in information technology development, Hanoi serves as the coordinating unit in collaboration with localities within and across regions in the policy for developing the information technology service supply chain, encouraging and supporting enterprises to link up within the supply chain.

Third, in the short and medium term, information technology exports have yet to be a priority in the development of the information technology industry. While Thailand has the potential to participate in the global supply chain with its strength in expanding information technology production facilities across international markets, Vietnam in general, and the Red River Delta sub-region in particular, should focus on the domestic supply chain in the short term, serving the local market. As of now, Hung Yen remains the only province to have recorded an information technology export value of $1 million, while other provinces have yet to demonstrate significant potential in this sector. Consequently, from now until 2030, policy efforts should center on fostering information technology business growth and distribution, with a strategic emphasis on domestic markets. Strengthening the local information technology industry's competitiveness against imported products and services is imperative, ultimately paving the way for the substitution of

select foreign technologies. Until local information technology products and services attain the capability to replace imports, information technology exports should not be considered a primary policy focus for provinces in the Red River Delta region.

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# EVALUATING THE QUALITY OF HEALTHCARE SERVICES IN HANOI: A COMPARATIVE ANALYSIS OF PUBLIC AND PRIVATE HOSPITALS

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**ABTRACT**

This study aims to evaluate and compare the quality of healthcare services between public and private hospitals in Hanoi, Vietnam. The research focuses on four hospitals: Thanh Nhan Hospital and Xanh Pôn Hospital (public); Thu Cúc International Hospital and Hanoi French Hospital (private). A survey was conducted among 302 respondents, selected from patients and their families visiting these hospitals between October 2023 and March 2024. Using Cronbach's Alpha, Exploratory Factor Analysis (EFA), and Linear Regression Analysis, the study identified key factors influencing service quality, including empathy, information, tangibility, administrative procedures, and responsiveness. The findings reveal that private hospitals generally provide higher-quality services, particularly in areas such as empathy, information provision, and responsiveness, while public hospitals excel in administrative procedures. The study concludes that while both public and private hospitals have their strengths, there is a need for continuous improvement, especially in enhancing service delivery and patient satisfaction across both sectors.

*Keywords*: "healthcare service quality", "public hospitals", "private hospitals"

## I. INTRODUCTION

The quality of healthcare services plays a crucial role in national development, serving as a key indicator of a country's socio-economic progress and overall quality of life. As globalization accelerates, the demand for healthcare services continues to rise, placing significant strain on healthcare systems, particularly in low- and middle-income countries where financial constraints and infrastructural limitations hinder service delivery. According to the World Health Organization (WHO, 2019), healthcare expenditures in these countries are rapidly rising, consuming a significant portion of their GDP. This imbalance between public demand and healthcare capacity results in overcrowding and declining service quality.

Even in developed countries, healthcare systems face considerable challenges, particularly with aging populations and shortages of medical professionals. These factors have necessitated healthcare reforms aimed at enhancing service quality and fostering private sector involvement. Research suggests that the expansion of private healthcare services not only eases the burden on public healthcare systems but also stimulates competition, ultimately improving overall service quality (**Xu & Wang, 2021)**.

Vietnam has embarked on healthcare reforms to improve service accessibility and quality, responding to the increasing complexity of healthcare demands. Despite significant progress, public healthcare institutions still struggle with persistent challenges such as overcrowding and resource shortages (Hau et al., 2021; Khong, 2020). Conversely, the private sector has expanded significantly, particularly in urban areas like Hanoi, attracting those with higher financial means despite increased costs.

Given these dynamics, an in-depth evaluation of healthcare service quality in both public and private hospitals in Hanoi is necessary. Such an assessment will provide valuable insights into existing gaps, inform policy recommendations, and contribute to the broader discourse on healthcare system improvements in Vietnam.

## II. MATERIAL AND METHODOLOGY

### 2.1 Conceptual Foundation

#### Healthcare Service Quality

Healthcare service quality plays a crucial role in patient satisfaction and healthcare facility selection. Numerous studies have compared public and private hospital services, highlighting factors affecting service quality and patient

perceptions. Most findings suggest private hospitals excel in infrastructure, service attitude, and waiting times (Jasvinder & Dharna, 2023; Abdul et al., 2022; Awinaba et al., 2021; Albert & Jain, 2018). However, some studies report no significant differences (Mustika et al., 2023) or indicate that public hospitals outperform private ones in treatment procedures, outcomes, and reliability (Swain et al., 2019), demonstrating that service quality varies by region and healthcare system.

In Vietnam, Phan Quoc Tan (2016) found that private hospitals offer superior service attitudes and shorter waiting times, while public hospitals, despite advanced facilities, struggle with overcrowding. Conversely, Hiep et al. (2020) argued that ongoing improvements in public hospitals have minimized quality gaps between the two systems.

**Factors Influencing Healthcare Service Quality**

Healthcare service quality is shaped by multiple factors, including infrastructure, staff competence, treatment procedures, costs, and administrative processes (Le, 2019; Eun Kim et al., 2017). Among these, human factors—such as professional skills, communication, and patient care—are key determinants (Mustika et al., 2023; Francis et al., 2016). Enhancing infrastructure, medical equipment, and reducing waiting times are also critical for service improvement (Anh et al., 2023).

Additionally, efficient management processes and transparent information access contribute to better healthcare delivery (Anh et al., 2023). Technological advancements, such as electronic medical record systems, have further improved hospital operations. Beyond institutional factors, patient perceptions play a crucial role in service evaluation (Arwa, 2020), as gaps between expectations and actual experiences influence overall satisfaction, particularly in comparisons between public and private hospitals (Lal, 2021).

**Patient Satisfaction**

Patient satisfaction is a key indicator in evaluating healthcare service quality, and studies have shown that it is influenced by various aspects. Shorter waiting times and swift treatment procedures are the main factors enhancing patient satisfaction in private hospitals. Additionally, the dedication of healthcare staff plays a significant role in building patient trust and satisfaction. Conversely, research by Nguyen (2013) indicates that patient satisfaction in public hospitals primarily stems from reasonable treatment costs and easy access to basic healthcare services. However, Anh et al. (2023) also point out that overcrowding and complex administrative procedures in public hospitals remain major obstacles reducing patient satisfaction.

**Factors Influencing Hospital Choice**

The decision between public and private hospitals is influenced by financial capacity, infrastructure, and service quality. A study by Gil et al. (2019) in South Korea found that individuals with higher incomes and private insurance prefer private hospitals, aligning with findings from Swain et al. (2019) in India, where private hospitals excel in infrastructure and staff attitudes, while public hospitals serve low-income patients seeking essential healthcare. Similarly, studies by Ajwinder & Ajay (2019) and Eun Kim et al. (2017) indicate that people with chronic illnesses, disabilities, and lower incomes often prefer public hospitals. Service availability and flexibility also play a role, with private hospitals attracting financially capable patients (Awinaba et al., 2021; Gil et al., 2019), while public hospitals struggle with resource constraints (Shumba et al., 2017).

In Vietnam, factors beyond service quality influence hospital choice (Hiep et al., 2020). Nguyen (2013) highlights that private hospitals attract patients seeking premium services, while public hospitals are preferred for their stability in treatment

## 2.2 Research method

### 2.2.1 Method and Data

This study aims to evaluate and compare the quality of healthcare services between public and private hospitals in Hanoi. The target population comprises patients and their families seeking medical care at these hospitals between October 2023 and March 2024. The study focuses on four hospitals: Thanh Nhan Hospital, Xanh Pôn Hospital (public), Thu Cúc International Hospital and Hanoi French Hospital (private), all chosen for their high patient volume and comprehensive healthcare services.

This study employs primary data collected through direct surveys of patients and their families using questionnaires. A total of 336 questionnaires were distributed, with 302 valid responses analyzed after excluding 24 incomplete questionnaires. Data analysis was conducted using SPSS 20 and Excel software, employing Cronbach's Alpha for scale reliability testing, Exploratory Factor Analysis (EFA), and Linear Regression Analysis.

### 2.2.2 Research model

In assessing the quality of healthcare services at medical facilities, numerous studies have been conducted, yielding various results. International studies by Byju (2014) and Sumathi K (2012) conducted in the cities of Pondicherry and Madurai indicate that the elements of "responsiveness" and "empathy" from healthcare staff are the most critical factors in healthcare service quality and have a strong, significant impact on customer satisfaction. In Vietnam, the Ministry of Health in 2016 has updated and proposed criteria based on the hospital quality assessment framework to guide and promote quality improvement activities in hospitals, with the primary perspective of "patient-centered care and treatment." Building on these research models, the author has developed a research framework with five factors influencing the evaluation of healthcare service quality in both public and private hospitals: empathy, information, tangibility, administrative procedures, and responsiveness.

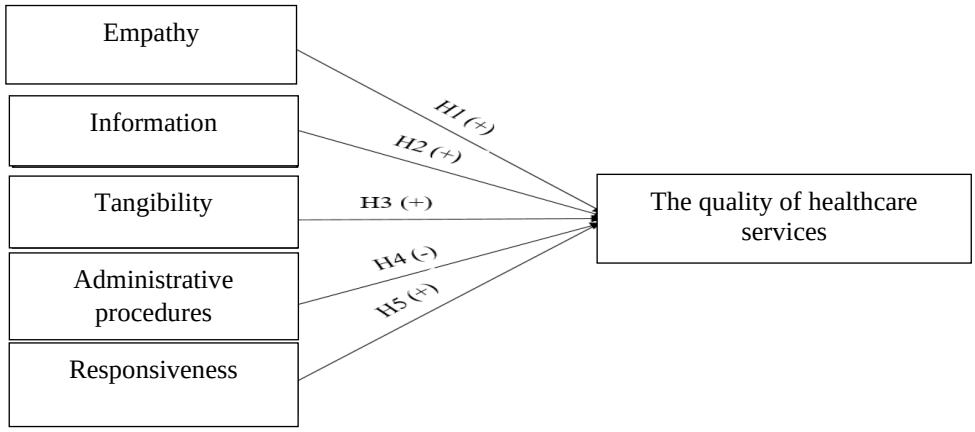



**Figure 1:** Research Framework

Private hospitals are hypothesized to have better quality than public hospitals (+)

Public hospitals are hypothesized to have better quality than private hospitals (-)

**Hypotheses:**

- **H1 (+):** Private hospitals will be perceived as having higher quality healthcare services regarding empathy than public hospitals.
- **H2 (+):** Private hospitals will be perceived as having higher quality healthcare services regarding information provision than public hospitals.
- **H3 (+):** Private hospitals will be perceived as having higher quality healthcare services regarding tangibility than public hospitals.
- **H4 (-):** Public hospitals will be perceived as having higher quality healthcare services regarding administrative procedures than private hospitals.
- **H5 (+):** Private hospitals will be perceived as having higher quality healthcare services regarding responsiveness than public hospitals.

## III. RESULTS AND DISSCUSION

### 3.1. Result

#### 3.1.1 Cronbach's Alpha reliability coefficient

The internal consistency of the research scales was assessed using Cronbach's Alpha. Table 1 presents the results for the five measured constructs: Empathy, Information, Tangibility, Administrative Procedures, and Responsiveness.

**Table 1: Scale Reliability Results**

| Observed Variable | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if items deleted |
|---|---|---|---|---|
| Empathy Scale - Cronbach' Alpha = 0.873 | | | | |
| DC1 | 10.447 | 3.404 | 0.690 | 0.853 |
| DC2 | 10.440 | 3.483 | 0.718 | 0.845 |
| DC3 | 10.374 | 3.139 | 0.800 | 0.810 |
| DC4 | 10.500 | 2.782 | 0.742 | 0.842 |
| Information Scale - Cronbach's Alpha = 0.846 | | | | |
| TT1 | 15.411 | 5.100 | 0.584 | 0.833 |
| TT2 | 15.553 | 4.746 | 0.644 | 0.817 |
| TT3 | 15.536 | 4.834 | 0.606 | 0.828 |
| TT4 | 15.517 | 4.636 | 0.686 | 0.806 |
| TT5 | 15.387 | 4.318 | 0.752 | 0.787 |
| Tangibility Scale - Cronbach's Alpha = 0.764 | | | | |
| HH1 | 22.391 | 3.289 | 0.456 | 0.743 |
| HH2 | 22.407 | 3.219 | 0.501 | 0.731 |
| HH3 | 22.457 | 3.113 | 0.579 | 0.711 |
| HH4 | 22.351 | 3.179 | 0.496 | 0.733 |
| HH5 | 22.318 | 3.041 | 0.556 | 0.716 |
| HH6 | 22.464 | 3.213 | 0.456 | 0.743 |
| Administrative Procedure Scale - Cronbach's Alpha = 0.856 | | | | |
| HC1 | 16.937 | 2.405 | 0.677 | 0.824 |
| HC2 | 16.947 | 2.402 | 0.692 | 0.821 |
| HC3 | 16.927 | 2.447 | 0.630 | 0.836 |
| HC4 | 16.914 | 2.292 | 0.659 | 0.830 |
| HC5 | 16.897 | 2.325 | 0.697 | 0.819 |
| Responsiveness Scale - Cronbach's Alpha = 0.75 | | | | |
| DA1 | 12.791 | 1.063 | 0.574 | 0.677 |
| DA2 | 12.748 | 1.039 | 0.547 | 0.691 |
| DA3 | 12.719 | 1.020 | 0.540 | 0.695 |
| DA4 | 12.772 | 1.081 | 0.520 | 0.705 |

The Empathy Scale achieved the highest reliability ($\alpha = 0.873$), indicating excellent internal consistency, while the Responsiveness Scale had the lowest reliability ($\alpha = 0.750$), suggesting room for improvement. The Information and Administrative Procedure scales also demonstrated strong reliability ($\alpha > 0.84$), confirming that the items within these constructs are cohesive and well-aligned.

### 3.1.2 Exploratory factor analysis (EFA)

To assess the construct validity, Exploratory Factor Analysis (EFA) was performed for both dependent and independent variables. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were conducted to verify sampling adequacy and data suitability for factor extraction.

**Factor analysis (EFA) for the dependent variable**

**Table 2: KMO and Bartlett's Test for Dependent Variable**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequancy | | 0,798 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 2722,314 |
| | Df | 253 |
| | Sig. | 0,000 |

The KMO value of 0.798 indicates that the sample size is adequate for factor analysis. The Bartlett's test significance ($p < 0.05$) confirms that the observed variables are sufficiently correlated to proceed with Exploratory Factor Analysis (EFA).

| | **Rotated Component Matrix** | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **HC1** | 0.821 | | | | |
| **HC5** | 0.796 | | | | |
| **HC2** | 0.772 | | | | |
| **HC4** | 0.762 | | | | |
| **HC3** | 0.719 | | | | |
| **TT5** | | 0.862 | | | |
| **TT4** | | 0.810 | | | |
| **TT2** | | 0.765 | | | |
| **TT1** | | 0.727 | | | |
| **TT3** | | 0.720 | | | |
| **DC3** | | | 0.892 | | |
| **DC4** | | | 0.858 | | |
| **DC2** | | | 0.840 | | |
| **DC1** | | | 0.825 | | |
| **HH3** | | | | 0.743 | |
| **HH5** | | | | 0.723 | |
| **HH2** | | | | 0.674 | |
| **HH4** | | | | 0.671 | |
| **HH6** | | | | 0.623 | |
| **HH1** | | | | 0.623 | |
| **DA3** | | | | | 0.762 |
| **DA1** | | | | | 0.691 |
| **DA4** | .318 | | | | 0.668 |

**Factor analysis (EFA) for the independent variables**

**Table 3: KMO and Bartlett's Test for Independent Variables**

| | | |
|---|---|---|
| **Kaiser-Meyer-Olkin Measure of Sampling Adequancy** | | 0.512 |
| **Bartlett's Test of Sphericity** | Approx. Chi-Square | 185.108 |
| | df | 10 |
| | Sig. | 0.000 |

The Bartlett's test of sphericity yielded a significance value of 0.000 ($p < 0.05$), confirming that the observed

variables are significantly correlated. The KMO coefficient (0.512) meets the minimum threshold, indicating that EFA is marginally appropriate for this study.

| | Component Matrix |
|---|---|
| | 1 |
| CLDV2 | 0.904 |
| CLDV5 | 0.902 |
| CLDV1 | 0.732 |
| CLDV3 | 0.598 |
| CLDV4 | 0.585 |

The findings confirm that the independent variables exhibit strong internal consistency and can be retained for subsequent regression analysis.

### 3.1.3 Multiple Regression Analysis

To test the research hypotheses, multiple regression analysis was conducted to examine the relationship between healthcare service quality (CLDV) and its influencing factors.

**Table 4: Pearson Correlation Matrix**

| | | CLDV | DC | TT | HH | HC | DA |
|---|---|---|---|---|---|---|---|
| CLDV | Pearson Correlation | 1 | .378** | .721** | .200** | .337** | .292** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 | .000 |
| | N | 302 | 302 | 302 | 302 | 302 | 302 |
| DC | Pearson Correlation | .378** | 1 | -.001 | -.018 | .062 | .067 |
| | Sig. (2-tailed) | .000 | | .981 | .751 | .282 | .247 |
| | N | 302 | 302 | 302 | 302 | 302 | 302 |
| TT | Pearson Correlation | .721** | -.001 | 1 | .067 | .176** | .305** |
| | Sig. (2-tailed) | .000 | .981 | | .247 | .002 | .000 |
| | N | 302 | 302 | 302 | 302 | 302 | 302 |
| HH | Pearson Correlation | .200** | -.018 | .067 | 1 | .072 | .084 |
| | Sig. (2-tailed) | .000 | .751 | .247 | | .212 | .147 |
| | N | 302 | 302 | 302 | 302 | 302 | 302 |
| HC | Pearson Correlation | .337** | .062 | .176** | .072 | 1 | .503** |
| | Sig. (2-tailed) | .000 | .282 | .002 | .212 | | .000 |
| | N | 302 | 302 | 302 | 302 | 302 | 302 |
| DA | Pearson Correlation | .292** | .067 | .305** | .084 | .503** | 1 |
| | Sig. (2-tailed) | .000 | .247 | .000 | .147 | .000 | |
| | N | 302 | 302 | 302 | 302 | 302 | 302 |

Table 4 presents the Pearson correlation coefficients between the dependent and independent variables, indicating significant relationships ($p < 0.05$ for all variables).

**Regression Model**

**Table 5: Anova test**

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 26.658 | 5 | 5.332 | 155.351 | .000[b] |
| | Residual | 10.159 | 296 | .034 | | |
| | Total | 36.817 | 301 | | | |
| a. Dependent Variable: CLDV | | | | | | |
| b. Inependent Variable: (Constant), DA, DC, HH, TT, HC | | | | | | |

**Table 6: Model Statistics**

| Model | R | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | 0.851[a] | 0.724 | 0.719 | 0.18526 | 1.854 |
| a. Independent Variables: (Constant), DA, DC, HH, TT, HC | | | | | |
| b. Dependent Variable: CLDV | | | | | |

The adjusted $R^2$of 0.719 indicates that with 95% confidence, the independent variables explain 71.9% of the variance in the dependent variable (CLDV), reflecting a strong correlation. The remaining 28.1% is attributed to factors outside the model and random error. The Durbin-Watson statistic of 1.854 suggests that the model does not violate the assumption of first-order autocorrelation.

**Checking the Normal Distribution of Residuals**

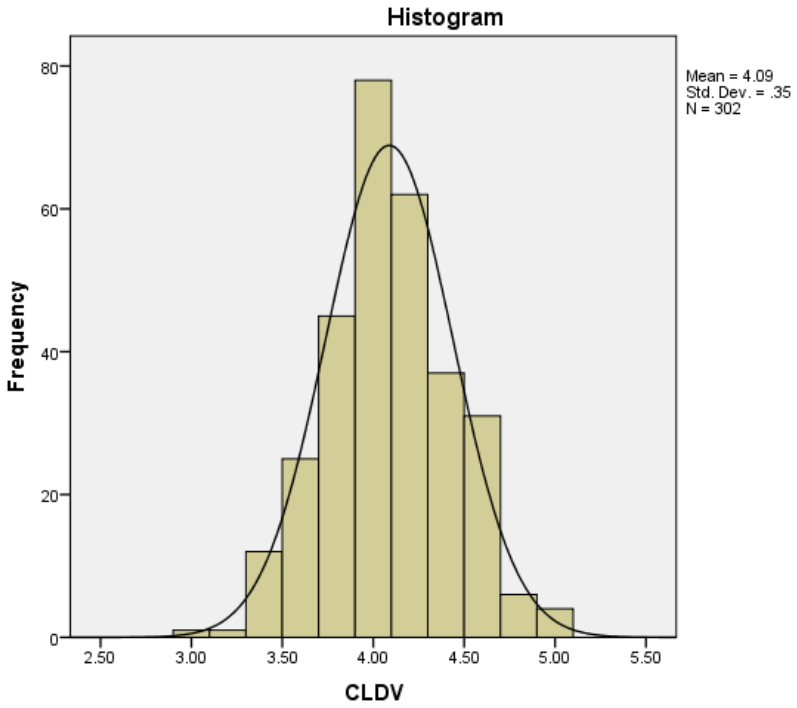



**Figure 2:** Residuals' Normal Distribution Plot

In regression analysis, showing a mean of 4.09 and a standard deviation of 0.35, indicating an approximately normal distribution. This confirms that the normality assumption is satisfied.

**Regression Model Equation**

The final multiple regression equation for predicting healthcare service quality (CLDV) is as follows:

CLDV = 0.323 + 0.223*DC + 0.455*TT + 0.151*HH + 0.197* HC - 0,067*DA (1)

The "Information" factor has the highest standardized Beta coefficient of 0.455, making it the most significant

determinant of healthcare service quality in the studied hospitals. Other factors in decreasing order of impact include "Empathy" (0.223), "Administrative Procedures" (0.197), "Tangibility" (0.151), and "Responsiveness" (0.067). Therefore, the factors of Empathy, Administrative Procedures, Information, and Tangibility contribute to higher perceived service quality in private hospitals, while Responsiveness is perceived as better in public hospitals.

### 3.2 Discussion

The analysis indicates that five factors—Empathy, Information, Tangibility, Administrative Procedures, and Responsiveness—significantly influence perceived healthcare service quality. Notably, Information emerged as the most impactful factor, with private hospitals providing superior access compared to public institutions. This finding aligns with previous research emphasizing that accessible medical records enhance patient recall and understanding, thereby improving satisfaction (Walsh et al., 2019).

Empathy was the second most influential factor, with private hospitals receiving higher patient ratings. Patients reported feeling more understood and cared for in private settings, likely due to enhanced communication skills among healthcare professionals. This observation is consistent with studies demonstrating that physician empathy significantly boosts patient satisfaction and compliance (Kirby et al., 2021).

Administrative Procedures also played a crucial role, with private hospitals outperforming public ones through streamlined processes. Patients experienced quicker, more efficient services in private hospitals, often facilitated by online platforms that reduce wait times. In contrast, public hospitals were noted for cumbersome procedures leading to delays and dissatisfaction.

Regarding Tangibility, private hospitals excelled due to modern equipment and well-maintained facilities, positively influencing patient perceptions. Public hospitals, however, faced challenges such as overcrowding and outdated infrastructure, likely due to budget constraints.

Interestingly, Responsiveness was the only factor where public hospitals slightly outperformed private ones, though the difference was minimal. Public hospitals, especially those with financial autonomy, have made strides in improving service delivery, evidenced by timely support and accurate diagnoses (Kashkoli et al., 2017). Despite these efforts, the overall advantage in service quality still leans toward private hospitals across most evaluated factors.

## IV. Conclusion

This study aimed to evaluate and compare the quality of healthcare services between public and private hospitals in Hanoi, using a sample of 302 patients surveyed across four hospitals. The investigation focused on key factors influencing service quality, including empathy, information, tangibility, administrative procedures, and responsiveness. Data analysis revealed that private hospitals generally offer higher quality services than public ones, particularly in terms of information access, empathy, and administrative efficiency. The findings indicated that the "Information" factor was the most significant in determining patient satisfaction, highlighting the importance of clear communication in healthcare settings. While public hospitals demonstrated competitive responsiveness, they were often hindered by overcrowding and inefficient procedures. Overall, this research underscores the need for ongoing improvements in both sectors to enhance healthcare quality and ensure equitable access for all socio-economic groups in Hanoi. Recommendations for policy enhancements and service quality improvements are essential for meeting the evolving healthcare demands of the population.

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# THE INFLUENCE OF BIG FIVE PERSONALITY TRAITS ON GEN Z'S ONLINE IMPULSIVE BUYING BEHAVIOUR IN VIETNAM: PATHWAYS TO SUSTAINABLE CONSUMPTION

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**ABSTRACT**

E-commerce has emerged as a global phenomenon, revolutionizing shopping behaviors and redefining traditional market boundaries. Once focused on straightforward transactions, it has evolved into a multifaceted ecosystem that reshapes consumer behavior. In Vietnam, its rapid growth, driven by convenience and accessibility, has significantly contributed to the rise of impulsive shopping behavior. However, the surge in impulsive buying, influenced by psychological triggers and marketing strategies, poses financial and social challenges, particularly among Gen Z consumers. Addressing these complexities requires in-depth research to enhance financial literacy and promote responsible consumer practices. This paper investigates the influence of the Big Five personality traits on impulsive shopping behavior among Gen Z in Vietnam. It explores how personality dimensions such as openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism shape impulsive purchasing behavior by applying The FFF Model of online consumer behavior to analyze the relationship between psychological factors and consumer behavior. Therefore, this research aims to benefit consumers by promoting thoughtful purchasing while helping businesses reduce consumers' post-purchase regret that can harm customer's long-term loyalty and lasting profitability for businesses.

*Key words:* "Big Five personality trait", "e-commerce", "FFF Model", "online impulsive buying", "sustainable consumption"

## I. INTRODUCTION

### 1.1 Background of the study

Over the past decade, e-commerce has increasingly played its role as an indispensable part of the global retail sector, driven by the widespread proliferation of internet connectivity and the rapid evolution of digital technologies. These advancements have not only revolutionized traditional retail dynamics but also enabled online platforms to deliver unparalleled convenience, extensive and diverse products, and competitive pricing structures, thereby altering consumer behavior on a global scale. According to The Statista, the number of individuals purchasing online is continuously climbing, with over five billion. In 2024, retail e-commerce sales are projected to surpass 4.1 trillion U.S dollars. This upward trend reflects the growing consumer reliance on online shopping. This shift has not only reshaped traditional retail models but it has also created new opportunities for businesses to expand their market and more goods options for customers in innovative ways. According to the report of the Ministry of Industry and Trade of the socialist republic of Vietnam, the Vietnam e-commerce sector continues to undergo impressive growth, approximately increasing 18-25% annually. By 2024, the market size is forecasted to exceed 2025 billion USD, reflecting a 20% rise compared to 2023 and accounting for nearly 9% of total domestic retail sales and service revenue. Moreover, the latest report from Metric, a data analytics platform specializing in e-commerce, the total retail sales across Vietnam's five major e-commerce platforms - Shopee, Lazada, Tiki, Sendo, and TikTok Shop - have reached 71.2 trillion VND. This represents a significant growth of 78.69% compared to the first quarter of 2023. This upward trend has enabled the increase of people purchasing impulsively, roughly 64% of global consumers engaged in spontaneous online shopping over 2022. This behavior is characterized by spontaneous buying decisions made without prior planning or consideration.

Scholars have shown interest in impulsive shopping behavior for more than six decades, with early studies focusing on defining the concept (Li & Jing, 2014). Applebaum (1951) characterized impulsive shopping behavior as unplanned purchasing triggered by promotional stimuli in stores or supermarkets. Stern (1962) further elaborated that this behavior encompasses any unplanned purchase transactions. Importantly, impulsive buying behavior is not confined to brick-and-mortar stores; it is equally prevalent in online shopping environments. Notably, online shoppers are often perceived to be more impulsive than their offline counterparts (Liu et al., 2013). Evidence suggests that impulsive purchases can account for approximately 40% of customers' total spending on online platforms, underscoring the necessity for online retailers to comprehend consumer behavior in the context of digital transactions (Verhagen & Dolen, 2011).

In general, existing research highlights diverse factors influencing impulsive purchasing decisions across websites, social media platforms, and e-commerce marketplaces. Trung et al. (2017) categorized the determinants of online impulsive buying into two primary groups. The first includes direct drivers such as impulsivity, immediate gratification, perceived rationality, and trust. The second encompasses indirect motivators like product availability, user-friendly website interfaces, and visual appeal. Meanwhile, Trang et al. (2021) demonstrated that immediate gratification is not the most influential determinant of impulsive purchasing. Instead, when ranked by impact, factors such as trust, supermarket advertisements, and impulsivity overshadow immediate gratification. Additionally, website usability has been recognized as a critical characteristic that attracts consumers to purchase unplanned items (Trang, 2023).

Furthermore, the factors influencing impulsive shopping tendencies vary not only across shopping formats but also across cultural contexts. Kacen & Lee (2002) applied Hofstede's cultural dimension theory to reveal that culture significantly shapes impulsive buying behavior. Compared to Western consumers, Asian shoppers exhibit lower levels of impulsive purchasing. Moreover, cultural independence - an individual-level cultural metric was not found to significantly affect impulsive buying among Asians, despite its influence on Western consumers' impulsive shopping behaviors. Lee & Kacen (2008) have suggested that consumers from collectivist cultures tend to engage in impulsive purchases when shopping with individuals who hold significance to them. Meanwhile, individualism has been observed to positively influence impulsive shopping in specific cultures, such as Vietnam, though its impact remains negligible in other cultural settings (Miao et al., 2019).

Impulsive buying behavior also varies by product category. For fashion and apparel, key factors include web design, product display, promotions, search functionality, and pricing, while product interest has minimal impact (Rhee, 2006). Wadera and Sharma (2018) found product variety most influential, followed by discounts, marketing, navigation, display content, and web design, with price having the least effect. In contrast, website quality does not significantly impact impulsive book purchases (Ravi, 2013).

With the rapid advancement of e-commerce, consumers' agency in their shopping journey has been markedly enhanced. Consequently, research into the determinants of impulsive buying behavior has increasingly shifted its focus toward the intrinsic characteristics of consumers. Given that consumers are exposed to similar information within the online shopping environment, variations in individual traits are more likely to catalyze impulsive purchasing behaviors. Therefore, examining the factors influencing impulsive buying from the perspective of consumers' internal characteristics in the context of e-commerce becomes imperative. In recent years, a growing body of literature has emerged on this topic, with prominent studies employing the Big Five personality model to better understand these behavioral dynamics.

Although many international studies have analyzed the relationship between the Big Five Model (BFM) and impulsive buying behavior (IP), most have not specifically focused on Gen Z, especially in the context of e-commerce. Research by Badgaiyan and Verma (2014), Mathai and Haridas (2014), and Thompson and Prendergast (2015) highlights how traits like extraversion and conscientiousness influence impulsive purchasing in traditional retail settings. In online environments, studies by Turkyilmaz et al. (2015) and Bosnjak et al. (2007) demonstrate that traits such as openness and emotional sensitivity also play a role in shaping online impulsive buying behavior. However, in Vietnam, studies largely concentrate on external factors like website usability, promotions, and eWOM, with minimal attention to the internal psychological factors, particularly personality traits.

Therefore, there is a significant research gap in understanding Gen Z's impulsive buying behavior in Vietnam,

especially in the context of the Big Five personality model. Currently, no studies have applied this model to explain impulsive purchasing in this group. Most existing research focuses on external factors like product images, website quality, and promotions, without exploring how personality traits influence buying decisions. This leaves a void in understanding the deeper psychological drivers of consumer behavior, particularly as e-commerce continues to expand. To fill this gap, this research aims to integrate the Big Five model and explore its impact on Gen Z's shopping behaviors in the digital age.

### 1.2 Research Questions and objectives

The research aims to investigate the impact of personality traits within the Big Five Model on impulsive buying behavior among Gen Z. The study aspires to provide a comprehensive understanding of the underlying motivations and consequences of impulsive purchases, thereby proposing strategies for personal financial management and enhancing spending efficiency in modern society. There are several main objectives of the research:

- RO1: To systematize the theoretical foundation of the Big Five Model and develop a research framework and measurement scales to examine the influence of the Big Five Model on online impulsive buying behavior among Gen Z.
- RO2: To ascertain the interactions of personality factors within the Big Five influencing online impulsive buying behavior among Gen Z
- RO3: To help Gen Z optimize financial management, foster sustainable consumption, and guide businesses in crafting sustainable marketing for long-term profitability
- To accomplish the above-mentioned goals, the following are some of the most important questions that will be answered:
- RQ1: What are the key personality traits from the Big Five Model that influence Gen Z's impulsive buying behavior on e-commerce platforms?
- RQ2: How do personality traits influence impulsive buying behavior among Gen Z on e-commerce platforms?
- RQ3: How can Gen Z improve financial management and adopt sustainable consumption, and how can businesses support this through sustainable marketing?

## II. MATERIAL AND METHODOLOGY

### 2.1. Conceptual Foundation

#### Big Five Model

The Five-Factor Model of Personality (FFM), commonly known as the "Big Five," consists of five key personality traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism (sometimes referred to as Emotional Stability), and Openness to Experience. This model emerged from the psycholexical approach, which argues that personality differences are encoded in language and reflected in the vocabulary people use (De Raad, 2000). The foundation of the Big Five was laid by Norman (1963) and Goldberg (1981), whose research identified core dimensions of personality. Costa and McCrae (1992) expanded the model by adding agreeableness and conscientiousness, resulting in the development of the NEO-PI tool to assess these traits. Further research by Costa and McCrae (2008) confirmed the causal relationships between the five factors, solidifying the Big Five as a comprehensive framework for understanding personality. For a long time, personality psychology struggled due to the absence of a common model or theoretical framework. The emergence of the Big Five model in the early 1990s provided a key solution to this issue (Costa & McCrae, 1992), though it faced strong opposition, especially from Eysenck (1992). This is evident not only in the growing body of research but also in the model's significant role in predicting various life outcomes (Roberts et al., 2007). Despite ongoing debates, personality psychology has evolved from fragmentation to a comprehensive classification system, a promising theory in just two decades.

#### Impulsive buying

Impulse buying is a spontaneous, emotionally driven purchase behavior where decisions are made quickly without careful consideration of alternatives or consequences (Beatty & Ferrel, 1998; Kacen & Lee, 2002). It is widely studied

due to its complexity and prevalence across various product categories (Baumeister, 2002; Ramanathan & Menon, 2006). Defined as an unplanned purchase driven by a desire for immediate ownership (Rook & Gardner, 1993), impulse buying is strongly linked to consumer impulsiveness (Puri, 1996). This behavior primarily fulfills hedonic desires (Hausman, 2000) and is triggered by strong emotional reactions to stimuli. Han et al. (1991) classify impulse buying into four types: planned, reminded, fashion-oriented, and pure impulse buying. Key characteristics of this behavior include spontaneity, strong desire, post-purchase satisfaction, and a lack of pre-planned intent (Virvilaite et al., 2009). Impulse buying behavior first emerged in retail stores (Sun & Wu, 2011), but the rise of e-commerce has fostered this behavior (Xiang, 2016). Researchers argue that online shopping encourages impulsive buying behavior more than physical stores (Liu et al., 2013) by eliminating constraints like location, operating hours, and social pressures from staff and other shoppers (Chan, 2017). Therefore, studying online impulsive buying behavior is essential in the digital economy, as it helps assess its impact on sustainable consumption, enabling businesses and policymakers to develop strategies that promote responsible shopping in an increasingly digitalized marketplace.

**The FFF Model of Online Consumer Behavior**

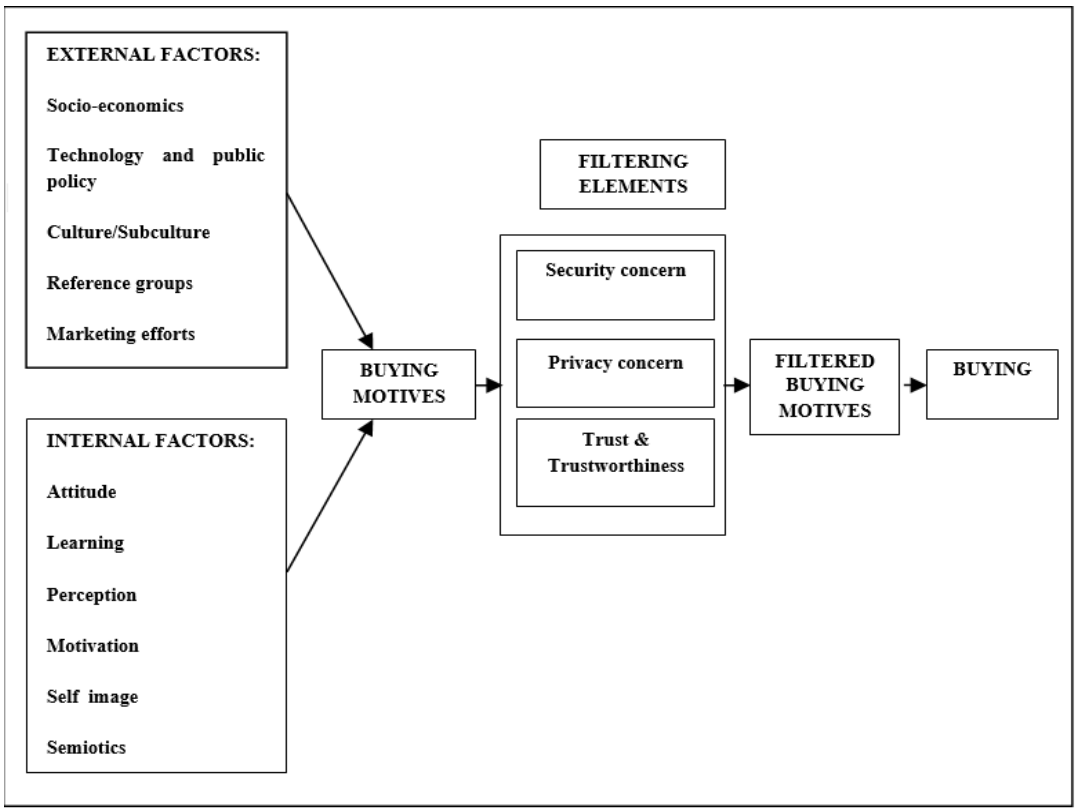



**Fig 2. 1 - The FFF Model of online consumer behavior**

*Source: Duralia, 2016*

Proposed in 2012 by management scholars Ujwala Dange and Vinay Kumar from Priyadarshini Engineering College and S. B. Patil Institute of Management, the FFF Model (Factors, Filtering elements and Filtered buying motive) offers a comprehensive framework for understanding online consumer behavior. This model delineates the interplay of internal and external factors that collectively shape consumers' purchasing decisions in the digital realm. Internal factors are personal traits or behaviors that encompass attitudes, learning, perception, motivation, self-image, and semiotics, all of which play a pivotal role in influencing how consumers approach e-commerce. External factors, on the other hand, include environmental stimuli such as social economics, technology and public policy, culture/subculture, reference groups and marketing efforts, which often guide consumer choices in the virtual marketplace. Furthermore, the FFF Model introduces the concept of filtering mechanisms - cognitive processes through which consumers evaluate and prioritize specific attributes like product variety, ease of navigation, perceived security, and trustworthiness of the platform. These filtering mechanisms not only narrow down the options available but also refine the consumer's final purchasing behavior. By synthesizing these factors, the FFF Model provides a nuanced

understanding of the complexities underlying online consumer behavior, offering valuable insights into how contemporary digital shoppers, particularly Gen Z, navigate e-commerce platforms. This model thus helps researchers explore the multifaceted drivers of impulsive shopping behavior in the ever-evolving landscape of online commerce. In the context of this study, the FFF Model serves as a theoretical foundation to understand how these factors interact with personality traits, specifically the Big Five personality traits, to influence impulsive shopping behavior.

This study aims to expand the applicability of the FFF Model by integrating it with the Big Five personality traits, providing a more personalized lens through which to analyze impulsive shopping behavior. Hence, the research seeks to uncover how Gen Z consumers in Vietnam's e-commerce environment navigate their online shopping experiences.

### 2.2 Research method

#### Hypotheses Development based on Past Studies

The factors underlying impulsive buying behavior can generally be categorized into two main types: external factors and internal factors. Turkyilmaz et al. (2014) highlighted external influences, including website usability, utility, and entertainment. Marketing cues also play a critical role in driving such behavior (Youn, 2000). As e-commerce evolves, consumer proactivity in shopping decisions has grown, shifting the research focus toward internal traits. Personality has been shown to influence impulsive buying significantly (Wang et al., 2022; Aquino & Lins, 2023). Besides, FFM is widely acknowledged in personality psychology and has been used in numerous studies on consumer behavior (Costa & McCrae, 1992; John et al., 2008). Unlike other personality frameworks such as MBTI or HEXACO, FFM provides a more comprehensive and detailed approach. Each factor of FFM encompasses six facets, which enhance FFM's ability to predict behaviors (Paunonen & Ashton, 2001). For instance, Neuroticism consists of anxiety, hostility, depression, self-consciousness, impulsiveness and vulnerability (Furnham, 2022), each capturing distinct nuances of personality (Speer et al., 2022). Moreover, findings from McCrae & Costa (1988) demonstrated that the MBTI categorizes personality into 16 types based on four dichotomous pairs that align closely with four of the five major dimensions of normal personality. Given its empirical rigor and extensive validation, the FFM is regarded as a more robust tool for personality assessment. Previous studies have demonstrated that each personality trait within the Big Five is strongly associated with impulsive buying behavior in an online environment (Turkyilmaz et al., 2015; Bosnjak et al., 2007). In Vietnam, Gen Z exhibits unique consumption behaviors, frequently engaging with e-commerce platforms and being highly susceptible to psychological factors such as emotions and impulsiveness. Thus, applying this model to examine the relationship between personality and impulsive shopping provides deeper insights into this group's behavior.

#### Big Five personality traits

The Big Five personality traits provide a conceptual framework for understanding personality traits through five core dimensions: Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism. Since the late 1990s, the Big Five model has established itself as the prevailing framework for understanding personality (DeYoung et al., 2007; John et al., 2008). Furthermore, personality traits play a crucial role in shaping consumer buying behavior (Otero-López et al., 2021). Previous research has extensively examined consumer impulse buying behavior in e-commerce, particularly investigating the impact of Big Five personality traits on such behaviors (Turkyilmaz et al., 2015; Ming et al., 2021).

The first factor, Openness to experience, is characterized by creativity, imagination, and receptivity to novelty (Zhao & Seibert, 2006). According to Wang et al. (2022) and Badgaiyan et al. (2016), individuals with high openness to experience are more drawn to novel ideas and innovative product offerings, making them more influenced by persuasive marketing and prone to impulsive buying decisions. In contrast, those with low openness tend to adhere to traditional preferences, exhibiting lower susceptibility to impulsivity and a preference for familiar products (Miao et al.,2019).

Conscientiousness is exemplified by being organized, self-disciplined, resilient, responsible, reliable and goal-oriented (Costa & McCrae, 1992). Consumers characterized by high conscientiousness are typically less impulsive in their buying behavior (Wang et al., 2022), as they carefully evaluate purchases and make more thoughtful decisions, which reduces their susceptibility to impulsive buying behavior (Miao et al., 2020).

Extraversion is marked by sociability, assertiveness, and a preference for engaging social interactions (Itani et al., 2020). Regarding extraversion, Wang et al. (2022) suggest that those with higher levels of extraversion may be more prone to impulsive purchases, as their sociability and receptiveness to external influences make them vulnerable to persuasive marketing tactics. Their tendency to engage with sellers and extend their shopping experience increases exposure to impulsive buying temptations.

Agreeableness is a personality trait defined by characteristics such as altruism, tolerance, empathy, and a propensity for nurturing and forgiving others (Barrick & Mount, 1991). Findings from Chen and Lee (2015) suggest that individuals with high agreeableness are more likely to trust others and make impulsive purchases compared to those with low agreeableness. Turkyilmaz et al. (2015) also argued that agreeableness plays a significant role in explaining online impulsive buying behavior, finding a positive association between agreeableness and impulsive buying.

Lastly, neuroticism pertains to one's ability to manage emotional stress and maintain psychological stability (Chen & Roberts, 2020). Concerning neuroticism, Miao et al. (2020) concluded that varying levels of neuroticism significantly influence the emotional pressure experienced by consumers, which can trigger impulsive purchases. When facing negative emotions, highly neurotic individuals may resort to impulsive buying behavior to seek temporary relief or instant gratification.

Although numerous international studies have explored the relationship between the Big Five Personality Model and impulsive buying behavior, few have specifically focused on Generation Z. Therefore, this study aims to fill this gap by examining the impact of Big Five personality traits on Gen Z's impulsive buying behavior in the e-commerce environment, offering insights into their unique consumer habits.

Therefore, the following hypothesis is derived.

- H1: Openness to experience has a positive relationship with online impulsive buying behavior among Gen Z
- H2: Conscientiousness has a negative relationship with online impulsive buying behavior among Gen Z
- H3: Extraversion has a positive relationship with online impulsive buying behavior among Gen Z
- H4: Agreeableness has a positive relationship with online impulsive buying behavior among Gen Z
- H5: Neuroticism has a positive relationship with online impulsive buying behavior among Gen Z

**Data collection and analysis**

The study was conducted using purposive and non-probability sampling methods. To collect data, a questionnaire specifically designed for the research context was developed and randomly shared across social media sites. 408 responses were collected, and the data was then analyzed using Structural Equation Modeling (SEM) techniques with Smart-PLS 4.0 software.

### 2.3. Research model

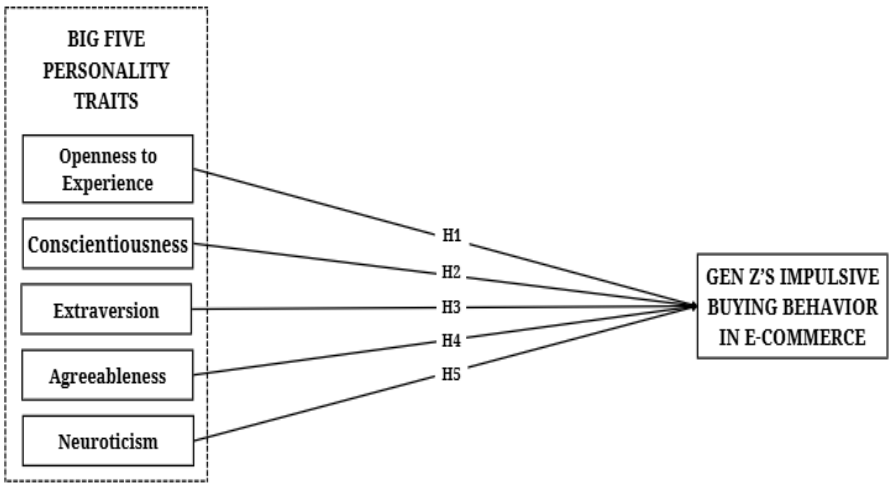
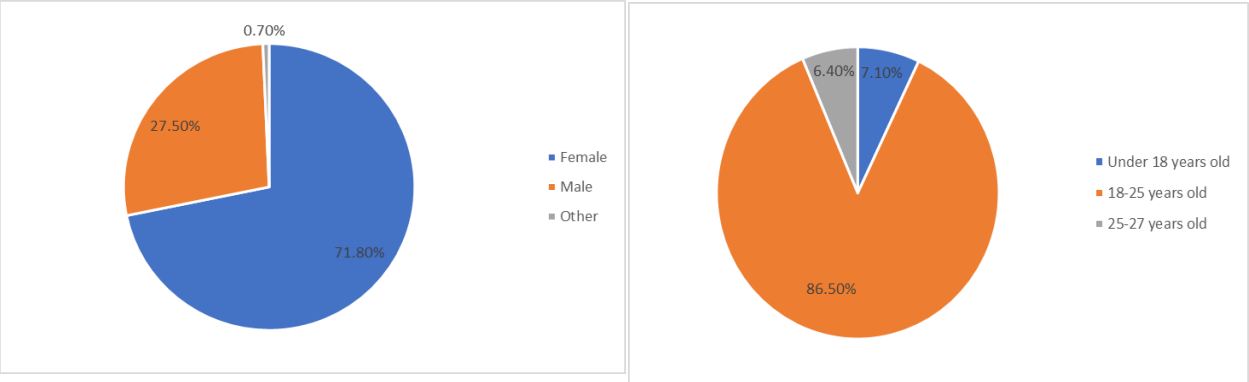



**Fig 2. 2 - Proposed Conceptual Model**

## III. RESULT AND DISCUSSION

### 3.1 Research subjects

According to the survey results on the Big Five personality traits and levels of impulsive shopping behavior among




Gen Z in Vietnam's e-commerce environment, following the total number of samples collected, the majority of participants are females which account for 71.8%, meanwhile the male participants make up 27.5% of the total numbers (Figure 3.1a).

**Fig 3. 1 - Results of demographic profile (N=408)**

The age distribution of the study group is illustrated in Figure 3.1b. The 18-25 age group represents the largest proportion of survey participants, accounting for 86.5%. This is followed by the 25-27 year-old age group, which comprises 7.1%. The under-18-year-old age group makes up the remaining percentage of the total sample. Most respondents engage in online shopping less than five times per month..

### 3.2. Model results

The results of the model analysis indicate that hypotheses potentially affect Gen Z's impulsive buying behavior in Vietnam's e-commerce environment (Figure 3.2)

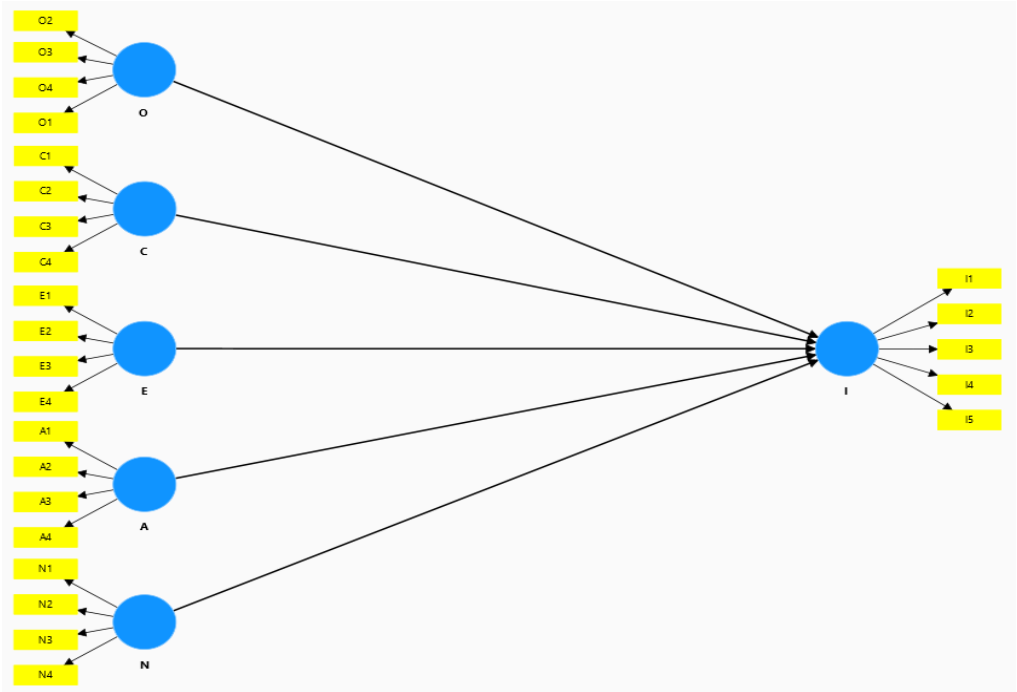



**Fig 3. 2 - Research model**

Table 3.1 shows the correlation results between variables and Online impulsive buying behavior . β = 0.423 indicates that individuals with higher levels of Openness to experience are significantly more inclined to engage in impulsive shopping behavior on e-commerce platforms. These individuals are naturally drawn to novelty and innovation, making them more receptive to new and creative products introduced by sellers, which can often result in

spontaneous purchases.

Similarly, β = 0.309 and β = 0.337, corresponding to Extraversion and Neuroticism respectively, reveal that individuals exhibiting higher levels of these traits are more prone to impulsive online shopping. Highly extroverted individuals are driven by their spontaneous interactions and heightened responsiveness to stimuli, leading them to make unplanned purchases. On the other hand, individuals with high neuroticism often experience negative emotions such as anxiety or distress, which can prompt them to indulge in impulsive buying as a coping mechanism to ease emotional instability.

Agreeableness, with β = 0.066, also influences impulsive shopping behavior, though its impact is notably minimal, as reflected in the model and survey findings.

Lastly, β = -0.340 for Conscientiousness underscores that individuals who score high in this personality trait are significantly less likely to engage in impulsive online shopping. Their strong sense of self-discipline and preference for structure enables them to exercise greater self-control, favoring planned and deliberate purchasing decisions over impulsive ones.

**Table 3. 1 – Results of β coefficient**

| Beta coefficient | |
|---|---|
| | **Online impulsive buying behavior** |
| Agreeableness | 0.066 |
| Conscientiousness | -0.340 |
| Extraversion | 0.309 |
| Neuroticism | 0.337 |
| Openness to experience | 0.423 |
| Online impulsive buying behavior | |

Table 3.2 evaluates the reliability and validity of variables using Cronbach's alpha, Composite reliability (rho_a), Composite reliability (rho_c) and Average variance extracted (AVE). The test results indicate that all variables have a Cronbach's Alpha coefficient ≥ 0.7 and Composite Reliability (CR) ≥ 0.7, demonstrating that the representative variables meet the required criteria and exhibit high reliability.

**Table 3. 2 - Reliability and validity of variables**

| | **Cronbach's alpha** | **Composite Reliability (rho_a)** | **Composite Reliability (rho_c)** | **Average Variance Extracted (AVE)** | **STANDARD** |
|---|---|---|---|---|---|
| **Agreeableness** | 0.885 | 0.904 | 0.920 | 0.742 | >0.7 |
| **Conscientiousness** | 0.888 | 0.920 | 0.921 | 0.746 | >0.7 |
| **Extraversion** | 0.872 | 0.875 | 0.912 | 0.722 | >0.7 |
| **Online impulsive buying behavior** | 0.922 | 0.924 | 0.941 | 0.763 | >0.7 |
| **Neuroticism** | 0.887 | 0.887 | 0.922 | 0.748 | >0.7 |
| **Openness to experience** | 0.890 | 0.897 | 0.923 | 0.751 | >0.7 |

**Table 3. 3 – The discrimination of the variables**

| | **Agreeableness** | **Conscientiousness** | **Extraversion** | **Online impulsive buying behavior** | **Neuroticism** | **Openness to experience** |
|---|---|---|---|---|---|---|
| **Agreeableness** | 0.861 | | | | | |
| **Conscientiousness** | 0.081 | 0.864 | | | | |
| **Extraversion** | 0.005 | 0.066 | 0.850 | | | |
| **Online impulsive buying behavior** | 0.103 | -0.202 | 0.341 | 0.873 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Neuroticism** | 0.057 | 0.110 | 0.135 | 0.365 | 0.865 | |
| **Openness to experience** | 0.103 | 0.177 | 0.020 | 0.391 | 0.046 | 0.867 |

Additionally, Table 3.3 assesses the discriminant validity of the variables, revealing that the highest values between variables are consistent. Therefore, the reliability of the variables and the authenticity discrimination of the variables are validated.

**Table 3. 4 - Results of the structural model**

| | **Original Sample (O)** | **Sample Mean (M)** | **Standard deviation (STDEV)** | **T statistics (\|O/STDEV\|)** | **P values** | |
|---|---|---|---|---|---|---|
| **Agreeableness -> Online impulsive buying behavior** | 0.066 | 0.074 | 0.038 | 1.747 | 0.081 | Non-support |
| **Conscientiousness -> Online impulsive buying behavior** | -0.340 | -0.345 | 0.040 | 8.481 | 0.000 | **Support** |
| **Extraversion -> Online impulsive buying behavior** | 0.309 | 0.310 | 0.048 | 6.513 | 0.000 | **Support** |
| **Neuroticism -> Online impulsive buying behavior** | 0.337 | 0.338 | 0.035 | 9.586 | 0.000 | **Support** |
| **Openness to experience -> Online impulsive buying behavior** | 0.423 | 0.421 | 0.039 | 10.737 | 0.000 | **Support** |

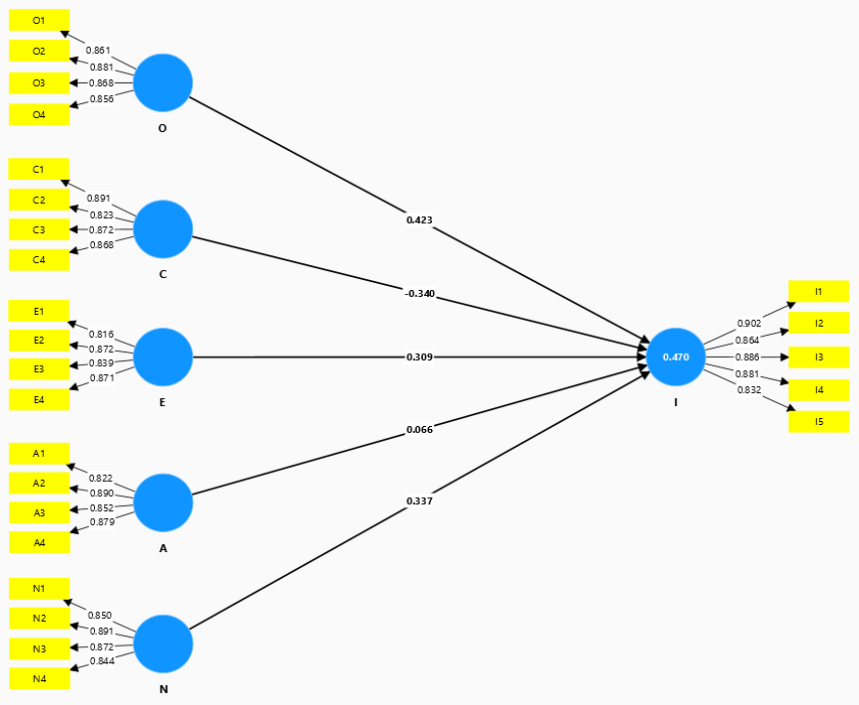



**Fig 3. 3 – The result of research model**

The analysis results depicted in Figure 3.2 reveal a strong correlation between most of the Big Five personality traits and Gen Z's impulsive buying behavior within Vietnam's e-commerce landscape. As presented in Table 3.4, the research findings highlight a significant interaction of Openness to Experience in influencing online impulsive buying behavior ($\beta = 0.423$). Furthermore, the p-values for Conscientiousness, Extraversion, Neuroticism, and Openness to Experience are all less than 0.05, indicating that hypotheses 2, 3, 4, and 5 are accepted. In contrast, the first hypothesis regarding the relationship between Agreeableness and online impulsive buying behavior has a p-value of 0.081, leading to the rejection of hypothesis 1.

## IV. CONCLUSION

### 4.1 Research Findings

The swift growth of e-commerce has significantly transformed customer behaviors, enabling greater accessibility to diverse products, competitive pricing and unparalleled convenience. In Vietnam, the adoption of online shopping has surged because of its ability to overcome geographical limitations and provide a purchasing experience. However, this convenience has also led to a notable rise in impulsive buying behavior, especially among Generation Z, which emphasizes the need to raise awareness of responsible consumption in the digital age. This study will analyze the influence of Big Five personality traits including Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism on Gen Z's impulsive buying behavior in online shopping by surveying in Vietnam. The results indicate that four out of five personality traits correlate with impulsive buying behavior in online platforms among Gen Z. Specifically, Conscientiousness, Extraversion, Open to Experience, and Neuroticism have significantly impacted on impulsive buying behaviors while there is a relationship between Agreeableness and impulsive buying behaviors. The primary purpose of this paper is to examine the correlations among these variables influencing Gen Z's impulsive buying behavior, particularly in the context of online shopping. Such behavior is identified as a significant driver of overconsumption - unplanned purchases driven by emotional and psychological factors, which trigger challenges for sustainability efforts and environmental protection. If younger individuals take control of their impulsivity and consume more cautiously; it can lead to avoiding wastefulness. Such behavioral shifts can contribute positively to environmentally sustainability, fostering a more responsible approach to resource usage and conservation. Addressing this issue requires fostering a culture of mindful consumption, particularly among younger individuals who are key drivers of consumer trends recently. This study will also help university students and younger people orientating investment deeply understand the necessity of budgeting apps, and automated savings platforms, which can educate them on topics like debt management, credit building, and long-term wealth creation. Therefore, it emphasizes the importance of fostering customer awareness and financial management as approaches to mitigate impulsive unsustainable consumption behaviors, which may promote more responsible and environmentally conscious purchasing decisions.

### 4.2 Limitations and Future Research Directions

This study has some limitations that should be considered. First, this research is restricted by its selective sampling and focuses only on Gen Z in Hanoi, primarily focusing on university students. These constraints may restrict the generalizability of the findings to broader. Future research will address these limitations by expanding other geographical samples and the scope of research. Such efforts will strengthen the reliability and practical relevance of the findings. Moreover, this research focuses on Big Five personality traits, while other factors such as self-discipline or narcissism may also play a significant role in defining impulsive shopping behavior in e-commerce. Therefore, future research should integrate additional personality dimensions to provide deeper insights into impulse buying motivations. Additionally, this study highlights the role of intrinsic traits in impulsive shopping behavior. However, intrinsic factors can be influenced or moderated by external factors such as marketing stimuli or cultural differences among countries. Future studies should adopt an integrated approach that considers both intrinsic and extrinsic factors in the online shopping environment. Furthermore, the impact of the Big Five on impulse buying behavior may not remain consistent across different contexts, different product categories or over time. Future studies could employ longitudinal studies to track change in this influence over time or conduct comparative studies across different groups and products to determine the stability of the relationship between personality traits and impulse buying behavior.

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# DYNAMICS OF HOUSEHOLD-LEVEL MULTIDIMENSIONAL ENERGY POVERTY IN VIETNAM

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**ABSTRACT**

This research examines the temporal changes of household-level energy poverty during the period 2012-2020 in Vietnam. Energy poverty is measured by multidimensional energy poverty, which comprises various types of energy access through cooking, electricity usage, service and entertainment appliances, and communication. The paper employs the Vietnam Household Living Standard survey in five consecutive datasets. The results indicate that the Vietnamese households have increasingly better quality of life as households have wide access to more various types of energy; thus, the MEPI index decreases steadily over the period. Research also shows that although the gap in energy poverty in urban and rural areas and among six regions has decreased, it still shows certain differences. This needs to be discussed in the government's inequality reduction policies in the coming time.

*Key words:* energy poverty, MEPI, regional disparity, households, Multidimensional Energy

## I. INTRODUCTION

Energy poverty is a key driver of socio-economic development and improves the quality of life (Valcic & Markuz, 2024; Zhang, 2024). Differences in infrastructure, economic conditions, consumption habits, and local policies create stark gaps in energy access across various regions (Pramanik et al., 2020; Tien & Quang, 2019). On an individual level, this impacts the livelihoods of energy-poor households, while on a broader scale, it hinders sustainable development, particularly poverty alleviation and energy sustainability.

Although there has been considerable research on energy access and energy poverty, these studies employ various methods to measure energy poverty (Katoch et al., 2023) or focus on a single factor like access to clean cooking energy (Domguia et al., 2024) or access to clean fuels and technologies (Sikdar et al., 2024). Another study in China uses two indicators, energy supply and energy consumption, to examine energy poverty (Zhang et al., 2024). This variation arises because energy poverty lacks a widely accepted definition, complicating its measurement (Guevara et al., 2023; Jones & Reyes, 2023).

Despite Vietnam's shift from traditional to modern energy sources, energy poverty has increased, particularly among poor households and ethnic minorities (Nguyen et al., 2019). Many households report dissatisfaction with their energy supply despite over 96% of households having access to electricity. Approximately 25% of households consume less than 50 kWh per month, indicating a gap between energy access and actual energy needs (Duong & Nguyen, 2021). Furthermore, energy poverty is exacerbated by regional disparities, with rural households and those in the northern and central coastal regions being most affected by temperature shocks, which reduce agricultural output and energy access (Feeny et al., 2021).

However, this paper identifies a significant research gap in the field of energy poverty. First, most existing studies focus on singular aspects such as electricity access or energy usage, while a multidimensional approach to comprehensively assess energy poverty remains limited. Second, in Vietnam, there is a notable lack of detailed analysis regarding disparities in energy access across key economic regions and between rural and urban areas over an extended period. Specifically, most prior studies have been limited to one or a few years, failing to capture the long-term trends and changes during the 2012-2020 period. This gap restricts a comprehensive understanding of the shifts and inequalities in energy access between different regions and sectors. Based on these findings, the research proposes solutions to narrow the energy access gap between regions, aiming to reduce energy poverty and ensure sustainable development.

## II. MEASURING MULTIDIMENSIONAL ENERGY POVERTY INDEX (MEPI)

We applied a multidimensional measurement based on the framework by Nussbaumer et al. (2012) to assess the Multidimensional Energy Poverty Index (MEPI), capturing energy consumption intensity across five categories: cooking facilities, electronic items, services, entertainment, and communications. Each category is assigned a weight of 0.2. From these categories, criteria are chosen due to the availability of data and based on Phung &Le (2024). As Cedano et al. (2021) mentioned, highlighted television usage—comparing color TVs and black-and-white TVs—to show energy consumption levels and household affordability. If a household cannot afford a color TV, it may reflect energy shortages or limited access to stable and sufficient electricity, offering deeper insights into their energy poverty status. As shown in table 1, these criteria include the use of eco-friendly cooking materials, air quality, access to electrical energy, using electric goods, heating or cooling, ownership of entertainment devices, and access to telecommunication technologies. Each criterion is coded as a binary variable with values '0' or '1,' where '0' indicates that the household is not energy poor, and '1' indicates energy poverty. Then, MEPI is calculated by adding a weighted average of these seven criteria. MEPI represents deprivation score, showing energy poverty level of households. The higher MEPI, the higher households are expected to be energy poor. Sabina Alkire (2014) mentioned that in developing countries, a threshold MEPI of 0.33 is defined as energy poverty. Thus, in our analysis, if a household's score exceeds the threshold of 0.33, its members are considered energy poor.

**Table 1. Measure Multidimensional Energy Poverty Index (MEPI)**

| Category | Variables | Weight | Households are considered to be poor energy if |
|---|---|---|---|
| **Cooking** | Eco-cook: Eco-friendly cooking materials | 0.1 | They cook with coal/coal briquettes/firewood/ farming products |
| | Air-quality: Air circulation quality in the house | 0.1 | They do not have gas stove or induction stove or electric stove |
| **Electricity usage** | Electricity: Access to electrical energy | 0.2 | They use electricity below 100 kW per year |
| **Luxury appliances** | Electric – device: Household use electric items for their convenient lives. | 0.1 | They do not own a refrigerator |
| | Thermal-device: Heating or cooling | 0.1 | They do not own heaters, air, conditioners, or fans |
| **Entertainment** | Entertainment: Ownership of leisure devices | 0.2 | They do not have a television (any type). |
| **Communication** | Communication: Access to telecommunication technologies | 0.2 | They do not have a landline or mobile phone. |

Furthermore, to evaluate regional poverty disparities, we calculate deprivation scores between rural and urban areas as well as among six regions. The regional codes range from 1 to 6, corresponding to the Northern Midlands and Mountainous Region (14 provinces), Red River Delta (11 provinces), North Central and Central Coastal Region (14 provinces), Central Highlands (5 provinces), and Southeast Region (6 provinces).

## III. DATA

The energy poverty data, encompassing cooking, electricity usage, luxury appliances, entertainment, and communications, were sourced from the Vietnam Household Living Standards Survey (VHLSS) for the period 2012-2020, provided by the General Statistics Office of Vietnam. This dataset is highly valuable and serves as a legally representative source of household data nationwide. For this study, the surveyed households were required to specify their average monthly energy consumption across different types of energy.

Of which five datasets ranging from 2012 to 2020, the observations are quite dispersed. Surveys on household consumption over the years have different sample sizes. In 2012, the number of households with data was 4,647, followed by 9,399 households for 2014 and 2016, and 9,398 households in 2020. In particular, in 2018, consumption data was conducted with a relatively large sample of 70,428 households.

## IV. RESEARCH RESULTS

### 4.1. Sample of households' energy poverty

A summary of households' energy poverty during the period 2012-2020 is provided in table 2. From that, the proportion of households inaccessible to energy criteria has mostly decreased over time.

Air-quality has shown a steady decline, decreasing from 10.76% in 2012 to 6.39% in 2020. This can be attributed to increased awareness among households regarding the use of cleaner, eco-friendly cooking materials like gas, induction, and electric stoves. The households with electrical energy poverty have decreased from 12.22% in 2012 to 4.24% in 2020. The most significant improvement has been observed in household electric goods, with the poverty rate decreasing from 24.42% in 2012 to 17.08% in 2020. However, this rate remains relatively high compared to other aspects, reflecting that many households, especially those in need of modern goods like refrigerators, still have limited access. The poverty rate regarding heating equipment has decreased from 14.03% in 2012 to 6.59% in 2020. Improved access to heating equipment has contributed to an enhanced quality of life, particularly in regions with harsh weather conditions such as the northern mountainous areas and the Central Highlands. The poverty rate in terms of telecommunications has decreased significantly from 17.67% in 2012 to 4.26% in 2020. The rapid development of information and communication technology (mobile phones, internet) has enhanced accessibility to these devices.

**Table 2. Number of poor households in each energy indicator, 2012-2020**

| Indicator \Year | 2012 | 2014 | 2016 | 2018 | 2020 |
|---|---|---|---|---|---|
| **Eco-cook** | 912 | 4671 | 3742 | 9100 | 2140 |
| | 19,63 (%) | 49,7 (%) | 39,81 (%) | 12,92 (%) | 22,79 (%) |
| **Air-quality** | 898 | 1325 | 1060 | 6166 | 600 |
| | 19,32 (%) | 14,1 (%) | 11,28 (%) | 8,76 (%) | 6,39 (%) |
| **Electricity** | 567 | 1007 | 767 | 2663 | 398 |
| | 12,2 (%) | 10,71 (%) | 8,16 (%) | 3,78 (%) | 4,24 (%) |
| **Electric – device** | 2549 | 3,868 | 3019 | 17201 | 1604 |
| | 54,85 (%) | 41,15 (%) | 32,12 (%) | 24,42 (%) | 17,08 (%) |
| **Thermal-device** | 652 | 1018 | 849 | 6383 | 619 |
| | 14,03 (%) | 10,83 (%) | 9,03 (%) | 9,06 (%) | 6,59 (%) |
| **Entertainment** | 467 | 720 | 709 | 6679 | 1145 |
| | 10,05 (%) | 7,66 (%) | 7,54 (%) | 9,48 (%) | 12,2 (%) |
| **Communication** | 821 | 951 | 682 | 5473 | 400 |
| | 17,67 (%) | 10,12 (%) | 9,03 (%) | 7,77 (%) | 4,26 (%) |

*Source: Calculation of authors based on VHLSS 2012-2020*

The following analysis will focus on clarifying the changes in energy poverty index according to different groups such as urban - rural and between regions. For the robustness of the analysis , table 3 shows ANOVA test for the differnces in the means of various groups and dependent variables. As shown, the P-value of all the tests are 0.00, showing that urban and rural group, or regional group have different means of MEPI and all components of MEPI at 95% confidence interval. These results confirm there exist mean gap among these groups that need to be futher analyzed.

**Table 3. ANOVA test on the differences between the means, by groups and dependent variables**

| Goup | MS | F | P-value |
|---|---|---|---|
| Dependent variable: MEPI | | | |
| Urban-Rural | 12.139 | 171.06 | 0.0000 |
| Regions | 8.0260 | 118.01 | 0.0000 |
| Dependent variable: Eco-cook | | | |
| Urban-Rural | 107.736 | 654.79 | 0.0000 |
| Regions | 42.275 | 275.30 | 0.0000 |

| | | | |
|---|---|---|---|
| Dependent variable: Air-quality | | | |
| Urban-Rural | 7.1774 | 121.51 | 0.0000 |
| Regions | 6.8792 | 122.42 | 0.0000 |
| Dependent variable: Electricity | | | |
| Urban-Rural | 4.8894 | 121.99 | 0.0000 |
| Regions | 4.9243 | 129.60 | 0.0000 |
| Dependent variable: Electric-device | | | |
| Urban-Rural | 19.006 | 136.10 | 0.0000 |
| Regions | 8.1650 | 59.43 | 0.0000 |
| Dependent variable: Thermal-device | | | |
| Urban-Rural | 6.4028 | 105.12 | 0.0000 |
| Regions | 7.0124 | 121.15 | 0.0000 |
| Dependent variable: Entertainment | | | |
| Urban-Rural | 2.3490 | 21.98 | 0.0000 |
| Regions | 4.3622 | 41.61 | 0.0000 |
| Dependent variable: Communication | | | |
| Urban-Rural | 1.2203 | 30.01 | 0.0000 |
| Regions | 0.1250 | 3.07 | 0.0000 |

*Source: Calculation of authors based on VHLSS 2012-2020*

**4.2. The dynamics in household-level energy access by areas in Vietnam during the period 2012-2020.**

The household energy poverty level in both rural and urban areas shows a decreasing trend across all seven criteria during the 2012-2020 period, except for the entertainment devices, which tend to increase. In general, rural households have higher levels of energy poverty than urban households. It is understandable that poor households and ethnic minorities mostly live in rural areas, heavily relying on traditional energy sources like coal and biomass to meet their energy needs. Another contributing factor was the rise in prices of modern fuels (e.g., LPG), which rural areas could not afford, leading to an increased use of cheaper fuels (such as coal, firewood, and wood).

Among the types of energy-related access, rural households face the greatest difficulty in accessing electronic goods. The poverty score for electronic goods is higher than 0.6 in 2012, three times larger than urban households. By 2020, the gap in the use of electronic goods between urban and rural areas has been smaller. Rural households have more conditions to buy refrigerators at home than before, therefore, poverty in electronic devices of rural households has decreased significantly and is only slightly higher than that of urban households.

In other poverty indicators, rural households have higher poverty reduction growth rates than urban households in environmental quality, electricity and mobile technology. It can be observed that the decline in eco-friendly cooking materials usage was more effective in rural areas due to increasing modernization, which gradually reduced the need for eco-friendly cooking materials. In urban areas, although the decrease was small, it still reflected a shift in cooking practices, as people stopped using harmful fuels to reduce negative impacts on the environment and health. This change resulted from greater environmental awareness among the population, along with the recognition of the harmful effects of emissions (e.g., CO, CO2) from cooking fuels on health.

For criteria electrical energy, household electric goods, and heating or cooling, both rural and urban areas experienced a decline in the rate of non-access. In rural areas, the decline was more pronounced: electrical energy dropped from 0.155676 in 2012 to 0.058339 in 2020, household appliances decreased from 0.651912 in 2012 to 0.202283 in 2020, and heating and cooling devices fell from 0.168624 in 2012 to 0.084179 in 2020. These improvements were facilitated by government policies, with local authorities and communities working together to address multidimensional energy poverty. Rising and more stable incomes allowed people to access more devices. In urban areas, where living standards were already higher than in rural areas, the changes were less significant. Electricity decreased from 0.037707 in 2012 to 0.009737 in 2020, household electric goods dropped from 0.289593 in 2012 to 0.106459 in 2020, and heating and cooling devices fell from 0.069382 in 2012 to 0.028562 in 2020. Urban areas, with

initially low energy non-access levels, saw improvements in infrastructure and living standards, reflecting effective policies and improved quality of life.




**Figure 2. Temporal trends in energy access inequalities across urban-rural areas.**

*Source: Calculation of authors based on VHLSS 2012-2020*

Regarding leisure, our study examined access to color or black-and-white television. Both rural and urban areas showed a slight increase in non-access levels during this period. In rural areas, non-access rose from 0.121048 in 2012 to 0.133006 in 2020, while in urban areas it increased from 0.049019 in 2012 to 0.099318 in 2020. This increase can be explained by the growing demand for satellite TV, as traditional terrestrial TV is no longer widely available. Some low-

income households could not afford the necessary services, leading to a rise in ownership of entertainment devices issues. For the access to telecom technologies criterion, with the ongoing development of technology and the widespread availability of the internet, information is increasingly accessible through mobile phones. As a result, non-access to communication energy decreased in both rural and urban areas, with rural areas dropping from 0.2162 in 2012 to 0.050571 in 2020 and urban areas decreasing from 0.077677 in 2012 to 0.02629 in 2020.

**4.3. The dynamics in household-level energy access by regions in Vietnam during the period 2012-2020**

Figure 3 shows that the Northern Midlands and Mountains and the Central Highlands are the two regions with the highest energy poverty levels in all indicators. In contrast, the Red River Delta and the Southeast are two regions with developed economic conditions, rapid urbanization, high average income and access to modern tools, and people here have the lowest poverty indicators.

Especially, in the indoor air quality criterion, the Northern Midlands and Mountains saw a considerable decline (plummeted from 0.471 in 2012 to 0.183 in 2020). Households have used more gas stoves and electric stoves than traditional cooking methods compared to the past. However, households in this area still use a lot of environmentally unfriendly cooking materials, resulting in an increasing trend in this kind of environmental energy poverty in the period 2012-2020. Higher levels of non-access to cooking energy are seen in those areas as a result of inadequate infrastructure, low income, and the ongoing reliance on traditional energy sources. On the other hand, clean energy sources are easier to access in urban or more developed areas.

As telecom technologies criterion, non-access levels decreased significantly across all six regions. However, it is worth noting that in the period 2012-2022, the regional differences in information technology began to narrow. Preferential policies for the development of technology infrastructure in mountainous and disadvantaged areas have created many opportunities for households in disadvantaged areas to access information technology, wireless and mobile phones. Table 3 also shows that a very small proportion (4.26%) of households do not have a telephone nationwide. This makes the gap in the use of communication devices in the regions increasingly narrow. Figure 3 shows that the mountainous and midland regions in the North or the Central Highlands all have access to communication devices almost equal to other regions in the country in 2020.

In the electricity criterion, all six regions saw a decline in the trend of not having access to power. Households also switched from using biomass energy (such as coal or firewood) to electricity, which enhanced their standard of living and decreased their dependency on non-sustainable energy sources. In the heating and cooling devices criterion, the non-access levels remained relatively unchanged across the regions over the years. Depending on the climate and the lifestyle needs of households in different regions, some households may not perceive the necessity of using heating or cooling devices. In cases where there is a demand, high electricity costs may limit the ability to access such devices.

The MEPI is calculated as weighted average of energy indicators as mentioned in table 1. This index shows that households are considered poor when the weighted average of the above criteria is greater than 0.33. Figure 4 shows the differences over time by region and area.

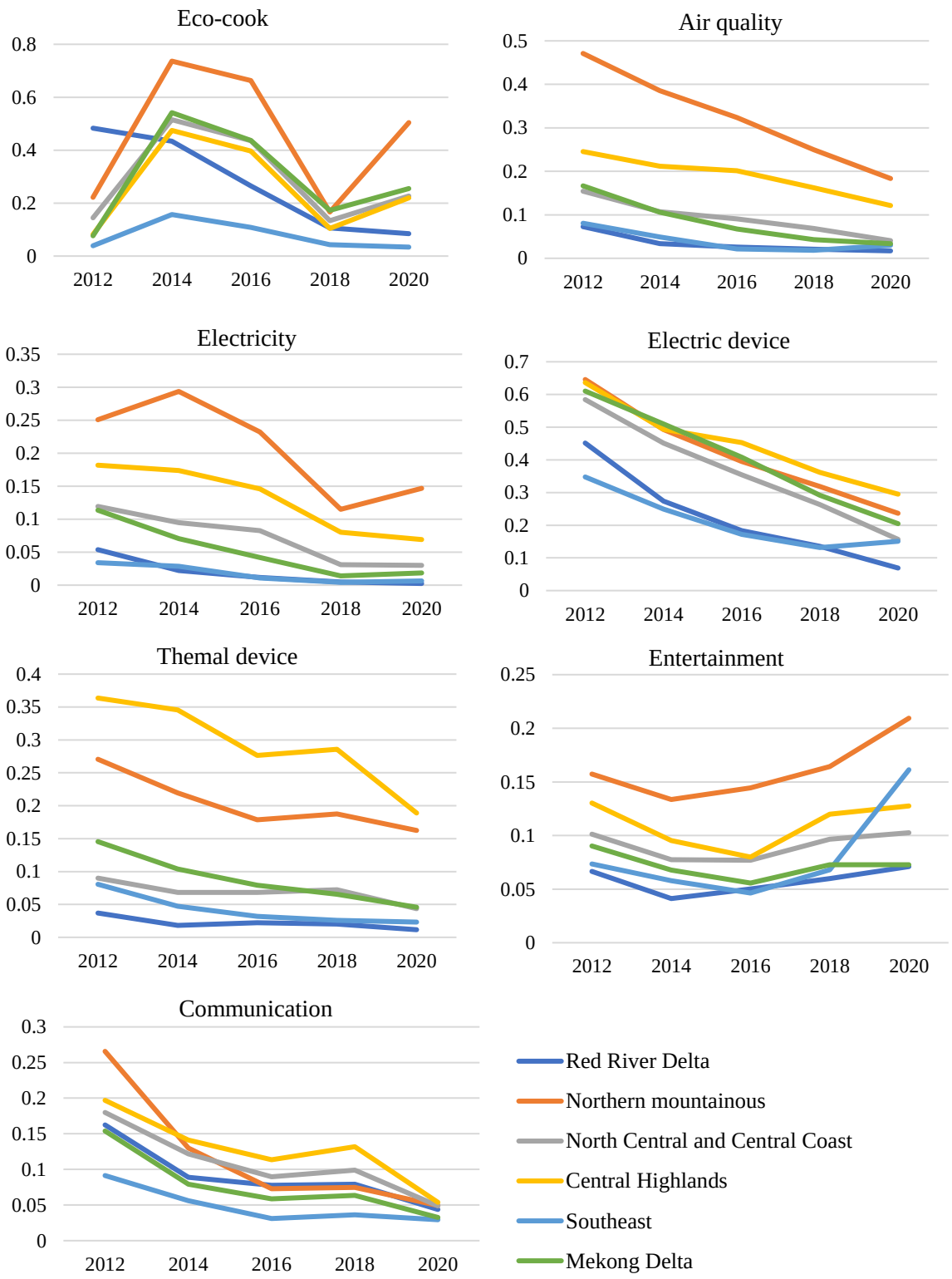



**Figure 3. Temporal trends in energy access inequalities across region gradients**

*Source: Calculation of authors based on VHLSS 2012-2020*

**4.4. The trend of changes in the Energy Poverty Index (MEPI) categorized in Viet Nam during the period 2012-2020.**

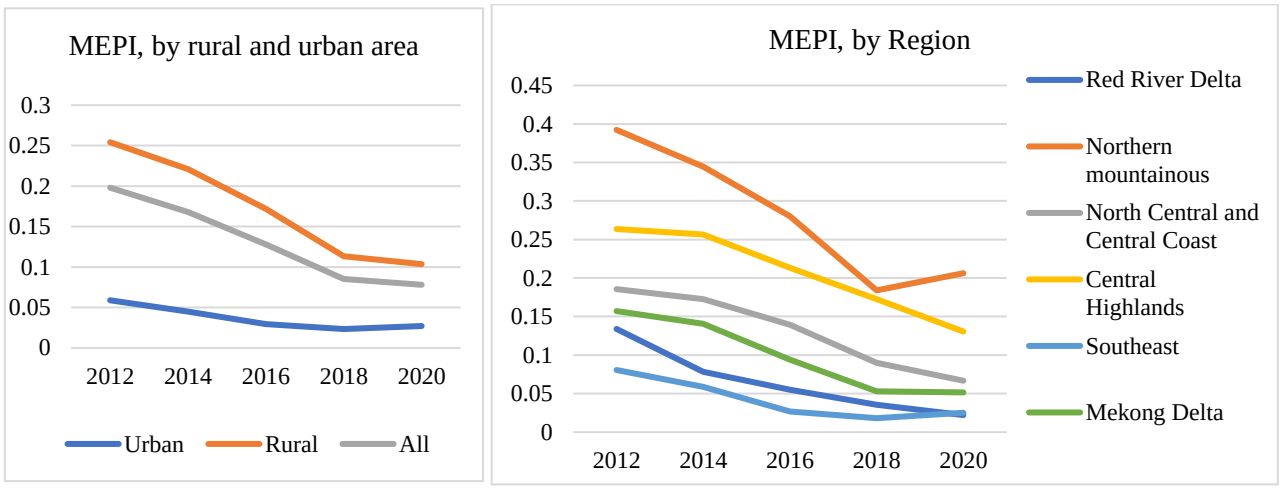
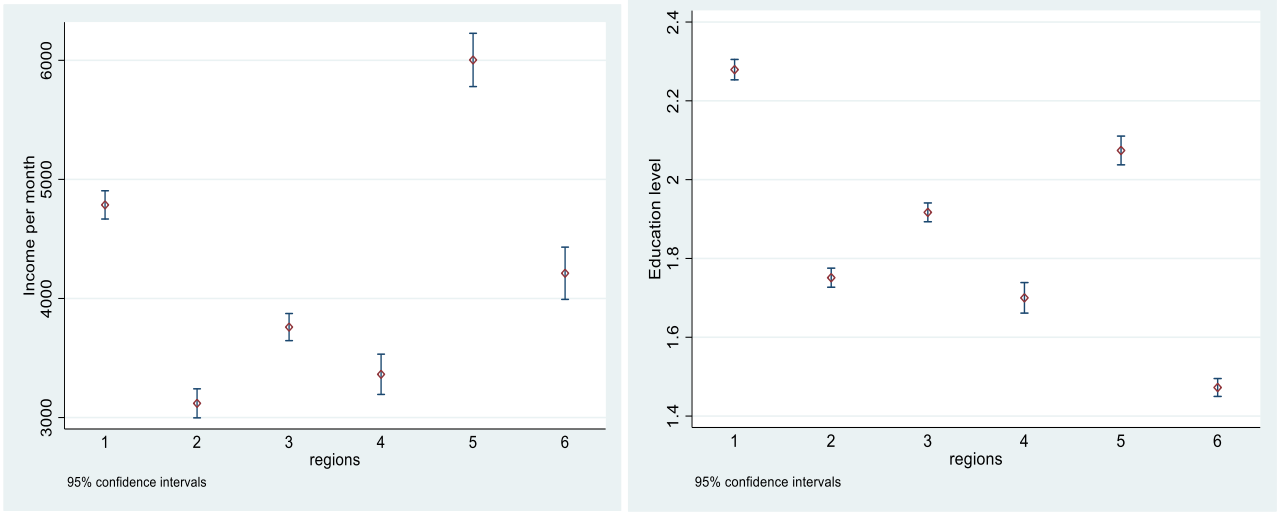



**Figure 1. Temporal trends in the Energy Poverty Index (MEPI), 2012-2020**

*Source: Calculation of authors based on VHLSS 2012-2020*

It can be seen that energy poverty level in Vietnam tends to decrease during 2012-2020. In 2020, the rate of energy poverty reduction slowed down compared to the previous period. In particular, poverty gap between urban and rural areas was very large at the beginning of the period, but the gap has gradually narrowed to half of what it was before. The difference between the two areas decreased from 0.1953 in 2012 to 0.0766 in 2020. This change reflects rural households' living conditions beginning to improve, reducing the wealth disparity between rural and urban areas.

However, energy poverty disparity among regions is still significant. The Southeast region captures the highest levels of energy access, so the energy poverty index is the lowest, ranging from 0.081 (2012) to 0.025 (2020). The Red River Delta and the Southeastern Region are both economic hubs with advanced industrial and urbanization development and state-of-the-art energy infrastructure, making them regions with favorable energy access circumstances. These advantageous circumstances enable energy sources to swiftly reach the populace, assisting in the fulfillment and enhancement of their energy requirements.




(4a) (4b)

**Figure 2. Confidences Interval Plot of income among regions and education level among regions, 2020.**

(4a): Unit of income; 1,000VND; (4b): Educational level ranges from 0 (no school) to 8 (Doctoral degree)

(4a), (4b): 1: The Red River Delta; 2: Northern midland and mountainous; 3:North Central and Central Coast; 4: Central Highlands; 5: Southeast; 6:Mekong Delta.

*Source: Calculation of authors based on VHLSS 2020*

The rate of energy poverty reduction is strongest in the Northern midland and mountainous region and the Central Highlands. These regions have challenging terrains, mainly mountainous areas, and limited energy infrastructure,

making modern energy access more difficult. The gradual reduction in the MEPI index reflects efforts to improve modern energy access nationwide. However, the substantial disparities between regions indicate that there are still inequalities in energy access. More priority should be given to regions with high MEPI, such as mountainous and midland regions of the North and the Central Highlands.

Factors affecting regional differences in energy poverty may come from income or education levels. Figure 4 shows that regions with high average income or high education levels have correspondingly low energy poverty. Therefore, economic and cognitive factors affect the quality of life of people in different regions.

## V. CONCLUSION

This research analyzes the dynamics of household-level energy poverty during the period 2012-2020 in Vietnam. The results indicate that the degree of energy deprivation tends to decline over time. The growth rate of energy poverty reduction slow down at the end of the period. The results also show that energy access is quite dispersed between rural and urban areas as well as among six regions in the country. The disparity between urban and rural households narrows down, although both regions exhibit a declining trend in the Energy Poverty Index (MEPI). Regarding economic regions, there is a significant disparity between the Northern and mountainous region and the Southeast. This makes for an uneven level of energy poverty among the six regions, although the MEPI tends to be downward for all.

Local measures have been largely explanatory for the MEPI index's recent improvement. Although the gap still exists, these improvements have been somewhat successful. Focus must be placed on creating all-encompassing instruments, expanding national regulations, and increasing public knowledge of this problem. First, in order to increase access to electricity, especially in mountainous areas, infrastructure should be upgraded through investments in the national power grid. Second, in order to decrease the usage of agricultural waste and enhance indoor air quality, social welfare policies and public awareness campaigns regarding environmental pollution should be created. Third, it is essential to promote the use of renewable energy sources and provide financial assistance programs to lessen the financial strain on households' energy access. Since energy poverty has many facets and is very difficult to properly reduce, this is not a problem that can be solved quickly.

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# FLOODING IN RURAL SOUTHEAST ASIA: HEALTH IMPACTS

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**ABSTRACT**

This research combines flood data extracted from satellite images with a rich panel data set of household surveys to examine the effects of floods on human health in six provinces of Vietnam and Thailand. We examine three health outcomes covering nutritional status and disease exposure as well as the effectiveness of different coping mechanisms. An increase in the share of village areas covered totally by water is associated with an average increase of around 13% in the likelihood of being underweight varying by gender and age groups. While experience of suffering from serious diseases and negative health status is a story composed of many factors, in which adaptation plays a significant role. We investigate several coping strategies commonly used by rural households in Southeast Asia. However, we only find a significant degree of success in assets strategy to deal with flood-related health impacts.

*Key words: "*Flood, health", "GIS", "MODIS images", "Vietnam", "Thailand"

## I. INTRODUCTION

Floods have long been considered one of the most common and destructive natural disasters globally, with severe impacts on human health and well-being. According to the Intergovernmental Panel on Climate Change (IPCC), the frequency and intensity of climate-related extremes, including floods, have been increasing in many regions due to climate change (IPCC, 2021). The World Bank has also highlighted weather shocks as a significant poverty risk factor, especially for countries in the Global South (Bangalore et al., 2016).

Asia remains the region most affected by floods, accounting for nearly 50% of global flood-related fatalities (UNDRR, 2022). A historical review of flood events from 1980 to 2019 across multiple databases reported approximately 539,811 deaths, 361,974 injuries, and 2,821,895,005 people affected by floods worldwide (Doocy et al., 2013; EM-DAT, 2022). The primary cause of flood-related mortality is drowning, but the true scale of the impact is likely underestimated due to inconsistent reporting, particularly for the injured and affected populations (Doocy et al., 2013).

Flood impacts on human health are widespread and complex, affecting communities unequally and differing in both the short and long term, as well as direct and indirect consequences (Alderman et al., 2012). Understanding the multifaceted nature of flood-related health risks is crucial for developing effective disaster risk reduction and climate change adaptation strategies, especially in vulnerable regions like rural Southeast Asia.

Despite the comprehensive insights provided by the existing literature, several research gaps remain. One key gap is the need to utilize more objective data sources, such as satellite imagery, to assess the associations between flood burden and health outcomes. This could provide a more comprehensive and quantitative understanding of the linkages between flooding and various health impacts, moving beyond the reliance on epidemiological studies and self-reported data. Additionally, more research is needed to examine the heterogeneity of flood-related health impacts based on socioeconomic factors and the availability of health services and insurance coverage within rural Southeast Asian communities. This would help uncover any disparities in vulnerability and access to healthcare, which could inform the development of more equitable disaster risk reduction and flood management strategies. Furthermore, the existing literature has tended to focus on a relatively limited number of urban areas. Expanding the research to encompass a broader range of rural communities across the region could provide valuable insights into the context-specific drivers and manifestations of flood-related health impacts. Finally, the long-term health impacts of flooding remain an area that requires further investigation, as more longitudinal studies are needed to better understand the trajectories of recovery and the factors that influence long-term health outcomes among flood-affected communities in rural Southeast Asia.

Addressing these research gaps through rigorous, multidisciplinary investigations could contribute to a more

comprehensive and nuanced understanding of the health consequences of flooding in rural Southeast Asia. This knowledge could then inform the development of evidence-based, context-sensitive policies and interventions to enhance community resilience and safeguard public health in the face of increasing flood risks.

This research aims to provide an understanding of the evidence on the human health impacts of flooding in rural Southeast Asia, a region highly susceptible to these disasters due to its geography, climate, and socioeconomic conditions. This study will contribute to a deeper understanding of the complex pathways through which floods affect the health and well-being of rural communities in the region, informing policy and practice to enhance resilience and improve health outcomes.

**Literature review and research gaps**

A systematic review of 212 epidemiological studies (Ahern et al., 2005) indicates that flood-related deaths typically occur acutely due to drowning or trauma, such as being struck by objects in fast-moving waters. Flood events can also lead to a range of injuries, as individuals attempt to evacuate themselves, their families, or valued possessions. Furthermore, the clean-up process after floodwaters recede may pose additional injury risks. Flooding can also facilitate the spread of waterborne diseases, especially in areas with limited access to clean water and sanitation. Rodent-borne diseases may also increase due to altered contact patterns during heavy rainfall and inundation. The relationship between flooding and vector-borne diseases is complex, as floodwaters may both create breeding grounds for mosquitoes and flush away existing sites.

Building on this foundational understanding, the literature further explores the diverse health implications of flooding in South Asia. For instance, studies have examined the factors influencing vulnerability to diarrheal diseases during and after severe floods in Bangladesh (Hashizume et al., 2008; Kunii et al., 2002). Expanding the geographic focus, researchers have investigated the water-energy-food nexus and its climate risk implications, including flooding, in Southeast Africa (Mabhaudhi et al., 2019), and the vulnerability of Da Nang, Vietnam, to floods and strategies for enhancing resilience, which hold relevance for rural Southeast Asia (An et al., 2022). At the local level, understanding farmers' perceptions and addressing context-specific constraints are critical for effective climate change adaptation in agriculture (Le Dang et al., 2014). Flood risk assessment and coping capacity have emerged as crucial factors in developing targeted flood risk management strategies and adaptation measures (Vu & Ranzi, 2017). Moreover, the transformation of household livelihoods in response to flood control schemes requires participatory and holistic approaches to flood management that consider the diverse needs and vulnerabilities of local communities (Tran & James, 2017). Projections of future flood dynamics in the Vietnamese Mekong Delta further highlight the need for long-term flood risk management and adaptation planning in the region (Triet et al., 2020). A comprehensive and context-sensitive approach to flood damage evaluation is essential for informing robust and equitable disaster risk reduction strategies (Molinari et al., 2014).

The literature also suggests that floods can increase the global burden of disease, morbidity, mortality, and social and economic disruptions, placing ongoing stress on health services, particularly in low-resource countries (Du et all., 2010). Qualitative research indicates that symptoms of stress and mental disorders can persist for years after a flood event (Tapsell & Tunstall, 2008). However, studies have shown that psychological distress can be reduced through coordinated awareness of flood risks, flood protection, and prevention behavior, the development of simple insurance procedures and protocols for fast recovery, and learning from previous experiences (Correa et al., 2017). Disruptions to transportation and essential services during flood events may also contribute to psychological distress among affected populations (Yoda et al., 2017), and even small-scale floods can significantly disrupt communities and have substantial physical and mental impacts (Tapsell & Penning-Rowsell, 2002).

According to a systematic review of 35 published articles over the period 2004-2011 (Alderman et al., 2012), floods are estimated to have caused almost 53,000 deaths globally, with the majority occurring in resource-poor countries and communities due to their greater vulnerability and weaker disaster management systems. Non-fatal injuries and the exacerbation of chronic illnesses are the leading causes of morbidity, occurring before, during, and after flood events, including during the clean-up phase and repopulation. Floods can also trigger the release of chemicals, leading to toxic exposure-related health impacts. Additionally, floods are associated with increased risks of

communicable diseases, including waterborne illnesses, hepatitis, respiratory and skin infections, leptospirosis, and vector-borne diseases transmitted by mosquitoes. The long-term health impacts of flooding remain complex and not well understood.

Building on these insights, recent studies have examined the urban development and landscape characteristics of Can Tho City (CTC), a strategic center in Vietnam's Mekong Delta, and explored strategies for enhancing the city's resilience to climate change-induced flooding (Van Long & Cheng, 2018). Additionally, researchers have used a Flood Vulnerability Index (FVI) to assess the flood vulnerability of Chilmari upazila in Bangladesh, identifying highly vulnerable areas and informing targeted mitigation efforts (Islam & Hasan, 2023). In Bangkok, a study investigated residents' perceptions of the causes of persistent flooding, highlighting the need for a multi-stakeholder approach to address the physical and institutional barriers to effective flood mitigation (Thanvisitthpon et al., 2018).

Most studies on the effects of floods on human health are based on the subjective responses of people living in the affected area. In this study, we aim to provide evidence-based on objective satellite floodwater images from NASA's MODIS Near Real Time Global Flood Water (MFW) database.

## II. MATERIAL AND METHODOLOGY

We use a panel dataset of rural households in Thailand and Vietnam collected by the "DFG-FOR 756: Vulnerability to Poverty in Southeast Asia" project (TVSEP, n.d.). This data source is combined with flood data retrieved from daily satellite MODIS Flood Water images (MFW) version 4.9 provided by NASA and processed with Geographical Information Systems (GIS). Merging these two data sources allows us to estimate the impact of varying flooding intensities on an array of health outcomes in a panel regression.

### 2.1. Household dataset

The household surveys were targeted at rural households in six provinces of Vietnam and Thailand. These include three provinces in Northeast Thailand and three provinces from the northern central coast and western highlands in Vietnam. In total, 4400 rural households were interviewed following a three-stage cluster sampling design. In Vietnam, the sampling design further included strata for different agroecological zones. (Hardeweg et al., 2007). In this paper, we use the data from the first four waves conducted in 2007, 2008, 2010, and 2013. Attrition over the four-year panel is relatively small and leaves us with a full sample of around 4000 households. The household data contains information about the demographics, health, educational achievements, economic activities, agricultural activities, shocks and risks, employment, financial activities, assets, and housing conditions of the sampled households. The surveys also include fundamental information on the villages based on the responses of the village heads.

The main outcomes of interest are self-reported health, disease prevalence, and anthropometric measures. In order to measure nutritional outcomes, we use Body Mass Index (BMI) for adults and WHO z-scores for children, to calculate binary indicators for "underweight" following the standard WHO classification. The binary variables of "sickness" and "serious disease" take a value of one if the respondents report "experiencing general sick health" or "having suffered serious disease or injury". In the surveys, health expenditures are recorded at the household level; they are the aggregate of all health-related expenditures including doctor fees, medical expenses, and other health care expenses.

### 2.2 Flood data

This study uses the same method in (Tu Le, 2020) to create flood indicators, in which we retrieved flood areas from daily satellite MODIS Flood Water Image (MFW). With the support of Geographic Information System (GIS) and Google Earth tools, we created the main indicators for this research as follow;

First, we download the daily satellite MFW product version 4.9, which produces daily surface and floodwater maps at approximately 250m resolution, in 10x10 degree tiles for location 100E020N-South Indochina. This location covers six provinces in the study. MFW images are used for the period between 2003 and 2013. Second, in GIS the MFW image was processed and coded for the day that image was taken, for example. The principle of MFW is that MFW removes from the MODIS Surface Water image as a reference or expected water layer, such that the remaining water is likely to show flooding. MFW only indicates where water has been detected, but not how deep the water was. We unify all daily MFW into yearly flood measures. Third, the images were merged into village boundaries in GIS. We use the proportion of the village area that has been flooded during the year as the main exposure for our analysis.

### 2.3 Research method

Pooled OLS and fixed effect regression models are used to estimate the effect of flooding on individual health outcomes, using the following regression specification:

$$H_{it} = \gamma_i + \alpha_1 F_{vt} + \beta X_{it} + \gamma_i + \rho_t + \varepsilon_{it} \quad (1)$$

Where $H_{it}$ are health outcomes of individual I at time t. $H_{it}$ is measured in three ways: (a) a binary underweight indicator based on WHO classification, (b) a binary disease variable that takes the value of one if respondents report having suffered from a "serious disease or injury", and (c) a binary sickness variable takes the value of one if respondents report their general health status to be "sick". $X_{it}$ a matrix of covariates observed for each individual i at time t, and $\gamma_i$ are the individual-level fixed effects capturing time-invariant features of each individual. In the pooled OLS regression, the fixed effects are removed. Finally, $\rho_t$ is the wave fixed-effects to account for the unobserved difference between survey years, and $\varepsilon_{it}$ is the error term with standard errors clustered at the village level. The explanatory variable of interest is $F_{vt}$, which is the average proportion of a village's area that has been covered by floodwater in the previous year of the survey, thus ranging from 0 to 1. The parameter estimate $\alpha_1$ will give the average marginal effect at the mean of an increase in water coverage from 0 to 1.

To examine the role of coping strategies in reducing the effects of floods on individual health conditions, we use the model (1) and interact our flood measure with a set of coping mechanisms including possession of public or private health insurance, assets value, off-farm income, and income from saving accounts.

## III. RESULT AND DISCUSSION

### 3.1 Descriptive statistics

Table 1 below provides summary statistics of the main variables used in the analysis. The sample is pooled across all four waves. The sample is split equally between males and females with an average age of around 33. Roughly 19.3% of the individuals are underweight, which is about 12.5% for Vietnam and 6.8% for Thailand; about half of them are children and the elderly. The share of the respondents indicating that they have suffered from serious diseases is 16%, as compared to 10% reporting experiencing generally sick health. Albeit the survey covers rural areas, health coverage is quite high: 80% of the respondents have a free health card, and another 9% are covered by private health insurance. On average, the households in the surveys have four people in each house. Approximately, 14% of the heads of households have completed their secondary school. The dependency ratio in the sample is quite high; this phenomenon demonstrates that in households in rural Southeast Asia, grandparents in the villages take care of grandchildren while people of working ages work beyond their villages. The average annual total consumption per capita is 1740 USD; this is approximately 90% of their income per capita (2112 USD). It can be seen that the distribution of the consumption is mainly for food and rice, which is about 65% of the total, while the expenditure on health is only 3%. The rural people seem to have a close bond with the surrounding community. To get health care, the average time from home to the nearest hospital (or clinic) is about 30 to 45 minutes.

**Table 1: Descriptive Statistics of the Studied Sample**

| | Mean | SD | Min | Max |
|---|---|---|---|---|
| **Individuals** (N = 78,472) | | | | |
| Age (in completed years) | 33.71 | 20.36 | 0.00 | 110 |
| Male (1/0) | 0.49 | 0.50 | 0.00 | 1.00 |
| Children (1/0) | 0.19 | 0.40 | 0.00 | 1.00 |
| Elder (1/0) | 0.12 | 0.32 | 0.00 | 1.00 |
| Underweight (1/0) | 0.193 | 0.38 | 0.00 | 1.00 |
| Serious disease (1/0) | 0.16 | 0.37 | 0.00 | 1.00 |
| Sickness (1/0) | 0.10 | 0.29 | 0.00 | 1.00 |
| Free health card (1/0) | 0.80 | 0.40 | 0.00 | 1.00 |

| | | | | |
|---|---|---|---|---|
| Private health card (1/0) | 0.09 | 0.28 | 0.00 | 1.00 |
| **Households** (N = 15,967) | | | | |
| Household size | 4.09 | 1.75 | 0.00 | 19.00 |
| Education of head | 0.14 | 0.34 | 0.00 | 1.00 |
| Dependency ratio | 0.66 | 0.70 | 0.00 | 6.00 |
| Total income per capita | 2112.19 | 5024.96 | -39506.96 | 256944.19 |
| Total consumption per capita | 1739.62 | 1603.54 | 114.37 | 55966.61 |
| Consumption per capita for foods | 817.10 | 673.07 | 17.03 | 14611.09 |
| Consumption per capita for health care | 41.47 | 232.62 | 0.00 | 16560 |
| Share underweight in household | 0.24 | 0.32 | 0.00 | 5.00 |
| Share serious disease in household | 0.22 | 0.31 | 0.00 | 5.00 |
| Share sickness in household | 0.14 | 0.26 | 0.00 | 5.00 |

*Sources: Sample of panel household data 2007, 2008, 2010, 2013; authors' calculation.*

*Notes: consumption and income variables have been converted to 2005 USD.*

Figure 1 displays the number of days of villages in the samples that had been flooded over 10 years, from 2004 to 2014. Half of the villages in the sample had never been affected by floods, and half of the other villages had flood water at least one day in a year. In the sample, there are 3 provinces less affected including Buriram, Daklak, Nakhom-Phanom, and 3 other provinces are more affected including Thua-Thien-Hue, Ha-Tinh, and Ubon-Rathathani. Among the 6 provinces of the sample, Buriram is the least affected province, and Thua-Thien-Hue is the most affected province. In Buriram, there is only about 5% of villages have been flooded for more than 10 days in a year, the most affected village in Buriram was flooded for about 100 days with coverage of about 35% of its area. Meanwhile, Thua-Thien-Hue has up to 10% of villages in the sample exposed to flood water for more than 100 days per year, those villages were covered by flood water over 50% to 100% of their area.

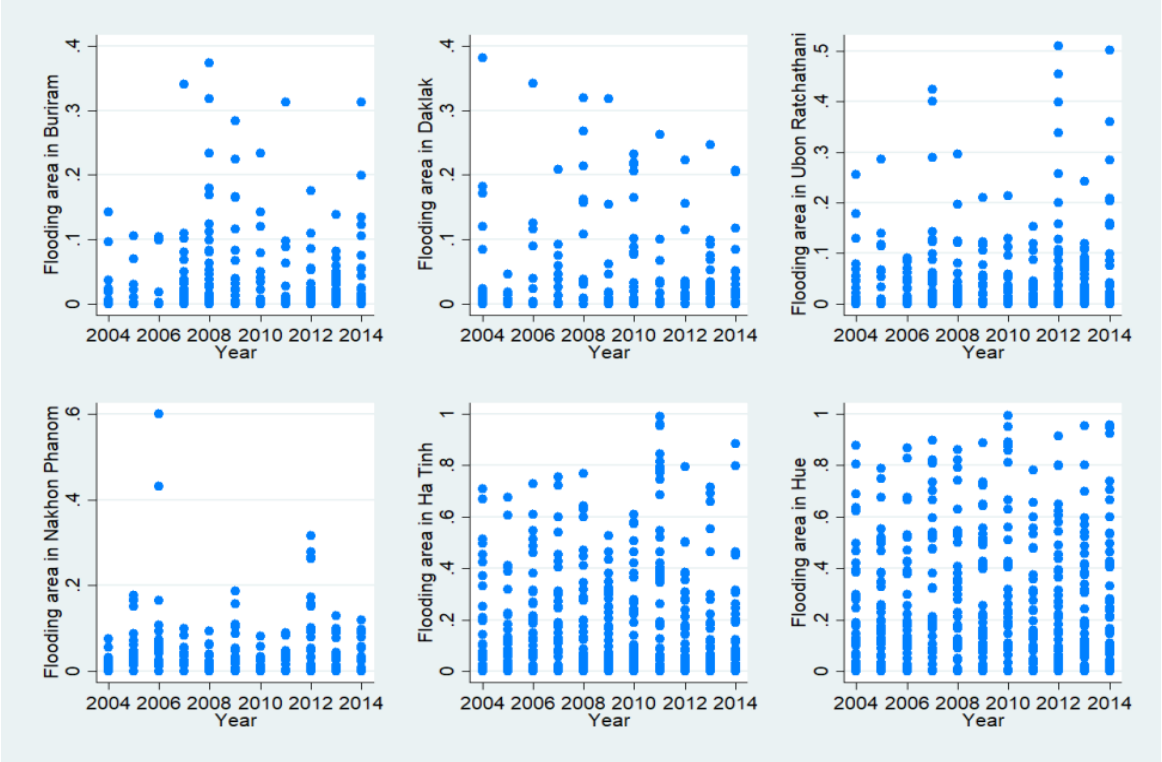



**Figure 1: Flooding area of villages in 6 Provinces, from 2004 to 2014**

*Source: Authors use GIS to create flooding map, and Stata to draw graphs*

**3.2 research results**

This section of the paper presents the results of our empirical analysis. First, we examine the effects of floods on health at the individual level, and then we assess the importance of coping strategies through formal and informal insurance mechanisms. All results use heteroscedasticity robust standard errors clustered at the village level.

**Table 2: The relationship between floodwater and underweight**

| | (1) | (2) | (3) |
|---|---|---|---|
| | **Underweight** | **Underweight** | **Underweight** |
| **Flood** | 0.123*** | 0.0830* | 0.143*** |
| | (4.59) | (2.43) | (4.35) |
| **Age group** | 0.0515*** | 0.0501*** | |
| | (13.26) | (12.96) | |
| **Household size** | 0.00115 | 0.00104 | 0.000822 |
| | (0.85) | (0.77) | (0.61) |
| **Dependency ratio** | 0.0159*** | 0.0147*** | 0.00489 |
| | (4.74) | (4.42) | (1.48) |
| **Assets, lagged** | -0.0154*** | -0.0152*** | -0.0154*** |
| | (-9.86) | (-9.74) | (-9.90) |
| **Head education** | 0.00183 | 0.00188 | 0.00313 |
| | (0.77) | (0.79) | (1.31) |
| **Cooking fuel** | -0.0254*** | -0.0258*** | -0.0249*** |
| | (-5.52) | (-5.57) | (-5.40) |
| **Private toilet** | -0.0220*** | -0.0223*** | -0.0229*** |
| | (-3.38) | (-3.43) | (-3.52) |
| **Time to town** | 0.000108 | 0.000103 | 0.000119 |
| | (0.65) | (0.62) | (0.72) |
| **Infrastructure index** | -0.0109*** | -0.0111*** | -0.0110*** |
| | (-4.37) | (-4.42) | (-4.37) |
| **Epidemic in village** | -0.00959 | -0.00981 | -0.00924 |
| | (-1.41) | (-1.46) | (-1.36) |
| **Public water** | -0.0475*** | -0.0469*** | -0.0477*** |
| | (-6.45) | (-6.37) | (-6.46) |
| **Female** | | 0.0512*** | |
| | | (11.11) | |
| **Flood*Female** | | 0.0753* | |
| | | (2.21) | |
| ***Ref to Adult*** | | | |
| **Infant** | | | 0.0299** |
| | | | (2.80) |
| **Children** | | | -0.0360*** |
| | | | (-6.53) |
| **Elder** | | | 0.152*** |
| | | | (14.47) |
| **Flood* Infant** | | | -0.0808 |
| | | | (-0.84) |
| **Flood* Children** | | | -0.0797 |
| | | | (-1.54) |
| **Flood* Elder** | | | 0.121 |
| | | | (1.26) |

| | | | |
|---|---|---|---|
| **_cons** | 0.271*** | 0.249*** | 0.363*** |
| **Observation** | 72480 | 72392 | 72480 |
| **Adjusted R2** | 0.0278 | 0.0328 | 0.0376 |
| **Individual-FE** | No | No | No |
| **Wave-FE** | Yes | Yes | Yes |

*Source: Author's calculation. All standard errors are clustered at the village level. Dependent variables: (1) the individual is underweight (1/0); Other controls: Household variables, Village variables. Significance levels * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$*

Table 2 presents the results on the effect of floods on the likelihood of being underweight for individuals living in the villages. Column (1) indicates a person living in a village covered by floodwater has a 12.3% higher likelihood of being underweight, while the effect of flood on the probability of being underweight for men is about 8.3%, women have roughly 7.5% higher likelihood than men (column (2)). The results in column (3) show the effect of flood on different age groups, the effect of flood on adults (aged 20-60) is around 14.3%, while the effects of flood on the likelihood of being underweight for children and adolescents (aged 0-5, and 5-19) is 8% lower than that of adults, and the elderly (aged over 60) is about 12% higher compared with adults, however, these differences are not statically significant. These results might be explained partly as that in the family, adults are the subjects who have responsibilities to participate in activities such as traveling, searching for food, trading, and exchanging goods, those activities need to be directly exposure to the floods, moreover, in family, likely adults would share their own foods for children, so in terms of flood impacts by age groups, adults are likely more affected than children. This should not be confused with the possibility of being underweight by age group in general, in which infants and elderly people are 3% and 15% more likely to be underweight than adults.

The impact of floods on the likelihood of being underweight might be through the relationship between flood and nutrition that individuals consume inadequately due to the damage in agricultural production or disruption of food supplies (Paterson et al., 2018). So, it is likely that this effect might be long-lasting, meaning that a village that has been flooded every year might have a greater impact on people living in that area in the likelihood of being underweight. To examine this hypothesis, we use data from floods over many years to calculate 5-year and 10-year flood indicators. The MODIS flood images were provided by NASA since 2002 (NASA, n.d.), therefore we use only 2013 household data to examine the impact of the 10-year flood indicator. Table 3 presents the effects of floods on the probability of being underweight, the results show that individuals living in the villages that are covered by floodwater every year are more likely to be underweight, the propabilities are increased respectively, 12.3% for within 1-year flood before the survey, 13.1% for within 5-years flood before the survey, and 13.7% for within 10 -years flood before the survey.

**Table 3: The relationship between floodwater and underweight**

| | **(1)** | **(2)** | **(1)** |
|---|---|---|---|
| | **1 year-flood** | **5-years flood** | **10-years flood** |
| **Floods** | 0.123*** | 0.131*** | 0.137*** |
| | (4.59) | (4.55) | (3.58) |
| **Age group** | 0.0515*** | 0.0515*** | 0.0558*** |
| | (13.26) | (13.26) | (10.67) |
| **Household size** | 0.00115 | 0.00114 | 0.00207 |
| | (0.85) | (0.84) | (0.94) |
| **Dependency ratio** | 0.0159*** | 0.0160*** | 0.0107* |
| | (4.74) | (4.76) | (2.07) |
| **Assets, lagged** | -0.0154*** | -0.0153*** | -0.0244*** |
| | (-9.86) | (-9.83) | (-7.55) |
| **Head education** | 0.00183 | 0.00172 | -0.00185 |
| | (0.77) | (0.72) | (-0.52) |

| | | | |
|---|---|---|---|
| **Cooking fuel** | -0.0254*** | -0.0254*** | -0.0142* |
| | (-5.52) | (-5.51) | (-1.98) |
| **Private toilet** | -0.0220*** | -0.0222*** | -0.0131 |
| | (-3.38) | (-3.41) | (-0.82) |
| **Time to town** | 0.000108 | 0.000122 | 0.000102 |
| | (0.65) | (0.73) | (0.32) |
| **Infrastructure index** | -0.0109*** | -0.0109*** | -0.0134*** |
| | (-4.37) | (-4.36) | (-3.45) |
| **Epidemic in village** | -0.00959 | -0.00981 | 0.00568 |
| | (-1.41) | (-1.44) | (0.43) |
| **Public water** | -0.0475*** | -0.0467*** | -0.0388*** |
| | (-6.45) | (-6.32) | (-3.50) |
| **_cons** | 0.271*** | 0.271*** | 0.330*** |
| **Observation** | 72480 | 72480 | 16376 |
| **Adjusted R2** | 0.0278 | 0.0278 | 0.0291 |
| **Individual-FE** | No | No | No |
| **Wave-FE** | Yes | Yes | Yes |

*Source: Author's calculation. All standard errors are clustered at the village level. Dependent variables: (1) the individual is underweight (1/0); Other controls: Household variables, Village variables. Significance levels * p < 0.1, ** p < 0.05, *** p < 0.01*

Next, we investigate how floods affect the likelihood of individuals contracting serious diseases, In Table 4, the results show, the average effect of flood on the likelihood of contracting serious diseases in the six provinces of the sample is not significant, and the impacts of the flood are not statically different for age groups or gender. We further tested with a subjective indicator, the feelings of general sickness, the results are similar to the likelihood of contracting serious diseases, except that the impact of flood on the elder group, which is 15.1% significantly higher than that for the adult group.

**Table 4: The relationship between floodwater and serious diseases**

| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| | **Serious diseases** | **Serious diseases** | **Serious diseases** |
| **Flood** | -0.00609 | 0.00997 | 0.00936 |
| | (-0.40) | (0.52) | (0.45) |
| **Age group** | 0.129*** | 0.128*** | |
| | (43.65) | (43.34) | |
| **Household size** | -0.00386*** | -0.00399*** | -0.00447*** |
| | (-3.54) | (-3.64) | (-4.11) |
| **Dependency ratio** | 0.0118*** | 0.0114*** | -0.00195 |
| | (4.60) | (4.42) | (-0.76) |
| **Assets, lagged** | -0.0124*** | -0.0123*** | -0.0124*** |
| | (-7.16) | (-7.10) | (-7.19) |
| **Head education** | -0.00358 | -0.00359 | -0.00172 |
| | (-1.63) | (-1.64) | (-0.78) |
| **Cooking fuel** | -0.0219*** | -0.0219*** | -0.0215*** |
| | (-5.29) | (-5.31) | (-5.24) |
| **Private toilet** | -0.0117 | -0.0116 | -0.0132* |
| | (-1.94) | (-1.92) | (-2.18) |
| **Time to town** | -0.000387** | -0.000395** | -0.000372** |

| | | | |
|---|---|---|---|
| | (-2.94) | (-2.99) | (-2.79) |
| **Infrastructure index** | -0.00847*** | -0.00852*** | -0.00846*** |
| | (-3.93) | (-3.95) | (-3.95) |
| **Epidemic in village** | 0.0276*** | 0.0280*** | 0.0283*** |
| | (3.51) | (3.55) | (3.59) |
| **Public water** | -0.0235*** | -0.0234*** | -0.0240*** |
| | (-3.75) | (-3.73) | (-3.83) |
| | (1.07) | (1.28) | (0.97) |
| **Female** | | 0.0270*** | |
| | | (7.59) | |
| **Flood*Female** | | -0.0336 | |
| | | (-1.30) | |
| ***Ref to Adult*** | | | |
| **Infant** | | | -0.107*** |
| | | | (-17.97) |
| **Children** | | | -0.112*** |
| | | | (-27.78) |
| **Elder** | | | 0.265*** |
| | | | (29.13) |
| **Flood*Infant** | | | -0.0898* |
| | | | (-2.37) |
| **Flood*Children** | | | -0.0441 |
| | | | (-1.87) |
| **Flood*Elder** | | | 0.0781 |
| | | | (1.19) |
| **_cons** | 0.124*** | 0.112*** | 0.367*** |
| **Observation** | 73369 | 73268 | 73369 |
| **Adjusted R2** | 0.0730 | 0.0745 | 0.0909 |
| **Individual-FE** | No | No | No |
| **Wave-FE** | Yes | Yes | Yes |

*Source: Author's calculation. All standard errors are clustered at the village level. Dependent variables: (1) individual suffers from serious diseases (1/0); Other controls: Household variables, Village variables. Significance levels * p < 0.1, ** p < 0.05, *** p < 0.01*

The results in Table 4 and Table 5, raise the question of whether it is a matter of omitted variables in the model. Observational health studies frequently deal with grouped or clustered data. When observations are clustered into groups, common group-level characteristics can affect outcomes. If all of these unique characteristics are observed and measured, it would be possible to include them in a model (1), although in most cases this is unrealistic. Some examples of the unobserved such as quality of diet, exercise, generic, predisposition, and culture … may or may not influence the predictor variables. Therefore, to check the concern of omitted variables, we add $\gamma_i$ as the individual level fixed effects to capture time-invariant features of each individual that may impact or bias the health outcome variables, however, we are aware the fixed effect model will give the estimate of the change of an individual's health condition with the average overtime of his/her health condition, and the fixed effect model cannot estimate the coefficients of time-constant variables such as gender or age groups, and still cannot capture the unobserved time-varying heterogeneity such as living habits may change partly with the seasons, in this case, the omitted variables still be concerned (Collischon & Eberl, 2020). The results in Table 6 indicate that the impact of the flood on individuals (after controlling for all individual time-constant factors) is positive, with a magnitude of about 4% for contracting serious diseases and 4.4% for feeling sickness, however, the effects are not statistically significant.

**Table 5: The relationship between floodwater and Individual sickness feelings**

| | (1) | (2) | (3) |
|---|---|---|---|
| | **Sickness** | **Sickness** | **Sickness** |
| **Flood** | 0.00285 | -0.00418 | -0.00537 |
| | (0.26) | (-0.34) | (-0.34) |
| **Age group** | 0.0892*** | 0.0914*** | |
| | (33.89) | (33.50) | |
| **Household size** | 0.00116 | 0.000518 | 0.000500 |
| | (1.33) | (0.57) | (0.58) |
| **Dependency ratio** | 0.00822*** | 0.00775*** | -0.00452* |
| | (3.94) | (3.62) | (-2.29) |
| **Assets, lagged** | -0.0107*** | -0.0109*** | -0.0105*** |
| | (-8.59) | (-8.54) | (-8.47) |
| **Head education** | -0.00341* | -0.00383* | -0.00213 |
| | (-2.21) | (-2.42) | (-1.37) |
| **Cooking fuel** | -0.0182*** | -0.0193*** | -0.0178*** |
| | (-5.77) | (-5.89) | (-5.65) |
| **Private toilet** | -0.0172*** | -0.0180*** | -0.0179*** |
| | (-3.87) | (-3.98) | (-4.07) |
| **Time to town** | -0.000120 | -0.000139 | -0.000105 |
| | (-1.16) | (-1.32) | (-1.02) |
| **Infrastructure index** | -0.00542** | -0.00587*** | -0.00542** |
| | (-3.23) | (-3.35) | (-3.25) |
| **Epidemic in village** | 0.00578 | 0.00564 | 0.00641 |
| | (1.10) | (1.03) | (1.22) |
| **Public water** | -0.0323*** | -0.0330*** | -0.0326*** |
| | (-6.70) | (-6.57) | (-6.76) |
| **Female** | | 0.0219*** | |
| | | (8.79) | |
| **Flood*Female** | | 0.0131 | |
| | | (0.63) | |
| ***Ref to Adult*** | | | |
| **Infant** | | | -0.0571*** |
| | | | (-14.09) |
| **Children** | | | -0.0622*** |
| | | | (-21.02) |
| **Elder** | | | 0.214*** |
| | | | (25.23) |
| **Flood*Infant** | | | -0.0264 |
| | | | (-0.92) |
| **Flood*Children** | | | -0.00657 |
| | | | (-0.34) |
| **Flood*Elder** | | | 0.151** |
| | | | (2.61) |
| **_cons** | 0.0699*** | 0.0640*** | 0.232*** |
| **Observation** | 77800 | 75560 | 77800 |
| **Adjusted R2** | 0.0565 | 0.0620 | 0.0785 |

| | | | |
|---|---|---|---|
| **Individual-FE** | No | No | No |
| **Wave-FE** | Yes | Yes | Yes |

*Source: Author's calculation. All standard errors are clustered at the village level. Dependent variables: (1) individual feels sick (1/0); Other controls: Household variables, Village variables. Significance levels * p < 0.1, ** p < 0.05, *** p < 0.01*

The results from the fixed effects model analysis further raise questions of whether individuals living in frequently flooded areas have adapted to flood environments, which could overshadow the impacts of floods on contracting serious diseases and feeling sick. To investigate this concern, we examine the impact of floods on the health conditions of people living in two different provinces, Thua-Thien-Hue which is the most affected province, and Buriram which is the least affected province. The results in Table 7 show that if a village in Buriram province is covered by flood water, it is associated with the likelihood of individuals living in that village contracting serious disease by about 28% and also increases the likelihood of feeling sick for people living in that village by 23%, while there is no significant impact for those living in flood-covered villages in Thua-Thien-Hue province. These results show that floods will have a strong impact on human health if floods occur irregularly in places that are not often flooded.

Giving attention to the other factors that are also closely related to the health conditions of local people such as family backgrounds and facilities in the community, we realize the fact that the story of the impact of the flood on human health is not only sole factor of nature but that is a combination of human copings and nature. Tables 4 and Table 5 present the correlations between household background with contracting serious diseases and feeling sick, including, household size, dependency ratio, assets (present value of assets lagged by one year), household head education, types of cooking fuel, and having private toilets. The results reveal a very clear message about these correlations is that families have richer assets, higher head education, less dependency ration, better cooking fuel (households use gas or electricity for cooking), having private toilets, and people living in such families have significantly lower the likelihood of contracting serious diseases, as well as the significant lower the likelihood of feeling sickness. Similarly, when we consider the correlations between the village background with contracting serious diseases and feeling sick, including, the time from village to town, the village infrastructure index, and the village having public water. These correlations are significant, people living in villages with better facilities, not only have a lower likelihood of suffering from serious diseases, but they are also less likely to feel sick. Villages that have epidemics might increase the likelihood of individuals getting serious diseases by 3%.

**Table 6: The relationship between floodwater and Individual health conditions**

| | (1) | (4) |
|---|---|---|
| | Serious diseases | Sickness |
| Flood | 0.0398 | 0.0440 |
| | (0.76) | (1.04) |
| Age group | -0.00142 | 0.00552 |
| | (-0.29) | (1.28) |
| Household size | -0.00418* | 0.00301* |
| | (-2.38) | (2.46) |
| Dependence ratio | 0.00203 | 0.00229 |
| | (0.56) | (0.76) |
| Assets, lagged | 0.00241 | 0.00208 |
| | (1.61) | (1.72) |
| Head education | 0.00638 | 0.000626 |
| | (1.70) | (0.19) |
| Cooking fuel | 0.000304 | -0.00512 |
| | (0.06) | (-1.36) |
| Private toilet | 0.0111 | 0.00318 |
| | (1.75) | (0.72) |

| | | |
|---|---|---|
| Time to town | -0.000855*** | -0.000254 |
| | (-5.04) | (-1.67) |
| Infrastructure index | -0.000775 | 0.00542** |
| | (-0.33) | (2.79) |
| Epidemic in village | 0.0274*** | 0.00711 |
| | (3.44) | (1.21) |
| Public water | -0.0120 | -0.0182** |
| | (-1.41) | (-3.03) |
| _cons | 0.174*** | 0.0403* |
| Observation | 73368 | 77799 |
| rho | 0.487 | 0.444 |
| Individual-FE | Yes | Yes |
| Wave-FE | Yes | Yes |

*Source: Author's calculation. All standard errors are clustered at the village level. Dependent variables: (1) individual suffers from serious diseases (1/0); (2) individual feels sickness (1/0); Other controls: Household variables and village variables. Significance levels * p < 0.1, ** p < 0.05, *** p < 0.01*

The findings above demonstrate that human health is influenced by nature as well as the relationship between nature and human coping. The results in Table 7 contend village infrastructure index in Hue played a significant role in reducing the likelihood of contracting serious diseases among villagers, while this factor played a negligible role in the probability of contracting serious diseases in villages in Buriram instead, the effects of floods play a significant role.

**Table 7: Comparison of the impacts of the flood on health conditions in Buriram Vs Hue provinces**

| | (1a) | (1b) | (2a) | (2b) |
|---|---|---|---|---|
| | Serious diseases Buriram | Serious diseases Hue | Sickness Buriram | Sickness Hue |
| Flood | 0.281* | -0.0374 | 0.229** | -0.00844 |
| | (2.03) | (-1.73) | (3.23) | (-0.45) |
| Age group | 0.120*** | 0.137*** | 0.0755*** | 0.0928*** |
| | (19.12) | (16.30) | (15.95) | (14.40) |
| Household size | 0.00177 | -0.00391 | 0.00422* | 0.00332 |
| | (0.83) | (-1.07) | (2.18) | (1.19) |
| Dependency ratio | 0.0102** | 0.0267** | 0.00695* | 0.0141** |
| | (2.74) | (3.06) | (2.05) | (2.76) |
| Assets, lagged | -0.00556* | -0.0222*** | -0.00438* | -0.0116** |
| | (-2.18) | (-3.93) | (-2.26) | (-2.88) |
| Head education | -0.00249 | -0.00542 | -0.00347 | -0.00552 |
| | (-0.61) | (-0.81) | (-1.15) | (-1.29) |
| Cooking fuel | -0.00566 | -0.0536*** | -0.00632 | -0.0540*** |
| | (-0.73) | (-4.34) | (-1.07) | (-5.98) |
| Private toilet | -0.0223 | -0.0297* | -0.0173 | -0.0144 |
| | (-1.26) | (-2.05) | (-1.20) | (-1.29) |
| Time to town | 0.000340 | -0.000473 | 0.000663* | -0.000230 |
| | (1.25) | (-0.82) | (2.53) | (-0.51) |
| Infrastructure index | -0.00382 | -0.0198* | -0.000521 | -0.00920 |
| | (-1.37) | (-2.57) | (-0.21) | (-1.62) |
| Epidemic in village | -0.0154 | 0.0528 | -0.00347 | 0.0241 |
| | (-0.90) | (1.16) | (-0.22) | (1.00) |
| Public water | 0.00274 | 0.0177 | -0.00689 | -0.0150 |

| | | | | |
|---|---|---|---|---|
| | (0.25) | (1.06) | (-0.72) | (-1.20) |
| _cons | -0.0285 | 0.235*** | -0.0325 | 0.0843 |
| Observations | 15086 | 9780 | 15694 | 10498 |
| Adjusted R2 | 0.0676 | 0.0970 | 0.0436 | 0.0641 |
| Individual-FE | No | No | No | No |
| Wave-FE | Yes | Yes | Yes | Yes |

*Source: Author's calculation. All standard errors are clustered at the village level. Dependent variables: (1) individual suffers from serious diseases (1/0); (2) individual feels sickness (1/0); Other controls: Household variables and village variables.*

Whether a household suffers a health shock is likely to be related to both its shock prevention strategies toward such a shock ex-ante, as well as its ability to cope with the shock ex-post (Javier Esparcia*, 2016; Paul et al., 2014; Wiesinger & Georg, 2007). Besides, (Thennakoon et al., 2020) suggest that local residents' adaptive behaviors in response to extreme weather events are significantly different from time to time due to climate changes. A study of the households' resilience to flooding in Bangladesh (Smith & Frankenberger, 2018) has provided evidence that the social and human capital, as well as asset holdings, reduced the negative impact of flooding on household food security. This raises the question of whether any of these factors mitigate the negative impact of flooding on health. In order to examine the role of coping strategies in reducing the effects of floods on individual health conditions in our studied sample, we model the importance of coping strategies by estimating equation (1) for the outcome including interactions of our flood measure with a series of variables reflecting the various coping strategies. These are the possession of a free health card in column (1) and private health insurance in column (2), the present value of household assets in column (3), off-farm income per capita in column (4), and saving in the household in column (5). Negative coefficients on the interaction terms indicate that the coping strategy is associated with a reduced health vulnerability to flood.

**Table 8: Coping strategies and serious diseases**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Serious Disease | Serious Disease | Serious Disease | Serious Disease | Serious Disease |
| Flood | -0.0186 | -0.00604 | 0.198* | -0.0224 | -0.00662 |
| | (-1.02) | (-0.30) | (2.12) | (-1.09) | (-0.39) |
| Flood*Free Health Card | 0.0536* | | | | |
| | (2.06) | | | | |
| Flood*Private-Health | | 0.00396 | | | |
| | | (0.15) | | | |
| Flood* Assets value | | | -0.0280* | | |
| | | | (-2.29) | | |
| Flood*Off-farm income | | | | 0.00473 | |
| | | | | (1.06) | |
| Flood*Saving in house | | | | | -0.00159 |
| | | | | | (-0.29) |
| Free Health Card | 0.0184** | | | | |
| | (3.14) | | | | |
| Private Health Insurance | | -0.00316 | | | |
| | | (-0.48) | | | |
| Assets value, lagged | | | -0.0114*** | | |
| | | | (-6.18) | | |
| Off-farm income, logged | | | | -0.000272 | |
| | | | | (-0.42) | |
| Saving in house, logged | | | | | -0.00414*** |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | (-4.16) |
| Observations | 73306 | 73369 | 73369 | 73362 | 73369 |
| Adjusted R2 | 0.0736 | 0.0730 | 0.0732 | 0.0730 | 0.0735 |
| Individual-FE | No | No | No | No | No |
| Wave-FE | Yes | Yes | Yes | Yes | Yes |
| Other controls | Yes | Yes | Yes | Yes | Yes |

*Source: Author's calculation. Dependent variables: Individual suffers from serious disease (1/0). Other controls: Household variables and village variables. Significance levels: * p < 0.1, ** p < 0.05, *** p < 0.01. All standard errors are clustered at the village level.*

Table 8, in column (1) presents the interaction term between individuals in possession of a free health card with the potential for serious disease and flood effects. Individuals who own free health cards are from poor households that fall below a certain income criterion, so it is not surprising to find that the likelihood for them to contract serious disease is about 1.8% higher than non-poor people, then combined with the impact of floods that likelihood increment by 5.4%, this finding reveals that the poor is the most vulnerable to flood impacts. Column (2) presents the relationship between individuals using private health insurance and the likelihood of serious diseases, the results demonstrate that owning private health insurance is not related to the effects of floods on getting serious diseases. However, again this coefficient should be interpreted as indicative rather than causal. Participation in private health insurance is influenced by considerable selection effects. While adverse selection theory would predict more sick people to invest in health insurance, we believe that in this case, participation effects could also lead to positive self-selection, whereby individuals with higher income (and thus presumably better health status) tend to participate more in private health insurance.

The informal insurance mechanisms investigated in columns (3-5) of Table 8 show all small effects on the probability of reporting serious disease for a given level of flood in the village the year before the survey. Again, this result is giving a signal that a household with more assets, and diversified income sources would be better able to cope with flood shocks. To sum up, we find few statistically significant reductions in the probability of contracting a serious disease for the investigated coping strategies, floods impact on contracting serious diseases varies in individuals with different family backgrounds, and in communities with different infrastructures.

Overview, Tables 4-8 show results for the impact of floods on human health in that the poor are at higher risk of contracting serious diseases, households with better backgrounds, and villages with better infrastructures have a lower probability of getting serious diseases for individuals living in those households and villages.

## IV. CONCLUSION

In this research, we studied the effects of floods, measured as the average share of village areas covered by water in a year, on health conditions in a large sample of households from six provinces in Vietnam and Thailand. This approach was implemented using a novel external dataset comprising satellite images, thereby allowing a highly precise and objective geographical measure of flood data. We assessed the association between floodwater and three self-reported health outcomes covering nutritional status and disease exposure. We find a positive association between our flood measure and the likelihood of being underweight and reporting a negative health status. However, the impact of floods is significant for being underweight, but the coefficients are rather small or reach statistical only for serious diseases as an outcome of interest with people living in the areas that are not usually flooded. We find some slight evidence that floods affect females and working-age individuals more strongly. The findings from an analysis of coping strategies show a fact that the effects of floods on human health are difficult to cope with; we only find a small effective of assets coping strategies dealing with flood-related health. These findings are useful for policymakers to identify which coping mechanisms might be better suited to reduce flood-related health vulnerability, and which ways might be effective to establish those coping strategies.

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# THE MODERATING ROLE OF TRUST DEVELOPMENT AND FACTORS INFLUENCING PURCHASE INTENTION VIA LIVESTREAM AMONG GENERATION Z

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**ABSTRACT**

In the era of "Industry 4.0" development, social media is becoming increasingly popular and serves as a method for people to access and explore rich sources of knowledge from various places. Through social media, individuals can be motivated to acquire and strengthen their limited knowledge and information. It is undeniable that social media has a significant impact on culture, economy, and vision in the digital age. The study employs a quantitative research method, utilizing a five-point Likert scale to measure the influencing factors, including the development of trust, subjective norms, streamer's credibility, perceived ease of use, platform design, perceived enjoyment, and social interaction.The research results indicated that the development of trust plays a moderating role in the relationship between influencing factors such as subjective norms and streamer's credibility with the purchase intention via livestream. Additionally, factors such as platform design, perceived ease of use, perceived enjoyment, and social interaction also had a significant impact on Gen Z's purchase intention.

*Keywords*: "development of trust"; "subjective norms"; "streamer's credibility"; "perceived ease of use"; "platform design"; "perceived enjoyment"; "social interaction", "purchase intention"

## I. INTRODUCTION

Online shopping has quickly become a popular global trend, growing rapidly and attracting a large number of consumers. Among the various forms, purchasing through livestreaming platforms is a new but extremely fast-growing method. According to a report by Coresight Research, global LIVE Commerce sales reached an impressive $171 billion in 2023, nearly tripling the $60 billion from 2019. Another study by Grand View Research predicts that the global LIVE Commerce market size will achieve a compound annual growth rate (CAGR) of 21.2% during the period 2024-2030. With a large population and high internet usage rate, Vietnam is a fertile market for the development of e-commerce. According to a report published by NIQ, approximately 95% of online shoppers purchased goods from livestream sessions during the first quarter of 2024. According to the statistical report published by Metric, the total output and revenue in the first half of 2024 compared to the same period in 2023 increased significantly, with the TikTok Shop platform rising from 150.54% to 242.15%. Known as a new era of e-commerce, livestreaming is the intersection of entertainment and commerce. One of the superior features of livestream commerce is the direct interaction, allowing the audience to ask questions and receive immediate feedback, creating a natural conversation and optimizing the way the audience engages through social media. Therefore, the paper is conducted with the aim of identifying the positive factors affecting consumers' purchase intentions through livestream. The research results will provide recommendations to contribute to improving product quality, sales systems, and optimizing the superior features of livestream commerce. Simultaneously, it will help businesses consider exploiting and enhancing the effectiveness of this form of e-commerce. The findings show the importance of user experience and social factors in driving online shopping behavior. Specifically, the level of interaction between customers, the credibility of the streamer, and the ease of use of the platform are key drivers in increasing purchase intentions.

## II. CONCEPTUAL BACKGROUND

### Consumer Purchase Intention

Consumer purchase intention seeks to systematically integrate knowledge from various fields (Mattila, 2004). It is an interdisciplinary field that studies how individuals and groups make decisions related to the purchase, use, and

disposal of products and services. Understanding consumer behavior is crucial for businesses and policymakers, as it provides insights into the factors influencing consumption patterns and choices (McFee, 2023).

Previous research has attempted to define customer intention as a study of how individuals, groups, and organizations select, purchase, use, and dispose of goods, services, ideas, or experiences to satisfy their needs and desires (Decrop & Woodside, 2017). Importantly, the Technology Acceptance Model (TAM) also provides a theoretical framework for understanding how users perceive and accept technology (Venkatesh & Davis, 1996). Besides the fields of information systems, marketing, and hospitality, TAM has been applied across various industries (Tung et al., 2008; Aghdaie et al., 2012). The Technology Acceptance Model (TAM) provides a theoretical framework for understanding how users perceive and adopt technology (Venkatesh & Davis, 1996). This model was developed based on the assumption that Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of a specific technology are the key determinants of the intention to use that technology.

**Subjective Norm**

According to Ajzen's (1991) Theory of Planned Behavior (TPB), which is currently a widely used theoretical framework for explaining human behavior, particularly in decision-making and intention formation, and is governed by three key factors: attitudes, subjective norms, and perceived behavioral control, subjective norm plays a crucial role in shaping consumers' behavioral intentions in various situations, including online shopping. Subjective norm is defined by Fishbein & Ajzen (1975) as an individual's perception of social expectations and pressures from those around them, such as family, friends, colleagues, or other influential people. Studies by Wang and Yu (2017), Pradhan (2018), and Hsu and Chang (2019) indicate that consumers' shopping intentions are significantly influenced by adherence to norms from important social groups, particularly in the context of online shopping via livestream. Livestream shopping creates a highly interactive environment where consumers can receive numerous opinions and suggestions. The influence of subjective norms in the context of online shopping is considered an important factor influencing consumers' purchase decisions and this level is greater when consumers perceive strong expectations and support from influential people in their social network. Therefore, the study proposes the hypothesis:

*H1: Subjective norm positively affects consumers' purchase intentions in livestream e-commerce.*

**Streamer's Credibility**

The credibility of streamers in e-commerce through livestream sessions reflects the degree to which consumers trust the information, recommendations, and endorsements provided by the streamer regarding the product (Ohanian, 1990). When the streamer is a celebrity, their endorsement becomes a crucial marketing strategy to enhance brand awareness and attract the right target audience. When implemented effectively, this strategy not only boosts current consumers' shopping behavior but also expands the reach to potential customers. Experimental studies have demonstrated that consumers' trust in the streamer's credibility can help mitigate perceived risks, enhance engagement, and positively influence purchase decisions (Song & Liu, 2021; Willemsen et al., 2012; Gong & Li, 2017). Additionally, a streamer's appeal helps attract consumers, making them more interested in the presented products and increasing the likelihood of consideration and purchase behavior (Xu et al., 2020). Based on this, the study suggests the hypothesis:

*H2: Streamer's credibility positively affects consumers' purchase intentions in livestream e-commerce.*

**The Moderating Role of Trust Development in Livestream E-commerce**

In livestream e-commerce, interactivity can foster close relationships between streamers and consumers, thereby enhancing trust (Wei et al., 2022). The entertainment aspect can pique consumers' curiosity about the streamer and the product, increasing their willingness to engage, leading to positive evaluations of both the product and the streamer (Wongkitrungrueng & Assarut, 2020). The element of "Trust Development" is fundamental to maintaining loyalty and supporting online shopping. It is formed through daily interactions between the streamer and viewers, the streamer's expertise, and other factors (Zhang et al., 2021). Liu et al. (2021) confirmed that social support directly and positively influences purchase intention in social commerce, with social trust partially mediating this relationship. This indicates that consumers develop trust when watching livestream sessions and form purchase intentions under the influence of that trust. Although the impact is not strong, in practice, customers' purchasing intention are still based on trust derived

from subjective norms (SN), streamer's credibility (SC), and previous theoretical foundations and studies continue to affirm this.

*H3: Trust development moderates the relationship between subjective norm and consumers' purchase intentions in livestream e-commerce.*

*H4: Trust development moderates the relationship between streamer's credibility and consumers' purchase intentions in livestream e-commerce.*

**Platform Design**

In livestreaming e-commerce, a user-friendly design of livestream platforms can provide consumers with an enjoyable shopping experience. This means that the design of livestream shopping platforms can influence consumers' sensory experiences, thereby affecting their shopping intentions and behaviors. A user-friendly and easy-to-use external design can inspire impulsive purchases and enhance self-efficacy. Lee and Chen (2021) found that the convenience of shopping has a positive impact on the perceived usefulness of products, encouraging consumers to make impulsive purchases.. The design of livestreaming e-commerce platforms directly impacts consumers' sensory experiences.

*H5: Platform design positively affects consumers' purchase intentions in livestream e-commerce.*

**Perceived Ease of Use**

For Wibowo (2013), perceived ease of use is the user's belief that technology will be easy to use. Conversely, Hartono (2013) defines perceived ease of use as the belief that using technology will be straightforward and without difficulty. The term "ease of use" can also be understood in various ways, generally referring to anything considered convenient and hassle-free. Customers often desire simplicity in using a system, especially when it involves payment or financial transactions. They want to use the system without trouble and without having to figure out how to use it. The ease of use of a product or technology significantly influences whether consumers can accept it. This is known as 'perceived ease of use' (PEU).

*H6: Perceived ease of use positively affects consumers' purchase intentions in livestream e-commerce.*

**Perceived Enjoyment**

Perceived enjoyment refers to the satisfaction or excitement consumers feel when interacting with their surroundings during the shopping process (Dwitya & Hartono, 2023). Livestream, with its high entertainment value, provides a fun, relaxing, and safe shopping medium, especially during the COVID-19 pandemic (Ducoffe, 1996; Chen & Lin, 2018). The motivation created by enjoyment and curiosity directly influences the intention to participate in livestream shopping (Gallego et al., 2016; Cai et al., 2018). According to Park and Lin (2020), perceived enjoyment and trust in digital celebrities can increase the likelihood of purchasing recommended products. Additionally, the entertainment experience from livestreaming positively impacts purchase decisions, improves customer attitudes, and increases loyalty towards livestream channels (Curras-Perez et al., 2014; Hsu et al., 2012).

*H7: Perceived* enjoyment *positively affects consumers' purchase intentions in livestream e-commerce.*

**Social Interaction**

In livestreaming e-commerce, content oriented towards social interaction conveyed through the streamer's speech when promoting products or services has a powerful impact on viewers' shopping behavior and gifting (Deng et al., 2016). Furthermore, intimate relationships between social network members play an important role in increasing information effectiveness. Additionally, social network structural factors such as relationship intensity, network density, and network centrality can enhance users' emotional and cognitive engagement, thereby increasing the likelihood of purchasing from the recommendations of close network friends (Park et al., 2018).

*H8: Social interaction positively affects consumers' purchase intentions in livestream e-commerce.*

**Development of Trust**

Trust, as defined by Sirdeshmukh et al. (2002), is the "consumer's expectation of the reliability of the service provider, as well as their ability to fulfill commitments." In e-commerce, trust in merchants plays a crucial role in reducing perceived risks in online transactions. Research by Hong and Cha (2013) indicates that when online merchants

take measures to mitigate certain risks, consumers' trust is enhanced, thereby increasing their online shopping intentions. Moreover, livestreaming e-commerce allows consumers to observe the streamer's behavior, including how they interact with other customer (Men et al., 2023). This observational capability helps consumers more accurately assess the streamer's reliability.

*H9: Development of consumer trust positively affects consumers' purchase intentions in livestream e-commerce.*

## III. METHODOLOGY

The data collected from the Likert scale will be used for quantitative analysis to determine the relationships between these influencing factors and purchase intentions. The five-point Likert scale will be applied with options ranging from "Strongly Disagree" to "Strongly Agree,". PLS-SEM enables the assessment of complex relationships between independent and dependent variables, including moderating effects, providing a more comprehensive perspective than linear regression. With its capability to handle non-normally distributed data and small sample sizes, PLS-SEM is particularly suitable for analyzing intricate structural models with interdependent relationships and enhancing predictive accuracy. Besides that, the PLS-SEM method is considered optimal for such studies, particularly when the sample size is small (Hair et al., 2014). The research model is constructed with a reflective structure. The most commonly used index for this purpose is CR, with acceptable values ranging from 0.70 to 0.95. Similarly, Cronbach's alpha is also used to evaluate internal reliability with similar threshold values but usually tends to be lower than CR (Hair et al., 2014). Additionally, Rho_A and Rho_C are analyzed as alternative measures of construct reliability. These indices provide a more accurate estimate of reliability, where Rho_A usually lies between Cronbach's alpha and CR, while Rho_C further refines reliability assessment by considering factor loadings and measurement errors. Threshold values from 0.70 to 0.90 are considered optimal when the factor model is correctly specified. Additionally, the Variance Inflation Factor (VIF) is calculated to check for multicollinearity issues among independent variables. VIF values below 5 are considered to indicate no serious multicollinearity.

## IV. DISCUSSION ANALYSIS

### Descriptive Statistics

After collecting and processing a total of 263 survey responses, the data was coded and analyzed. The mean values of the variables range from 3.31 to 3.92, while the standard deviations range from 0.918 to 1.165, reflecting the dispersion of the data.

### Measurement Model Evaluation

The CR ranges from 0.913 to 0.962, significantly higher than the 0.7 threshold proposed by Henseler & Sarstedt (2013. Notably, all factors have CR > 0.9, indicating very high reliability and stability of the theoretical model. DT has the highest AVE (0.885), while SC has the lowest AVE (0.702) but still meets the convergent validity requirement. This proves that the observed variables have strong interconnections and effectively explain the variance of the latent factor.

Specifically, the factor loadings for the observed variables under DT are 0.938 and 0.944, far exceeding the required threshold, reflecting well the latent concept and ensuring stability. Similarly, the PEU factor has loading coefficients ranging from 0.899 to 0.929, indicating a very high level. The PE factor also exceeds the 0.7 threshold, with loadings ranging from 0.885 to 0.922. These values not only indicate strong correlations but also ensure the stability and high reliability of the scale. The factors SI and SC are also highly rated with loadings from 0.904 to 0.918 and 0.754 to 0.893, respectively. Although some loadings for the SI factor are lower than for other factors (e.g., SC2 with a loading of 0.754), they still exceed the 0.7 threshold, indicating good reliability. Lastly, the factors SN and PD have loadings from 0.816 to 0.884 and 0.864 to 0.920, respectively, demonstrating that these scales meet the requirements for reliability and validity. For the factor PI, the observed variables have loadings from 0.847 to 0.929, with the lowest loading for PI4 at 0.867, still exceeding the 0.7 threshold. In general, all scales have high reliability. Overall, all observed variables have reasonable VIF values, allowing the model to continue without multicollinearity concerns.

**Table 4.1: Estimated measurement**

| Latent variable | Manifest variable | Outer Loading | VIF | rho_A | rho_C | Cronbach's anpha | AVE |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **DT** | DT2 | 0.938 | 2.454 | 0.871 | 0.939 | 0.870 | 0.885 |
| | DT3 | 0.944 | 2.454 | | | | |
| **PEU** | PEU1 | 0.929 | 4.685 | 0.952 | 0.962 | 0.951 | 0.836 |
| | PEU2 | 0.921 | 4.296 | | | | |
| | PEU3 | 0.899 | 3.444 | | | | |
| | PEU4 | 0.907 | 3.806 | | | | |
| | PEU5 | 0.915 | 4.131 | | | | |
| **PE** | PE1 | 0.900 | 3.472 | 0.946 | 0.957 | 0.944 | 0.817 |
| | PE2 | 0.905 | 3.981 | | | | |
| | PE3 | 0.922 | 4.244 | | | | |
| | PE4 | 0.885 | 3.167 | | | | |
| | PE5 | 0.906 | 3.928 | | | | |
| **SC** | SC1 | 0.805 | 2.216 | 0.929 | 0.943 | 0.929 | 0.702 |
| | SC2 | 0.754 | 2.182 | | | | |
| | SC3 | 0.884 | 3.638 | | | | |
| | SC4 | 0.893 | 3.936 | | | | |
| | SC5 | 0.819 | 2.619 | | | | |
| | SC6 | 0.829 | 2.940 | | | | |
| | SC7 | 0.871 | 3.267 | | | | |
| **SI** | SI1 | 0.916 | 3.765 | 0.933 | 0.951 | 0.932 | 0.83 |
| | SI2 | 0.918 | 3.655 | | | | |
| | SI3 | 0.904 | 3.421 | | | | |
| | SI5 | 0.907 | 3.336 | | | | |
| **SN** | SN1 | 0.884 | 2.623 | 0.874 | 0.913 | 0.873 | 0.725 |
| | SN2 | 0.829 | 1.974 | | | | |
| | SN3 | 0.875 | 2.428 | | | | |
| | SN5 | 0.816 | 1.881 | | | | |
| **PD** | PD1 | 0.874 | 3.089 | 0.934 | 0.949 | 0.932 | 0.788 |
| | PD2 | 0.871 | 2.788 | | | | |
| | PD3 | 0.920 | 4.326 | | | | |
| | PD4 | 0.864 | 2.653 | | | | |
| | PD5 | 0.907 | 3.713 | | | | |
| **PI** | PI1 | 0.904 | 3.569 | 0.937 | 0.951 | 0.935 | 0.795 |
| | PI2 | 0.847 | 2.458 | | | | |
| | PI3 | 0.911 | 4.050 | | | | |
| | PI4 | 0.867 | 2.745 | | | | |
| | PI5 | 0.929 | 4.684 | | | | |

**R-Square Analysis**

The results show that the $R^2$ value for DT is 0.662, indicating that the model explains 66.2% of the variation in DT, with two main factors being SN and SC. Similarly, the $R^2$ value for PI is 0.773, indicating that the model explains 77.3% of the variation in PI, with key influencing factors including DT, PU, PE, SI, and PD. The adjusted $R^2$ value slightly decreases to 0.769, showing that the model is stable and not overly complex.

**Table 4.2: R-squared coefficient analysis results (R-square)**

| | R-square | R-square adjusted |
|---|---|---|
| DT | 0.662 | 0.659 |
| PI | 0.773 | 0.769 |

**F-Square Analysis**

The f-square analysis results show that SC has a strong impact on DT with f-square = 0.377, indicating the important role of streamers in building consumer trust. In contrast, SN has a smaller impact with f-square = 0.078, suggesting that while cultural and social factors have an influence, they are not decisive in the model.

For PI, SI has a moderate effect with f-square = 0.125, reflecting that social connections between consumers and the community or streamer play a role in influencing purchase decisions, though not decisively. PU and PE have small effects (f-square = 0.064 and f-square = 0.018), indicating these factors have an influence but are not strong enough to create significant changes in the model.

Notably, PD also has a small effect on PI with f-square = 0.049, indicating that while platform design plays a role in the user experience, it needs to be combined with other factors such as ease of use and trust in the streamer to maximize its impact on purchase behavior.

**Table 4.3: F-squared impact factor analysis results (F-Square)**

| | f-square |
|---|---|
| DT -> PI | 0.001 |
| PEU -> PI | 0.064 |
| PE -> PI | 0.018 |
| SI -> PI | 0.125 |
| SC -> DT | 0.377 |
| SN -> DT | 0.078 |
| PD -> PI | 0.049 |

The analysis results indicate that all factors are significant; however, “Development of Trust” ($\beta = 0.028$, $P = 0.552$) and “Perceived Enjoyment” ($\beta = 0.147$, $P = 0.136$) do not reach statistical significance ($P > 0.05$), suggesting that these two factors have no substantial impact on “Purchase Intention.” Nevertheless, trust is still a key factor in maintaining long-term customer relationships and influencing purchase intention (Chen et al., 2021). This aligns with theoretical foundations and previous research, further reinforcing the crucial role of trust and enjoyment in consumer purchasing intention.

**Table 4.4: BOOTSTRAPPING analysis results**

| Relationship | Beta (Original Sample O) | P-value | T-statistics | Statistical significance |
|---|---|---|---|---|
| DT → PI | 0.028 | 0.552 | 0.595 | Not accepted |
| PEU → PI | 0.242 | 0.001 | 3.197 | accepted |
| PE → PI | 0.147 | 0.136 | 1.491 | Not accepted |
| SI → PI | 0.335 | 0.000 | 3.631 | accepted |
| SC → DT | 0.586 | 0.000 | 9.280 | accepted |
| SN → DT | 0.266 | 0.000 | 4.031 | accepted |
| PD → PI | 0.225 | 0.007 | 2.710 | Accepted |

**Variance Accounted For (VAF) Analysis**

The analysis of indirect effects shows that both "Streamer's Credibility" (SC) and "Subjective Norm" (SN) have full mediation effects on "Purchase Intention" (PI) through "Development of Trust" (DT).

**Table 4.5: VAF index analysis results**

| Relationship | Indirect Effect | Total Effect | VAF | Evaluate |
|---|---|---|---|---|
| SC -> PI | 0.016 | 0.016 | 1 (100%) | Full mediation |
| SN -> PI | 0.007 | 0.007 | 1 (100%) | Full mediation |

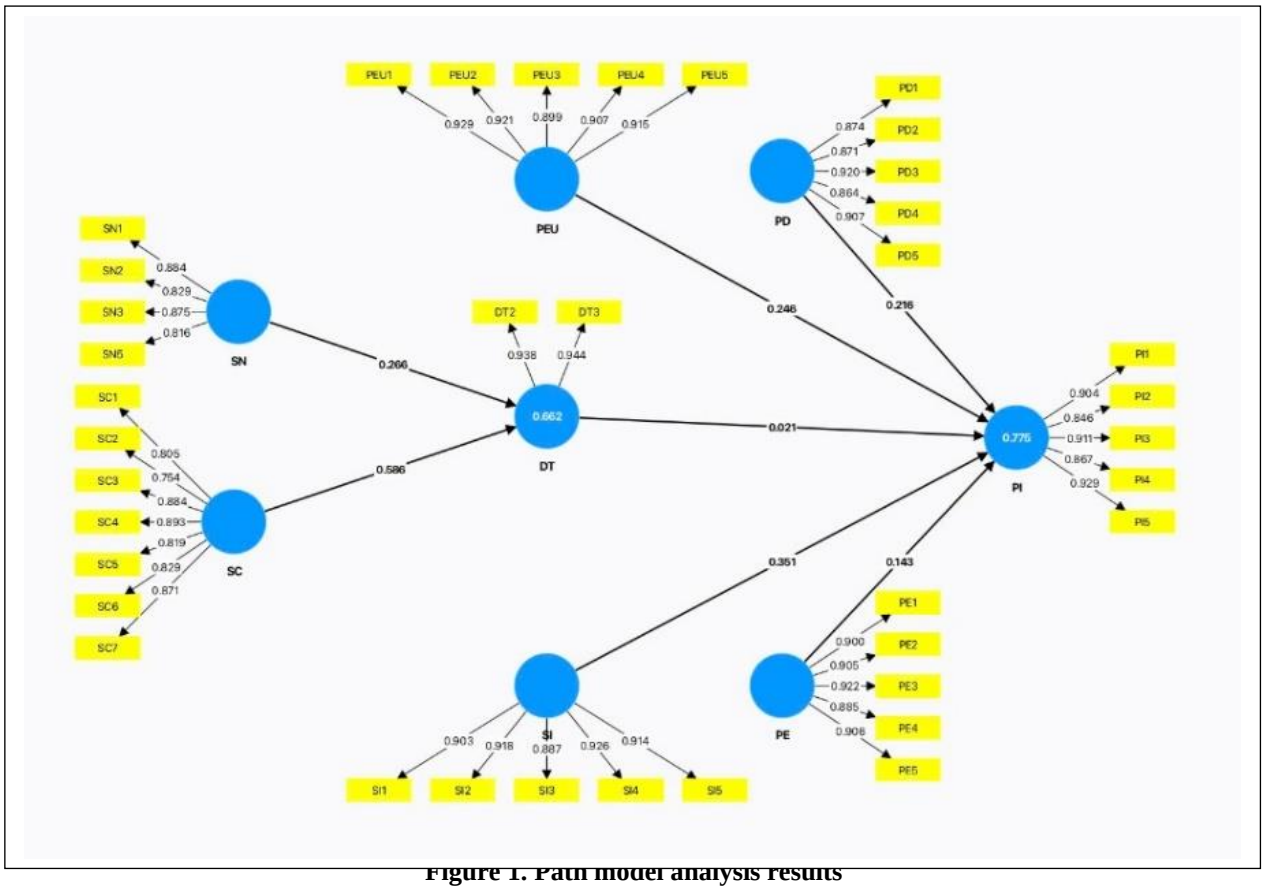



**Figure 1. Path model analysis results**

## V. CONCLUSION

The study reveals that three factors have a direct and significant impact on Purchase Intention through livestreaming, namely Social Interaction (β = 0.335), Perceived Ease of Use (β = 0.242), and Platform Design (β = 0.225). Additionally, Streamer's Credibility (β = 0.586) and Subjective Norm (β = 0.266) have indirect effects through the mediating role of Trust Development. Although Trust Development does not have a significant direct impact on Purchase Intention (β = 0.028, p = 0.552), it plays a crucial role in connecting other factors to consumers' shopping behavior.

These results underscore the importance of user experience and social factors in driving online shopping behavior. Specifically, the level of interaction between customers, the credibility of the streamer, and the ease of use of the platform are key drivers in increasing purchase intentions. This has significant implications for businesses and e-commerce platforms in optimizing marketing strategies, enhancing user experience, and building customer trust to boost sales through livestreaming.

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# SESSION 2: MARKETING

# DEVELOPING A MODEL OF DIGITAL SOCIAL RESPONSIBILITY (DSR) IMPACT ON CUSTOMER BRAND SATISFACTION

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**ABSTRACT**

In the contemporary business landscape of Vietnam, enterprises are significantly emphasizing and focusing on Digital Social Responsibility (DSR). These are not only complementary factors but also important ones in brand establishment strategy by creating customer trust and satisfaction. The aim of this research is to measure the pivotal role played by various DSR factors in shaping customer satisfaction by elevating trust for a brand with eWOM as a moderator factor. To accomplish this, a qualitative method approach is deployed to do the empirical validation of research hypotheses and robust a theoretical framework for other DSR research later. In this research, the theoretical models related to DSR will be organized, and proposed a comprehensive research model to measure the impact of DSR on brand satisfaction by brand trust of customers as a cornerstone for future scholarly investigations. The findings of this research illustrated research design relating to DSR factors recently.

*Key words:* "model development", "digital social responsibility", "satisfaction", "customers"

## I. INTRODUCTION

Digital Social Responsibility (DSR) is a transformative extension of the conventional Corporate Social Responsibility (CSR) paradigm. They are emphasizing on the enterprises' ethical behavior and commitments in digital environments, with individuals, governments, and organizations. The connections between DSR, brand satisfaction, and brand trust are increasingly significant in the digital era, as consumers have placed greater focus on ethical behavior in online environments recently. Firstly, Puwirat and Tripopsakul (2019) indicated that DSR initiatives develop brand trust by creating transparency, ethical practices, and commitments to privacy in social commerce contexts. Additionally, trust also acts as the mediator between DSR and brand equity, indicating that effective DSR can lead to stronger brand relationships. Furthermore, several researchers have shown that brand trust positively affects brand satisfaction, with higher trust levels leading to increased customer satisfaction (Nugrahanta & Ariani, 2024). Secondly, DSR factors play an important role for brand satisfaction, such as enhanced customer experience, alignment with values or improve sustainability, and responsibility. In addition, DSR initiatives also boost brand image and consumer perceptions, which are essential for customer retention (Kim & Nilufar, 2024). In general, the high-level DSR brand will have greater credibility, resulting in increasing brand trust and brand satisfaction. However, Nugrahanta & Ariani (2024) highlighted the complex interplay between these factors and the need for a holistic approach to brand management. Therefore, this research aims to underscore the contentious nature of DSR, shedding light on the divergent viewpoints that shape discussions around this subject. By examining the foundational principles and practical applications of DSR, this study designs a new framework to explore how Digital Social Responsibility can cultivate enduring brand trust and bolster brand satisfaction, with eWOM as moderator factor, in an increasingly interconnected world.

## II. LITERATURE REVIEW

### 2.1. Concept

#### Digital Social Responsibility (DSR)

According to Okazaki et al. (2020), digital media gives enterprises the ability to create community responsibility programs that are both more relevant and engaging for consumers. Similarly, Puriwat and Tripopsakul (2021) explain that DSR uses social media platforms such as Facebook, Twitter, and Instagram to promote customer participation and collaboration in corporate social responsibility (CSR) activities. These platforms allow fast, low- cost, and interactive communication, enabling positive discussions between companies and consumers about DSR initiatives. Therefore,

DSR is the implementation of CSR through digital platforms like social networks or company websites. As social media and digital technologies develop quickly, this idea is essential for increasing customer satisfaction and brand engagement. Enterprises must prioritize DSR to meet customer expectations and build lasting value in a competitive market.

**Customer Satisfaction with the Brand**

**Customers**

Customers are the ones who make purchasing decisions and consume goods and services based on personal requirements and preferences, often regarded as the central point in a company's marketing strategies (Solomon, 2019). They are important stakeholders in a business's operations, enhancing the development and competitive advantages, as customer satisfaction significantly influences an organization's long-term success (Schiffman and Wisenblit, 2019). Customers play a crucial role in any organization, and managing customer relationships (CRM) has become a significant area of research and practice in marketing and management. Therefore, DSR activities are not only improve brand image but also create and maintain sustainably customer relationships. Additionally, DSR motivated customers engagement in society value creations (Phuong et al., 2021).

**Customer satisfaction**

Various theories and concepts regarding service quality and satisfaction have led to the development of models and metrics to assess the relationship between these two factors. Among these, the SERVQUAL model by Parasuraman and colleagues (1985, 1988) has received widespread acceptance and application in research. Cronin and Taylor (1992) have delineated differences between quality and satisfaction, such as: (1) quality pertains to specific aspects, whereas satisfaction can stem from any factor; (2) quality does not necessitate prior experience, while satisfaction requires a consumption experience; (3) quality focuses on a few product factors, while satisfaction encompasses multiple cognitive and emotional factors. Oliver (1997) emphasizes in the satisfaction theory that the level of satisfaction depends on the extent to which customer expectations are met, leading to loyalty when expectations are met or exceeded. According to Zeithaml and colleagues (2009), customer satisfaction does not necessarily reflect service quality; however, perceptions of quality influence their future intentions and behaviors, playing a significant role in impacting satisfaction. Survicate (2024) indicates that customer satisfaction is the degree to which a product or service meets or exceeds customer expectations, measured through their perception of value derived from the product or service. High satisfaction often predicts the likelihood of customers remaining loyal to a brand and their intention for repeat purchases.

**Brand**

The American Marketing Association defines a brand as "a name, symbol, sign, design, or a combination of these elements intended to identify the products or services of a manufacturer and differentiate them from competitors' products." From this traditional viewpoint, a brand is considered part of the product, with its primary function being to distinguish its products from similar offerings of competitors. However, this perspective fails to elucidate the role of brands in the context of the global economic shift towards globalization and intense competition, leading to a significant expansion of the components that constitute a brand (Nguyen Dinh Tho and colleagues, 2002). Kotler and Keller (2016) assert that a brand is not merely a name or symbol but encompasses the entirety of perceptions and experiences that consumers derive from that product or service. Kotler and Keller (2022) also argue that a brand is a promise to consumers, providing them with distinctive value compared to their competitors. This includes both tangible and intangible elements that influence customers' perceptions and emotional connections with the brand. This underscores the crucial role of a brand in fostering trust and satisfaction from customers.

**Customer Satisfaction with the Brand**

He and colleagues (2012) define brand satisfaction as an emotional response, emphasizing the emotional structure and the quality of the brand relationship. Satisfaction occurs when the brand's performance meets customer expectations. This holds true even in the case of digital news platforms, where audiences feel satisfied only when the content meets their expectations for accuracy, timeliness, and in-depth analysis. Additionally, Palla and colleagues (2014) have demonstrated that satisfaction derived from well-established brands is easier to achieve compared to newly

established brands. Solomon (2023) posits that brand satisfaction results from positive or negative experiences that customers have with the brand, evaluated based on the brand's commitment and consistency in delivering value. In the digital landscape, brand satisfaction extends to satisfaction with online interactions and customer service, creating a comprehensive experience for customers as they engage with the brand (Alfonso, 2024).

**Brand Trust**

According to Morgan and Hunt (1994), trust is considered as a critical factor in building and maintaining relationships between brands and consumers. Trust not only influences customer satisfaction with the brand but also helps to minimize the sense of risk when making purchases, thereby fostering a more positive interaction between the brand and the customer. In Aaker's study (1997), brand trust is established when customers are willing to use a brand's product because it can meet and satisfy the functions that customers desire when using it. Brand trust is a core factor in creating sustainable relationships between customers and providers, as highlighted in Bernarto's research (2020).

**Electronic Word of Mouth (eWOM)**

Litvin and colleagues (2008) define eWOM as the transmission of information about products, services, or sellers over the internet, targeting consumers. With the rise of social networks like Facebook, customers can easily share their personal experiences, making eWOM a popular tool in influencing consumer awareness and purchasing decisions. According to Huete-Alcocer (2017), WOM not only influences behavior but also shapes customers' attitudes toward a product or service. Jassim and colleagues (2020) clarify that eWOM allows consumers worldwide to freely share and post reviews about products, enabling other users to reference before making purchases. Al-Dmour and colleagues (2022) also emphasize that the diversity of eWOM, from reviews to sharing personal experiences, is a crucial factor in promoting and building trust for products and services. Alfandi and colleagues (2022) suggest that eWOM about budget services can establish a framework to guide businesses in improving not only service quality but also optimizing communication and marketing messages to potential customers (Barween and colleagues, 2022).

### 2.2. Relevant Research Works

**Model by Puwirat and Tripopsakul (2019)**

The objective of this study is to investigate the impact of Digital Social Responsibility (DSR) on customer trust and brand value in the context of social commerce. The results indicate that DSR initiatives significantly and positively influence customer trust and brand value. DSR also indirectly affects brand value through customer trust, playing an intermediary role in the realm of social commerce. This research provides a clearer understanding of the role of Digital Social Responsibility in shaping customer attitudes and brand value in the context of social commerce.

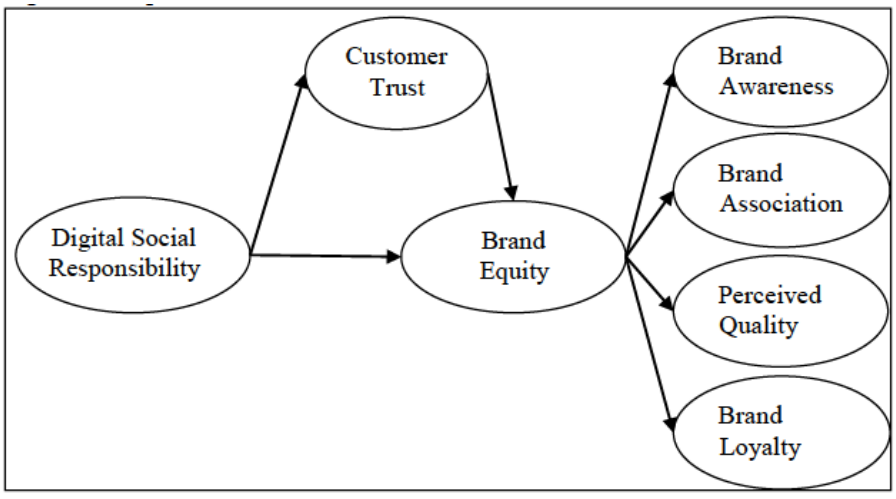



**Figure 1. Research model of Puwirat and Tripopsakul (2019)**

**Model by de Oliveira Santini and Colleagues (2020)**

This study examines customer engagement on social media (CESM). The results indicate that customer engagement is driven by satisfaction, positive emotions, and trust, but not by commitment. Satisfaction is a stronger predictor of customer engagement in high convenience situations (compared to low), B2B (compared to B2C), and

Twitter (compared to Facebook and Blogs). Twitter seems to enhance customer engagement through higher satisfaction and positive emotions compared to other social media platforms. The research also finds that customer engagement brings significant value to companies, directly impacting business performance, behavioral intentions, and word-of-mouth. Moreover, experiential consumption amplifies the impact of customer engagement on business performance nearly three times that of utilitarian consumption.

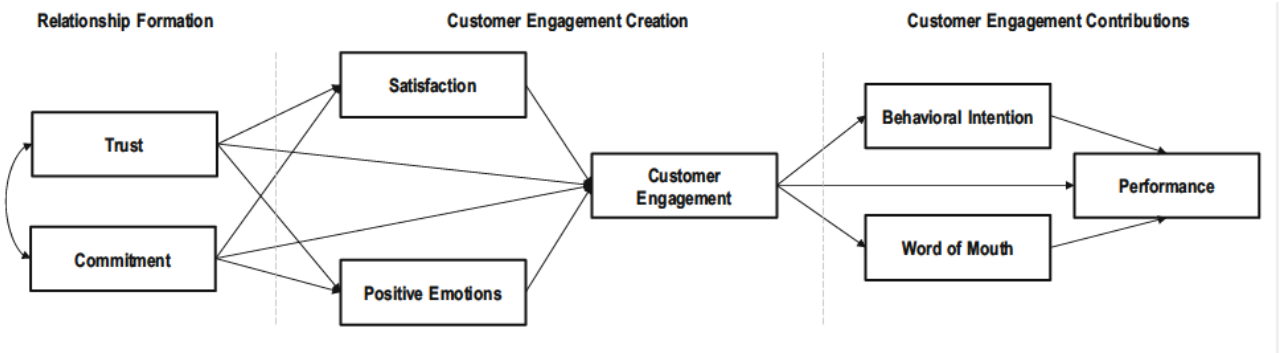



**Figure 2. Research model of de Oliveira Santini et al. (2020)**

**The model by Puwirat and Tripopsakul (2021)**

The purpose of this study is to investigate the impact of DSR on brand preference and purchase intention among consumers, comparing between product categories with high and low levels of involvement. The results indicate that DSR initiatives are significantly and positively related to consumers' brand preference and purchase intention. The moderating results show that the level of product involvement plays an important role in enhancing the relationship between DSR initiatives and brand preference. The impact of DSR on brand preference is stronger for respondents with low product involvement compared to those with high product involvement. The study emphasizes the importance of DSR and expands the current knowledge on DSR and its potential impact on customer perceptions.

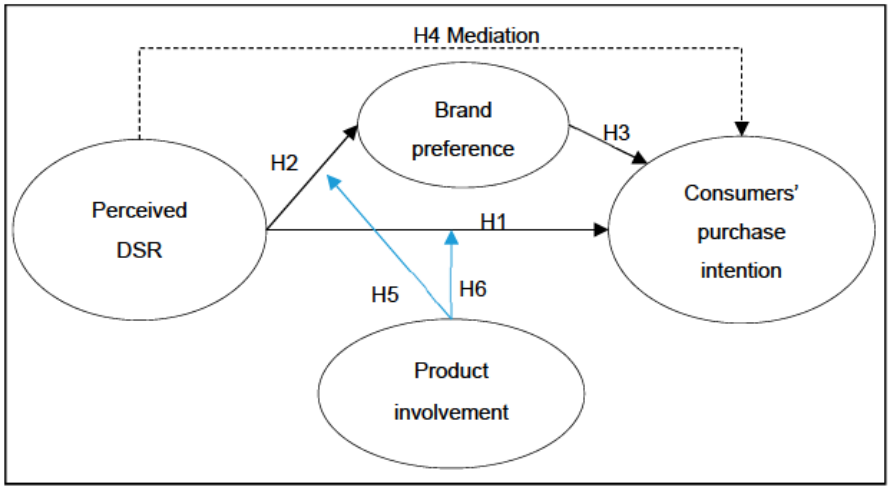



**Figure 3. Research model of Puwirat and Tripopsakul (2021)**

**Model by Puwirat and Tripopsakul (2022)**

Research on Digital Social Responsibility (DSR) and its impact on customer perception and behavior on social media remains limited. This study, based on a sample of 157 respondents from universities in Thailand, shows that DSR positively influences customer awareness and online word-of-mouth (WOM), supporting prior research by Fatma et al. (2020). DSR is a cost-effective and time-efficient platform for attracting stakeholders, enhancing customer sentiment, and generating positive WOM. Businesses should view DSR as a strategic approach tailored to different customer segments, recognizing that not everyone has access to digital platforms. DSR is considered a marketing activity, building brand advocacy through social media channels. User interactions (likes, comments, shares) on a company's DSR initiatives on social media contribute to this advocacy. DSR is an effective method to encourage positive emotions and WOM from customers, leveraging the convenience of digital channels over traditional ones. Companies need to

design comprehensive social responsibility programs both online and offline to meet stakeholders' needs and gain a competitive edge.

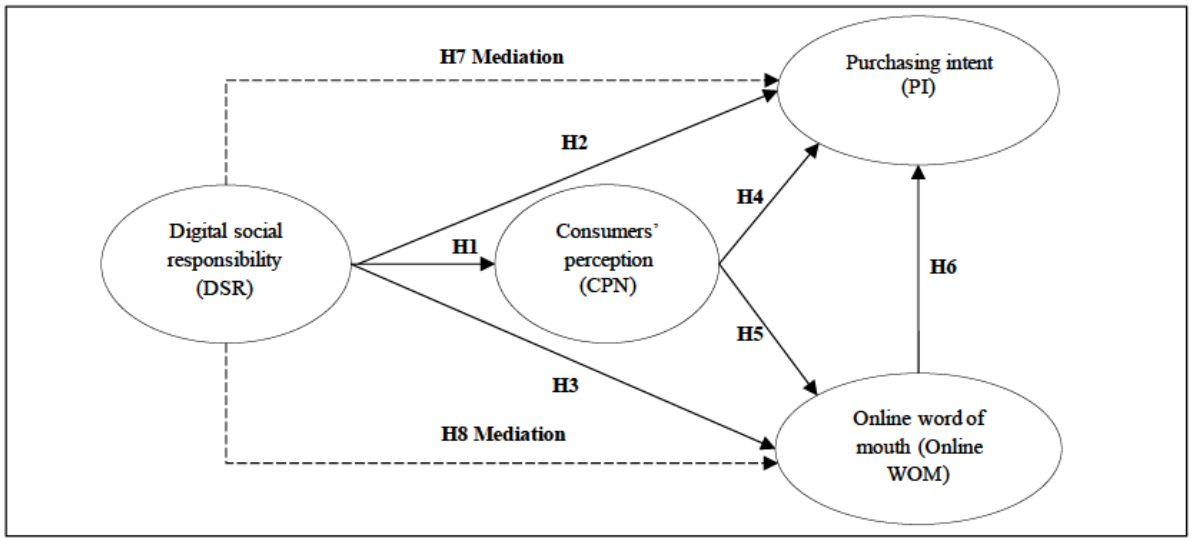



**Figure 4. Research model of Puwirat and Tripopsakul (2022)**

**Model by Zhang and Colleagues (2023)**

The integration of charity activities in the form of games into digital social responsibility (DSR) initiatives has spurred customers to engage in socially and environmentally friendly behaviors in their daily lives. To maximize the benefits of DSR, this study analyzes how sustainable customer outcomes of DSR translate into external outcomes, such as customer citizenship behaviors, and internal outcomes, like customer continuance intentions. Furthermore, the study examines the roles of emotional commitment and gamification within a singular framework in shaping customer responses to DSR. Results from an experimental study conducted within DSR programs demonstrate that the underlying psychological mechanisms linking customer engagement in DSR to various customer outcomes are mediated by emotional commitment and moderated by gamification. This research contributes to the DSR literature on sustainable engagement outcomes by proposing a theoretical framework to understand the psychological mechanisms and boundary conditions influencing customer responses to DSR.

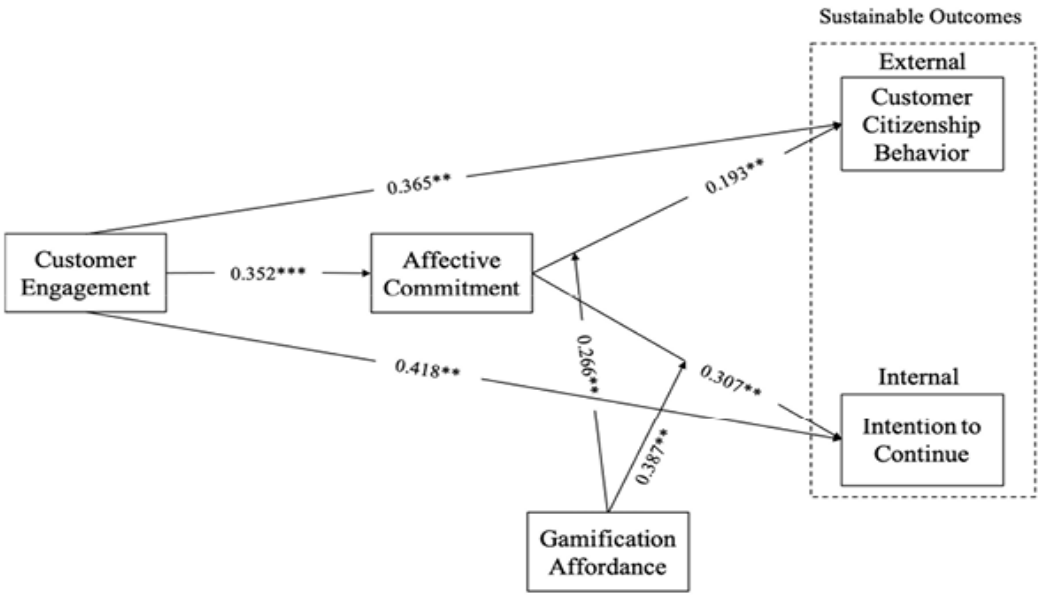



**Figure 5. Research model of Zhang et al. (2023)**

**Model by Amankona and Colleagues (2024)**

The research reveals a strong positive relationship between corporate social responsibility (DSR) and purchase intention, mediated by consumer engagement and brand loyalty. However, it does not show that the attitude of

Generation Y towards DSR moderates this relationship. The study underscores the importance of DSR for manufacturing businesses in Ghana. By exploring relatively uncharted territory regarding DSR and its impact on consumer behavior in developing countries, especially within the context of manufacturing businesses in Ghana, this research adds to the overall body of existing work. This study elucidates how DSR influences the purchase intention of Generation Y customers by considering the mediating roles of brand loyalty and consumer engagement.

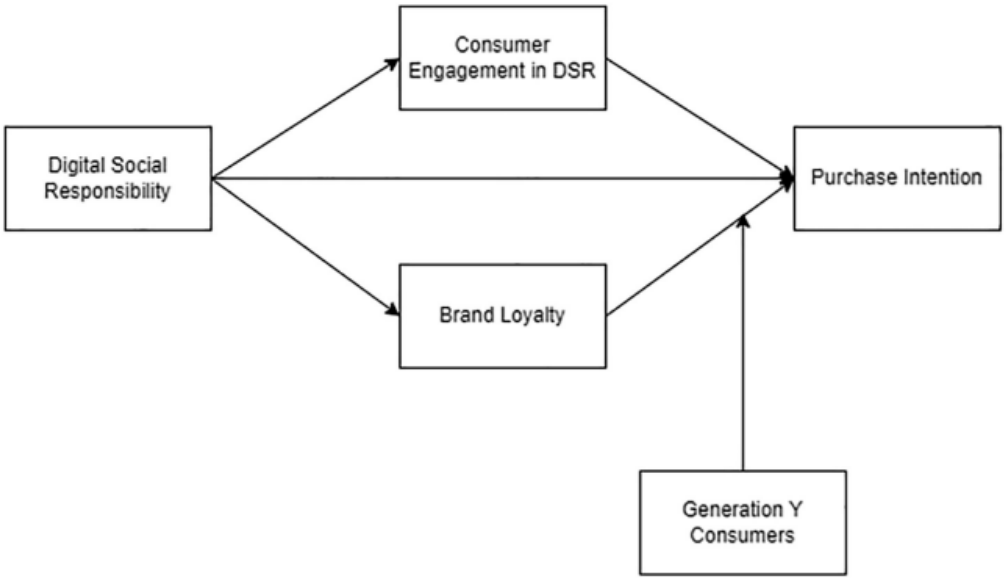



**Figure 6. Research model of Amankona et al. (2023)**

### 2.3. Proposed Model

Building on theoretical foundations and a review of relevant research topics by authors both domestically and internationally, this study inherits and advances previous research topics by authors such as Okazaki et al. (2020), Puriwat and Tripopsakul (2021), Solomon (2019), Schiffman and Wisenblit (2019), Phuong et al. (2021), Parasuraman et al. (1985, 1988), Cronin and Taylor (1992), Oliver (1997), Zeithaml et al. (2009), Survicate (2024), Nguyen Dinh Tho et al. (2002), Kotler and Keller (2016, 2022), He et al. (2012), Palla et al. (2014), Solomon (2023), HubSpot (2024), Morgan and Hunt (1994), Aaker (1997), Bernarto (2020), Litvin et al. (2008), Huete-Alcocer (2017), Jassim et al. (2020), Al-Dmour et al. (2022), Alfandi et al. (2022), Barween et al. (2022)... Additionally, the authors integrate previous related research models such as those by Puriwat and colleagues (2019, 2021, 2022), de Oliveira Santini and colleagues (2020), Zhang and colleagues (2023), Amankona and colleagues (2024)... and develop a model on "The Impact of Digital Social Responsibility (DSR) on Customer Brand Satisfaction" consisting of five factors including DSR - Digital Social Responsibility; Brand factor; Trust factor impacting the Satisfaction factor; meanwhile, the eWOM factor acts as a moderator between the Trust and Satisfaction factors; through intermediary variables directly influencing customer satisfaction with the Brand. The research model is based on the PLS analysis model where the Trust and Satisfaction factors are higher, the customer satisfaction with the Brand is higher.

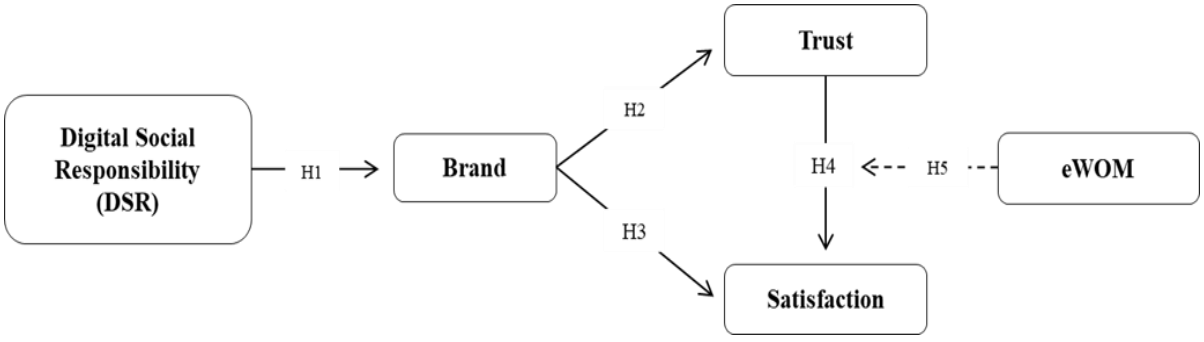



**Figure 7. Proposed research model**

### 2.4. Research Hypotheses

Hypothesis H1: Digital Social Responsibility (DSR) has a positive effect on Brand.

Hypothesis H2: Brand has a positive effect on Trust.

Hypothesis H3: Brand has a positive effect on Satisfaction.

Hypothesis H4: Trust has a positive effect on Satisfaction.

Hypothesis H5: eWOM has moderation between the Trust and the Satisfaction.

## III. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This study provides a comprehensive overview of the theoretical framework, inheriting and synthesizing numerous relevant studies to investigate the factors and research model of how DSR influences customer satisfaction with the brand—a novel emphasis of the author group. The theoretical foundation was constructed based on 38 referenced studies, culminating in the proposal of a research model consisting of 5 factors affecting customer satisfaction with the brand through the influence of DSR. Consequently, the authors suggest the research model "The Impact of Digital Social Responsibility (DSR) on Customer Brand Satisfaction" as illustrated in Figure 7. Exploring the impact of Digital Social Responsibility (DSR) on customer satisfaction with the brand is a promising field of significant importance in the context of an increasingly digital market. Building customer satisfaction with the brand now extends beyond product or service quality to encompass various aspects related to how a brand demonstrates its social responsibility in the digital space. Future research should focus on these 5 key factors to comprehensively assess the impact of DSR on customer satisfaction with the brand.

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# IMPACT OF LUXRY BRAND AUTHENTICITY'S DIMENSIONS ON FUNCTIONAL VALUE, PERSONAL VALUE, AND SOCIAL VALUE

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**ABSTRACT**

In the context of consuming luxury brands, the purpose of this study was to investigate the effects of three aspects of brand authenticity—brand individuality, brand continuity, and brand consistency—on three aspects of perceived value—functional value, personal value, and social value. Information was gathered via a sample poll consisting of 485 customers. The research model was tested using the partial least squares structural equation modeling (PLS-SEM) using SmartPLS version 3.0. The findings demonstrated the influence of brand continuity, uniqueness, and consistency on the authenticity of premium brands. Furthermore, the findings demonstrated that although there was no significant correlation between brand authenticity and functional value, there was a favorable association between brand authenticity and both social and personal values. The results of this research provide credence to the notion that brand authenticity may and ought to be regarded as a critical component in the growth of perceived value and the prosperity of luxury businesses.

*Key words: "*brand authenticity", "brand consistency", "brand individuality", "brand continuity", "perceived value".

## I. INTRODUCTION

In a time when customers must deal with an increase in product marketing, brands that convey true meaning will gain an edge over their competitors. Consumers increasingly seek authenticity in brands, as authenticity has surpassed quality as a common purchasing criterion (Nayeem et al., 2019; Pine & Gilmore, 2007), especially in luxury brands. Brand authenticity is starting to receive much attention from marketers as they want to analyze consumer preference for authentic offerings to help improve the consumer experience of how they consume and relate to their experiences with others (Taheri et al., 2018). Brand authenticity is essential for luxury brands for several reasons. First, luxury brands must differentiate themselves from competitors to maintain their premium position. Authenticity helps luxury brands stand out in a market crowded with other competitors and fake brands (Bargoni et al., 2022). Second, authenticity creates trust between the brand and the consumer. Consumers are willing to pay a premium for luxury goods because they trust that the brand delivers a high-quality product that meets their expectations. Authenticity reinforces this trust by proving the brand's values and promises are genuine. Third, luxury brands are built to last; authenticity is essential for longevity. An authentic brand has a clear and consistent identity that transcends the latest trends and fads. This enables luxury brands to maintain relevance over time and build a loyal customer base that returns repeatedly. Finally, luxury brands are not just selling products but a lifestyle and a set of values (Ramadan et al., 2018). Authenticity helps luxury brands establish an emotional connection with their customers by evoking a sense of heritage, legacy, and tradition. This emotional connection creates a deeper bond between the brand and the consumer, leading to stronger brand loyalty. Therefore, it is necessary to bring authentic experiences to consumers (Kim & Bonn, 2016).

Although many researchers have delved deeply into broader ideas about brands, such as brand equity, brand personality, and brand loyalty (Abril & Rodriguez-Cánovas, 2016; Šeinauskienė et al., 2015), very few studies examining authentic brand structure have been conducted in the context of luxury brands (Hernandez-Fernandez & Lewis, 2019). Additionally, research on the effects of genuine brands or their numerous precursors on dimensions of perceived value, such as functional value, personal worth, and social value, is still notably lacking (Hernandez-Fernandez & Lewis, 2019). Authenticity may add perceived value to luxury products in the luxury brand market. Consumers perceive authentic luxury brands as having a higher intrinsic value because of their heritage, craftsmanship, and tradition. This perception of value allows luxury brands to command higher prices for their products, which, in turn, reinforces their premium positioning. Luxury companies, therefore, possess a natural foundation and opportunity to

foster authenticity in customers' minds.

However, it is essential to consider the unique characteristics of the Vietnamese market, which present distinct challenges and opportunities for luxury brands. As a rapidly developing economy with an expanding middle class, Vietnam offers a burgeoning market for luxury goods. Particularly in Ho Chi Minh City, home to some of the country's largest shopping malls, consumer behavior toward luxury brands reflects a blend of global trends and local cultural nuances. Vietnamese consumers are not only drawn to the exclusivity and prestige of luxury brands but also place significant value on authenticity due to their deep-rooted appreciation for heritage, tradition, and craftsmanship. The need for authenticity among Vietnamese luxury consumers differs markedly from international markets, as local socio-cultural and economic contexts shape it.

This study addresses these gaps by focusing on luxury brand authenticity in Vietnam, with data collected from surveys conducted in five of the largest shopping malls in Ho Chi Minh City. It offers a conceptual framework to examine how authentic brands influence perceived value in the Vietnamese luxury goods market. According to Aliyev et al. (2019), the luxury brand market is a segment of the retail industry that focuses on high-end products often associated with quality, exclusivity, and prestige. By understanding Vietnamese consumers' specific preferences and expectations, this study aims to guide managers and executives in creating greater consumer awareness of brand individuality, continuity, and consistency. Additionally, it seeks to enhance perceived value dimensions, including functional, personal, and social value. The findings will enable marketers to evaluate better and defend their marketing strategies, tailoring their efforts to resonate with the unique dynamics of the Vietnamese luxury market.

## II. LITERATURE REVIEW AND RESEARCH HYPOTHESES

### 2.1 Brand authenticity

The term "authenticity" is rooted in the Greek words "autos" and "hentes," meaning "self" and "doer" or "being," respectively, which suggests acting on one's authority (Södergren, 2021). Authenticity has long been an important ideal in Western thought, mainly since the Romantic era, and it has been linked to the notion of an innate, genuine self, exemplified by the works of Jean-Jacques Rousseau (Laermans, 2018). The term's original meaning suggested resistance to conformity and extrinsic motivations, but it has since evolved to include concepts like genuineness, sincerity, truthfulness, responsibility, and transparency.

The paradox of brand authenticity stems from the fact that while authenticity and personal autonomy were initially associated with rejecting societal norms and institutions, they were later co-opted by powerful economic forces (Thompson et al., 2013). As a result, brands now offer ways for consumers to enact their true selves and engage in self-actualization. This has led to iconic brands embodying authenticity by leveraging cultural and political authority as resources for self-expression, which can cause consumers to feel disconnected from their identity projects and aspirations (Arnould & Thompson, 2005).

The concept of brand authenticity has rapidly grown in terms of definition and conceptualization in recent times. Although this point of view is evident in many early definitions, it may be claimed that authenticity is far more complicated than being unique or authentic (Alexander, 2009). An item's authenticity is frequently used to indicate that it is accurate and not fake. Cory (2013) has defined brand authenticity simply as "genuineness in its product and its principles." O'Neill et al. (2014) define authenticity as what consumers want. Brand authenticity has been defined as "the extent to which consumers perceive a brand to be faithful and true towards itself and its consumers, and to support consumers being true to themselves" Morhart et al. (2015). The concept of authenticity has changed significantly, from a straightforward promise of genuine goods or services to a coherent and potent statement about non-commercial distinction and deeply ingrained company principles (Beverland et al., 2008).

In short, brand authenticity refers to the degree to which consumers perceive a brand as genuine, honest, and trustworthy. It reflects the extent to which a brand's identity and values align with its actions and behaviors and the degree to which consumers perceive the brand as delivering on its promises. Authenticity is an important aspect of brand identity, especially in the context of consumer preferences for transparency and ethical behavior (Safeer et al., 2021). Authentic brands are those that are perceived as accurate to their core values, delivering on their promises and acting in an ethical and socially responsible manner. In contrast, inauthentic brands may be perceived as dishonest or

misleading and may not align with consumer values or expectations. This can result in a loss of trust and credibility and decreased consumer loyalty and sales. Authenticity can be communicated through various brand elements, including messaging, design, and marketing campaigns. It is also reflected in the brand's behavior and actions, including product quality, customer service, and social responsibility initiatives. The relationship between brand authenticity and the personal value of luxury brands suggests important implications for marketers. By communicating a brand's authenticity and aligning its values with its target audience, marketers can enhance consumers' value associated with the brand. This can increase consumer loyalty and drive sales. Similarly, the relationship between brand authenticity and the social value of luxury brands suggests that marketers should focus on building trust, credibility, and transparency to enhance the brand's social value (Hamby et al., 2019). By acting ethically and socially responsible and communicating this effectively, luxury brands can build a strong and loyal customer base that values the brand's authenticity and commitment to its core values.

Bruhn et al. (2012) developed a scale to measure consumers' perception of brand authenticity. In the study of Bruhn et al. (2012), authenticity was discovered to consist of four dimensions. The antecedents were identified through literature review and qualitative research as reliability, originality, continuity, and naturalness. These four aspects differ significantly from those derived from the work of Napoli et al. (2014). According to Eggers et al. (2013), brand authenticity includes brand congruency, customer orientation, and consistency. This concept strongly resembles the model developed the following year by Schallehn et al. (2014). In both models, brand consistency is recognized as the antecedent of brand authenticity, providing a reliable complement. In the study of brand authenticity, Coary (2013) identified three main aspects: adherence to principles, maintaining product originality, and being a pioneer.

Moulard et al. (2016) created a conceptual framework for brand authenticity based on the self-determination theory, attribution theory, and current brand research to address the absence of empirical examination of the impacts and antecedents of brand authenticity. According to this model, there are four antecedents to brand authenticity, including two linked to steady brand behaviors and two to unusual brand behaviors (uniqueness and scarcity) (longevity and longitudinal consistency). The framework also suggests quality and anticipated trust as two impacts or results of brand authenticity. Schallehn et al. (2014) analyzed this model, and the structure is comparable. In the context of their research, these writers define originality as "the distinctive manner the brand delivers on its promise" (Schallehn et al., 2014). Comparatively speaking, their conception of individuality may be grouped under the uncommon brand behaviors suggested by Moulard et al. (2016). The ideas of continuity and consistency are thus considered solid brand behaviors. As a result, brand individuality, continuity, and consistency are three antecedents of brand authenticity that the author considers in this study.

**2.2 Relationship of brand individuality, brand consistency, brand continuity and brand authenticity**

Brand individuality refers to the ability of a brand to distinguish itself from competitors and create a unique identity and personality (Light, 2014). Consumers perceive a brand that can differentiate itself and create a unique identity as more authentic. Brands that maintain their individuality while maintaining their core values and fulfilling their promises are considered genuine, honest, and trustworthy (Hernandez-Fernandez & Lewis, 2019). Conversely, brands that lack personality and imitate their competitors are viewed as dishonest and profit-oriented. Therefore, brand individuality is important in enhancing brand authenticity by creating a unique identity and personality, differentiating itself from competitors, building a strong customer relationship, and increasing its perceived authenticity.

Brand consistency is a crucial factor in impacting brand authenticity. It refers to the degree to which a brand's visual identity, messaging, and actions are consistent across all channels and touchpoints (Bengtsson et al., 2010). Consistency in a brand's communication and behavior creates trust and reliability, which increases its perceived authenticity. Brands that consistently deliver on their promises, maintain a cohesive identity and message, and communicate consistently across channels are seen as genuine and trustworthy. In contrast, inconsistent brands can cause confusion and mistrust among consumers, leading them to view the brand as inauthentic (Eggers et al., 2013). Therefore, brand consistency is vital in enhancing brand authenticity by reinforcing its authenticity and building customer trust.

Brand continuity is another crucial factor that impacts brand authenticity (Schallehn et al., 2014). It refers to the

degree to which a brand's identity and message remain consistent over time. Brands that maintain continuity in their identity and message are perceived as genuine, honest, and trustworthy because they create a sense of stability and reliability. Brands that frequently or drastically change their identity and message are viewed as not genuine or trustworthy, leading to consumer confusion and mistrust (Eggers et al., 2013). Therefore, brand continuity is important in enhancing brand authenticity by maintaining a consistent identity and message over time, reinforcing its authenticity, building trust with customers, and leading to increased consumer loyalty and positive word-of-mouth.

H1. Brand individuality positively influences brand authenticity.

H2. Brand consistency positively influences brand authenticity.

H3. Brand continuity positively influences brand authenticity.

**2.3 Perceived value**

Perceived value is a consumer's overall assessment of a product's utility based on their perceptions of what they receive and give, as defined by Zeithaml (1988). Perceived value is a subjective measure based on an individual's personal beliefs, preferences, and experiences. From an economic point of view, consumers consider their perceived value as the price they are willing to pay for a good or service and the value they receive from the service. From a psychological perspective, perceived value helps solve cognitive and affective problems that affect purchase decisions and brand choices. Functional, personal, and social values are the main aspects of perceived product value (Wiedmann et al., 2009). A consumer's perception of value is a subjective concept that tends to influence their attitudes toward a product or service when it fulfills their wants and needs.

The functional value of buying a luxury brand refers to the practical benefits that the product provides beyond its perceived status or prestige (Salehzadeh & Pool, 2017). Although luxury brands are often associated with high prices and exclusivity, they may also offer superior quality, design, and functionality compared to other products. Luxury brands may use higher quality materials, more advanced technology, or more sophisticated design techniques, which can result in more durable, efficient, or comfortable products. Additionally, luxury brands may offer better customer service, warranties, and after-sales support, which can enhance the product's overall value and provide consumers with greater peace of mind. Luxury brands may also invest in research and development, innovation, and customization, which can result in products tailored to the consumer's specific needs and preferences.

Buying luxury brands may give individuals personal value regarding the perceived benefits they derive from owning and using these products (Zhang & Zhao, 2019). Luxury brands are often associated with high quality, superior craftsmanship, and exclusivity, providing individuals with status, prestige, or luxury (Nwankwo et al., 2014). Luxury brands often invest heavily in marketing and storytelling, which can create emotional connections with consumers and make them feel part of a particular lifestyle or community. For some individuals, buying luxury brands may also be a way to express their style or identity or to reward themselves for their achievements or hard work. Owning luxury brands is also a symbol of success, power, or influence, providing individuals with confidence and self-esteem.

The social value of buying a luxury brand refers to the social and cultural benefits that the product provides beyond its functional value (Ajitha & Sivakumar, 2017). Luxury brands are often associated with social status, prestige, and exclusivity, which can provide individuals with a sense of belonging, identity, or cultural capital (Prentice & Loureiro, 2018). Owning luxury brands may be seen as a symbol of success, power, or influence, which can enhance their social status and reputation. Owning luxury brands may also give individuals access to exclusive networks, events, and experiences, which can help them build social connections and enhance their cultural knowledge and appreciation. Additionally, luxury brands may significantly impact the wider society and culture, as they often serve as symbols of excellence, creativity, and innovation.

**2.4 Relationship of brand individuality, brand consistency, brand continuity and brand authenticity, functional value, personal value and social value**

When consumers perceive a brand as authentic, they are more likely to trust that its promises and claims about its products are true (Napoli et al., 2016). This, in turn, can increase the perceived quality and reliability of the product, leading to a higher functional value for the consumer. Additionally, authentic brands tend to have a more precise identity and a better understanding of their target audience, resulting in products that are better suited to meet the needs

and desires of their customers. This can further enhance the functional value of buying a luxury brand. Moreover, brand authenticity can influence the perceived prestige of owning a luxury brand product. Authentic brands are often perceived as more exclusive and prestigious, which can increase the perceived value of owning a luxury product, further enhancing its functional value. Brand authenticity can positively impact the functional value of buying a luxury brand by increasing the perceived quality and reliability of the product, better aligning the product with the needs and desires of its target audience, and enhancing the prestige associated with owning a luxury brand product.

H4. Brand authenticity positively influences functional value.

When consumers perceive a brand as authentic, they tend to develop a stronger emotional connection with it (Hamby et al., 2019). They may view the brand as more genuine, honest, and trustworthy and, therefore, feel more positive about owning and using products from the brand. Authentic brands often have a clear and consistent identity, which can resonate with consumers who share similar values and beliefs. This creates a sense of affiliation and belonging, increasing the personal value consumers attach to buying a luxury brand. Moreover, when consumers perceive a brand as authentic, they may feel that owning and using its products enhances their self-image, making them feel more confident and sophisticated. In addition, authentic luxury brands often have a rich history, heritage, and cultural significance, which can add to their perceived personal value. Consumers may feel a sense of pride and ownership when they own products from such brands, which can further enhance the personal value they derive from buying luxury brands. Brand authenticity can significantly impact the personal value of buying a luxury brand by creating emotional connections, enhancing self-image, creating a sense of affiliation and belonging, and providing a sense of pride and ownership.

H5. Brand authenticity positively influences personal value.

A brand perceived as authentic by consumers is likelier to be seen as prestigious and associated with high social status (Fritz et al., 2017). This can enhance the brand's social value, as owning and displaying such a brand can signal to others that the individual is sophisticated and successful. In addition, an authentic brand is likely to have a positive reputation among peers and society at large, further enhancing the social value of owning and using the brand. On the other hand, if a brand is perceived as lacking authenticity, it may be seen as a symbol of conformity or a lack of discernment, which can diminish its social value. Therefore, the authenticity of a luxury brand can play a crucial role in shaping its social value and desirability among consumers. In addition, an authentic brand can also enhance the social value of buying a luxury product by creating a sense of community and belonging among consumers. Consumers who share the same values and aspirations may feel a sense of connection and identity with the brand, leading to a more excellent social value associated with owning and using the brand's products. This can also lead to increased brand loyalty and advocacy, as consumers who feel a sense of community with the brand may be likelier to promote and defend it to others.

Furthermore, a brand's authenticity can also impact the social value of buying a luxury brand in terms of the brand's social responsibility and ethical practices. Consumers today are increasingly concerned about the social and environmental impact of their purchases, and brands that are perceived as authentic in their commitment to social responsibility and ethical practices may be more highly valued by consumers (Hasan et al., 2022). This can enhance the social value of buying a luxury brand, as consumers may feel that their purchase aligns with their values and contributes to a greater social or environmental good.

H6. Brand authenticity positively influences social value.

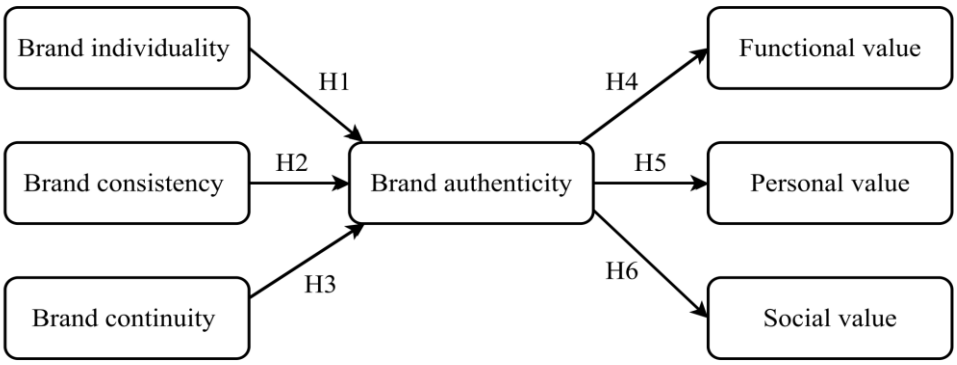



**Figure 1. Research model**

## III. RESEARCH METHODOLOGY

### *3.1 Sampling Procedures and Participants*

Based on the list of the 15 largest shopping centers in Ho Chi Minh City, Vietnam, the author randomly selected five shopping centers to collect data. Data was collected directly from shoppers at these five malls, including Takashimaya, Vincom Mega Mall, Van Hanh Mall, AEON Mall Tan Phu, and Bitexco. The author conducted a survey using a convenience sampling method of 100 participants at each shopping center. Convenience sampling allowed the author to select participants based on their accessibility, availability, geographic distance, and willingness to respond. Additionally, this sampling method has been applied in previous studies on the buying behavior of luxury brands. The first part of the questionnaire explained the purpose of the study and collected demographic information from respondents (see Table 1). The remaining questions related to brand authenticity, individuality, consistency, continuity, functional value, personal value, and social value. A total of 850 questionnaires were distributed, aiming for a broad and diverse sample to ensure the data was representative of shoppers in Ho Chi Minh City's luxury brand market. Out of the 850 distributed questionnaires, 485 valid responses were collected. The final sample size of 485 was determined after excluding incomplete and invalid responses to ensure the reliability and accuracy of the data for analysis. This response rate aligns with accepted norms in similar studies and provides a sufficiently large sample for meaningful statistical analysis and generalization of findings. The decision to work with the 485 valid responses was based on their completeness and relevance to the research objectives. Sample demographics are depicted in Table 1.

### 3.2 Measurement

Each construct in the current study is adopted from the previous research and measured using a five-point Likert scale (1 strongly disagree and five strongly agree). The measures of brand individuality, consistency, and continuity were adopted by Hernandez-Fernandez and Lewis (2019). These were measured using three items for each construct. The six-item scale of brand authenticity items is adopted from Schallehn et al. (2014). Finally, the functional, personal, and social value measures were adopted by Salehzadeh and Pool (2017).

### 3.3 Data analysis

This study employed the variance-based partial least square structural equation modeling (PLS-SEM) approach to analyze the data using the software SmartPLS version 3.0. The procedure for our data analysis consists of (1) the evaluation of the collinearity and standard method bias, (2) the assessment of the reliability and validity of the measurement model, and (3) the evaluation of the structural model.

## IV. RESULT

**Table 4. 1 – Demographic information of respondents**

| Variable | Frequency | Percentage (%) |
|---|---|---|
| Gender | | |
| Male | 214 | 44.12 |
| Female | 271 | 55.87 |

| | | |
|---|---|---|
| Age | | |
| 22-30 | 149 | 30.72 |
| 30-40 | 228 | 47.01 |
| 40+ | 108 | 22.26 |
| Working sector | | |
| Business | 241 | 49.69 |
| Education | 137 | 28.24 |
| Environment | 42 | 14.73 |
| Information technology | 38 | 7.83 |
| Hospitality | 14 | 2.88 |
| Others | 13 | 2.68 |

**4.1 Collinearity and common method bias**

Given that this research employs a self-reported survey approach, common method bias is a major risk factor for measurement errors (Podsakoff et al., 2003). As a result, the author ran two statistical analyses to assess the significance of CMB. First, the author conducted Harman's one-factor test by loading all items into an unrotated exploratory factor analysis, which was based on Podsakoff et al. (2003). Less than half, or 32.25 percent, of the total was accounted for by the first (biggest) factor that was obtained by principal components factor analysis. Consequently, no CMB evidence was detected. The second approach that was utilized to look for CMB further was the one that Liang et al. (2007) suggested. A common method factor including elements from every construct in the PLS model was included in this test. The average of the substantive factor loadings was 0.684, and the findings showed that all of them were statistically significant at $p<0.001$. In contrast, the majority of technique factor loadings were significantly less than their corresponding substantive factor loadings (average = 0.000, $p>0.05$). As a result, these results suggested that CMB did not pose a significant risk to the study's validity.

**4.2 Measurement model**

The convergent validity and discriminant validity of each model concept were assessed by the author in order to determine the quality of the measurement model (see Table 2). The variables' Cronbach's Alpha ranged from 0.802 to 0.888, indicating that all values were significantly higher than the 0.7 criterion. Similarly, the composite reliability (CR) values were also significantly higher than 0.7 (Fornell & Larcker, 1981). The construct dependability was supported when taken as a whole. Subsequently, all first-order variable AVEs fell between 0.514 and 0.756, above the suggested cut-off of 0.50. Accordingly, it showed that the study's convergent validity of measures was adequate.

**Table 4. 2 – Construct reliability and convergent validity**

| Construct | Cronbach's alpha | Composite reliability (CR) | Average variance extracted (AVE) |
|---|---|---|---|
| **1. Brand authenticity** | 0.881 | 0.905 | 0.514 |
| **2. Brand individuality** | 0.888 | 0.915 | 0.642 |
| **3. Brand consistency** | 0.856 | 0.893 | 0.584 |
| **4. Brand continuity** | 0.860 | 0.900 | 0.643 |
| **5. Functional value** | 0.838 | 0.908 | 0.756 |
| **6. Personal value** | 0.866 | 0.908 | 0.713 |
| **7. Social value** | 0.802 | 0.863 | 0.558 |

Next, HTMT.85 and the Fornell and Larcker (1981) criteria may be used to assess the discriminant validity. Each latent variable's square root of the AVE, as shown in Table 3, varied from 0.717 to 0.869, which was stronger than the correlations between latent variable pairings. It meets the requirement set forth by Fornell and Larcker (1981). Additionally, all components' HTMT correlation ratios are smaller than 0.85, which further supports discriminant validity. When combined, discriminant validity is adequate for the measuring model used in this investigation.

**Table 4. 3 – Correlation, AVE, and Heterotrait-Monotrait (HTMT) ratio value.**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **1. Brand authenticity** | **0.717** | 0.686 | 0.727 | 0.773 | 0.724 | 0.726 | 0.521 |
| **2. Brand individuality** | 0.609 | **0.801** | 0.485 | 0.608 | 0.524 | 0.6 | 0.279 |
| **3. Brand consistency** | 0.633 | 0.424 | **0.764** | 0.685 | 0.683 | 0.688 | 0.513 |
| **4. Brand continuity** | 0.673 | 0.534 | 0.588 | **0.808** | 0.704 | 0.633 | 0.527 |
| **5. Functional value** | 0.623 | 0.453 | 0.58 | 0.598 | **0.869** | 0.606 | 0.501 |
| **6. Personal value** | 0.635 | 0.528 | 0.593 | 0.546 | 0.518 | **0.844** | 0.369 |
| **7. Social value** | 0.44 | 0.236 | 0.426 | 0.439 | 0.412 | 0.31 | **0.747** |

***Note:*** *Correlations and Heterotrait-Monotrait ratio are at the lower and upper of the diagonal, respectively; the square roots of AVE are highlighted in bold.*

**4.3 Structural model.**

The PLS model's explanatory strength and predictive relevance were evaluated using R2 values and the Stone-Geisser Q2 metric, respectively (Hair et al., 2022). The findings reveal that the R2 varied from 0.253 (social value) to 0.602 (brand authenticity), beyond the 0.25 threshold value. This suggests that the variation accounted for by these endogenous factors was substantial and high. By contrast, the cross-validated redundancy $Q^2$ values of all endogenous components were more than zero, indicating the predictive usefulness of the model.

The direct effects were tested using a t-test and the bootstrapping procedure with 5,000 samples, as Table 4 illustrates. The findings supported H1, H2, and H3 since they showed a substantial direct influence on brand authenticity from originality, consistency, and continuity. Additionally, the findings showed that although there was no significant association between brand authenticity and functional value, it was favorably related to social and personal values. Consequently, H5 and H6 were supported, while H4 was not.

**Table 4. 4 –. Research results**

| | Hypotheses | Path | p-value | Supported |
|---|---|---|---|---|
| H1 | Brand individuality è Brand authenticity | 0.301 | 0.000 | Yes |
| H2 | Brand consistency è Brand authenticity | 0.312 | 0.021 | Yes |
| H3 | Brand continuity è Brand authenticity | 0.328 | 0.000 | Yes |
| H4 | Brand authenticity è Functional value | 0.623 | 0.432 | No |
| H5 | Brand authenticity è Personal value | 0.635 | 0.000 | Yes |
| H6 | Brand authenticity è Social value | 0.440 | 0.012 | Yes |

**V. DISCUSSION**

Today, the competitive landscape for luxury brands is increasingly fierce. Luxury brands not only face competition but also the dangers of counterfeit products. To win these competitions, luxury brands must focus on building deep connections with consumers. The findings of this study are similar to those of Alexander (2009) and Newman and Dhar (2014), suggesting that consumers will establish a strong emotional relationship with a brand compared to less authentic brands. More specifically, in the market for luxury products and the relationship between brand individuality and authenticity, the higher the degree to which a luxury brand delivers on its promise, the more likely consumers are to consider it authentic. Brand uniqueness is the capacity of a brand to forge distinctive linkages in a consumer's mind between the brand and the things that matter to them. By establishing a distinct identity, a brand can differentiate itself from its competitors and attract a specific target audience. This uniqueness helps the brand to position itself as a market leader in a specific industry or niche. This finding could be of particular importance in the luxury goods market. Given the wide range of competitors and the threat posed by counterfeit luxury goods, consumers may view brand individuality as an essential attribute influencing the potential consumption of these brands. If a luxury brand can differentiate itself, thereby increasing awareness of brand individuality, then that brand will be rewarded with the audience's perception of authenticity.

Regarding the relationship between brand consistency and authenticity, brand consistency refers to the brand's

ability to maintain a consistent image across all marketing channels, including visual elements such as logos, typography, color schemes, and messaging. By demonstrating that the brand's identity remains consistent, the brand can establish strong brand recall, which helps consumers recognize and identify with the brand. Consistency also helps to build brand trust, as consumers associate the brand with consistent quality and experience. Given the brand's positioning in the market, luxury brands should take actions consistent with their brand promise, making sure not to engage in any activities contrary to their nature. All luxury brands provide upscale and luxurious goods. Hence, attempting to boost the sense of brand consistency might result in a better perception of authenticity.

In terms of the connection between brand continuity and brand authenticity, it is crucial for increasing brand recognition and authenticity to successfully fulfill previous brand promises and link previous actions with current brand promises. Several well-known brands have existed in the luxury market for a very long time. These well-known companies have a compelling narrative to tell customers, solid value systems, and a rich history. The veracity of these qualities has been demonstrated. The connection between brand continuity and authenticity should not be disregarded, not even by newcomers to the market. Creating a captivating narrative and establishing key principles early on helps raise customer awareness of brand continuity and boost their impression of authenticity. This means that the brand's core values and personality remain consistent, even as the brand evolves and adapts to changing circumstances. This continuity helps to reinforce the brand's identity and establish it as a trusted and reliable player in the market.

Brand authenticity positively impacts personal value because it creates a sense of trust and emotional connection between the brand and the consumer. Authenticity reinforces the idea that a brand's values and promises are genuine, which makes consumers feel confident that they are investing in a product or service that meets their expectations. This confidence, in turn, leads to a higher perceived value for the product, as consumers are willing to pay a premium for luxury goods that they trust to deliver a high-quality experience. Additionally, personal authenticity can evoke a sense of heritage, legacy, and tradition that resonates with consumers on a deeper level, making them feel more connected to the brand and its values. This emotional connection and sense of belonging to the brand can also increase perceived value for consumers.

Brand authenticity can positively impact social value because it helps establish a brand's credibility and reputation. When a brand is seen as authentic, it is perceived as honest and trustworthy, and its values and promises are genuine. This can create a social identity for consumers who align with the brand's values and beliefs. This can lead to a sense of social belonging and a desire to share and promote the brand with others, which can increase its social value. Authenticity can also create a sense of heritage and tradition, which can help to establish a brand's cultural significance and increase its social value. Brand authenticity can create a sense of social status and belonging for consumers, positively impacting social value.

Finally, the research results show that brand authenticity does not directly impact function value. This result can be explained because function value refers to the functional benefits that a product or service provides, such as quality, efficiency, or effectiveness. On the other hand, authenticity is a non-functional attribute of a brand that pertains to the brand's identity, values, and heritage. While authenticity can enhance a brand's perceived quality or reliability, it is not directly related to the functional benefits of the product or service.

## VI. CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

Brand authenticity may and should be considered a crucial component for the success of brands, according to the positive and significant associations discovered in this study. To establish and raise awareness of authenticity, personal, consistent, and ongoing brand promise fulfillment is necessary. This is an interesting outcome in the luxury goods market as countless brands use very similar marketing strategies, and some of the luxury brands have been around for a long time. This is very difficult for new brands to position themselves. In addition, this study shows that brand authenticity affects only personal and social value and has no impact on function value. This study provides deeper insights into aspects of perceived value that previous studies have not explored.

This study provides several actionable implications for luxury brand managers, particularly in markets like Vietnam. First, for consumers with high demands for authenticity who invest time verifying product legitimacy and avoiding counterfeits, brands should integrate transparency tools such as digital authentication (e.g., QR codes or

blockchain verification) to emphasize product origins, craftsmanship, and ethical practices. These tools can be incorporated into packaging, in-store displays, or promotional materials to create a seamless experience. Second, enhancing brand individuality, continuity, and personality can help brands differentiate in competitive markets. Managers should promote individuality by showcasing unique heritage and craftsmanship through storytelling campaigns or collaborations with local artisans. Ensuring brand continuity through consistent visual identity, messaging, and customer experience across touchpoints further reinforces authenticity. Third, building an emotional connection through immersive brand experiences and storytelling is essential. This can include pop-up exhibitions, virtual reality tours, or advertising campaigns highlighting the brand's legacy and tradition. Leveraging social value perception is another critical aspect; marketers can organize exclusive events, partner with cultural institutions, or highlight sustainability initiatives to foster a sense of exclusivity and social prestige. Finally, marketers must tailor strategies to cultural and demographic contexts. In Vietnam, where consumers highly value heritage and craftsmanship, luxury brands should emphasize these attributes in campaigns while researchingresearching to understand evolving perceptions of authenticity and adjust strategies accordingly. These targeted and context-specific approaches can strengthen brand authenticity and drive customer loyalty.

This study is also not without its limitations. First, this sample lacks a precise classification of luxury brands. Further studies may focus on a specific group of luxury brand categories. Second, this study was limited to mediators. Other potential mediators of the relationship between brand authenticity and perceived value exist, such as brand trust and perceived quality, which should be included in a future model. Finally, this study focused on outcomes as three dimensions of perceived value. Other positive outcomes can be considered about brand authenticity, such as brand trust, brand love, brand awareness, brand loyalty, and brand personality.

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# THE EFFECTIVENESS OF CAUSE-RELATED MARKETING ON CUSTOMER LOYALTY UNDER CSR INITIATIVES: A CASE STUDY OF UPRACE – A VIETNAMESE ONLINE RUNNING EVENT

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**ABSTRACT**

Purpose – This research investigates the effects of sport-charity events under CSR initiatives on corporate image and customer loyalty, and examines the participant's perceptions to join the event, the involvement of customers with the social impacts, and the event sponsor's fit.

Design/methodology/approach – Survey questionnaire and quantitative approach are used to collect the data from participants who joined the UpRace running event. The survey received 255 responses in total and 237 valid responses. The data were analyzed by the partial least square-structural equation modeling (PLS-SEM) technique.

Findings – The data show that corporate image performs an important role as an indirect mediator in the relationship between the perception of joiners and customer loyalty. Besides, becoming a sponsor for a well-organized event can have positive effects on corporate image and customer loyalty.

Practical implications – The study proposed some recommendations for corporates to build brand image and customer loyalty through organizing or sponsoring charitable sports events.

Originality/value – This study is distinguished from past studies because it analyzes charitable sporting events from the perspective of people who attended the event. The research's results emphasize the relevance of CSR in corporate marketing and communicating with the community.

*Keywords:* corporate image, corporate social responsibility (CSR), sports sponsorship event

## I. INTRODUCTION

Recently, the concept of corporate social responsibility (CSR) has been applied widely in the marketing industry. Among many CSR initiatives implemented, firms have recognized the possibility of expanding the scope of CSR to collaborate with sports events as sponsors and support philanthropic causes to achieve their own social and economic goals (Trendafiova, Ziakas, and Sparvero, 2017). Therefore, the question of how sponsorships for sports charity events impact the business purposes of corporations has risen (Plewa et al., 2016). Although relevant scholarly research has lately expanded the topic (Woolf et al., 2013; Eagleman and Krohn, 2012), little is known regarding the possible effects of certain sponsorship components on participants, who are also the customers, in a non-profit participatory sports event (Silva, A., 2021).

Based on the growing trend of corporate sponsorship for philanthropic or charitable sports activities, the evaluation of how a charity program can impact stakeholders, particularly the participants in sports events, has become critical. According to research, involvement in the activity (Lardinoit & Derbaix, 2001), attitudes regarding the events (Quester & Thompson, 2001), and event sponsors (Olson & Thjomoe, 2011) are important variables influencing sponsorship success.

Therefore, this research analyzes UpRace - an online running event, as the context, and VNG Corporation as the event's primary sponsor, to investigate the relationships between those aspects and CSR effectiveness from a sponsored charity sport event. The research also investigates the effectiveness of those factors on the loyalty of customers to the products and services of corporations. UpRace is an online running event held annually in Vietnam, and it is technically supported by VNG Corporation. VNG Corporation and other sponsors committed to donating 1,000 VND for social organizations in every kilometer run of joiners recorded by the UpRace application (UpRace., n.d.). Four years after its launch, UpRace has attracted more than 230,000 joiners and gained around 20 billion VND donated to Vietnam and

international non-profit organizations, including Operation Smile Vietnam, Newborns Vietnam, Save Vietnam's Wildlife, etc.

The following parts of this research include three steps. First, this research reviewed previous literature in marketing and public relations for sports management. Second, primary data from participants were collected and analyzed. Finally, the results were discussed, and proposed suggestions for future CSR initiatives and further research in the marketing industry.

The results of this research will explore the relationship between corporate social responsibility (CSR) initiatives associated with charity sports events, and their impact on corporate image and customer loyalty. The first area of investigation focuses on how CSR activities undertaken during charity sports events influence how the public perceives the sponsoring corporation. The second area will analyze how corporate image, shaped by its CSR efforts, can translate into increased customer loyalty. Finally, the research examines the impact of cause-related events, particularly charity sports events, on the perception of participants towards the sponsoring companies. This exploration aims to shed light on the potential for these events to create positive associations and build trust between brands and consumers. By investigating these interconnected themes, this research seeks to provide valuable insights into the strategic use of CSR within the context of charity sports events and its potential to benefit both corporations and their customers.

## II. LITERATURE REVIEW

### 2.1 CSR in sport sponsorship activity

CSR consists of corporate charities for a social cause or to support the community's well-being (Kotler and Lee, 2005), which has a significant impact on sports sponsorship initiatives, particularly in charity sporting events (Walzel, 2018). Sponsorship for charitable issues has reached recorded levels, indicating how customers are willing to purchase enterprises that align with their own beliefs and values (Sung and Lee, 2016). The connection of corporate CSR to a sports organization could enhance brand image to the community and boost the company's reputation (Mahmood and Bashir, 2020). Furthermore, CSR efforts directly or indirectly promote customer loyalty to the brand (García de Leaniz and del Bosque Rodríguez, 2015), while helping create a favorable business image (Gürlek et al., 2017). Besides, according to Irwin et al. (2013), sponsorship of sporting events had been acknowledged as an efficient tool for firms to engage with target audiences about their social responsibility activities.

### 2.2 Corporate image of the sponsor (CI)

Keller (1993) proposed that the image of corporations would be the impression of the organization by its stakeholders. It is the combination of a person's feelings, thoughts, attitudes, knowledge, perceptions, and beliefs about a company (Trivedi, 2020). According to studies in a variety of industries, A successful CI provides a competitive advantage by connecting current and prospective customers, enhancing customer satisfaction, and boosting market shares and sales (Nguyen and Leblanc, 1998). As a result, corporate image is a strong predictor of sponsorships success (Tsiotsou and Alexandris, 2009).

### 2.3 Customer loyalty (CL)

In research regarding the attendance of the marathon event, Du et al. (2015) characterized the intentions of customers to become loyal as "positive goal-directed behavioral responses toward an event". Customers become more loyal to a sponsor firm when they believe they would contribute to the improvement of society (Gürlek, Düzgün, and Meydan Uygur, 2017). CSR activity also influenced the loyalty of customers through brand image, as well as word-of-mouth (Du et al., 2015) in the sport sponsorship context (Martnez et al., 2014).

Customers' positive behaviors towards events impact the positive attitude towards the corporate sponsors, including social interchange, philanthropy, and a sense of involvement, according to Meenaghan (2001). Consumers' view of the sponsor and CL is directly influenced by their amount of goodwill toward the sponsor, as well as their engagement level in the sponsored event or activity. This discussion leads to the first hypothesis:

**H1**: CI has a positive effect on CL

### 2.4 Involvement with social impact (ISI)

Activity involvement is an indication of each person's behavior toward a specific sports event and has been

characterized by Havitz and Dimanche (1997) as "an unobservable state of desire, excitement, or interest towards a leisure activity or linked product". According to Ridinger et al. (2012), involvement is significant because it has the potential to change the behavior and attitude of the participants in terms of the brand's products, services, or activities, and integrating the sponsorship information process in customer impressions (Dos Santos et al., 2016) and sponsorship effectiveness (D'Astous and Bitz, 1995). Participation in this study will be defined as a personal link to children's disparity and orphans, as well as endangered wild animals. Considering the situation of this running event, the research hypothesizes that participants who have a strong sense of ISI will favorably appraise the sponsorship organization to the event.

**2.5 Attitude toward the event (AE)**

D'Astous and Bitz (1995) argued that AE is one of the most significant factors influencing sponsorship results and people attracted to the event tend to generate positive attitudes toward the corporate sponsor. Although some research has shown that an event's attitude is important, the impact of attendees' attitudes towards the event on the brand, especially after witnessing social responsibility activities sponsored by the brand, remains inconclusive (Mao and Zhang, 2013). Bal et al. (2010) observed that emotional reactions impacted the development of attitudes about events and the consequences of sponsorship. As a result, the hypotheses are developed:

**2.6 Sponsorship Fit (FIT)**

"Fit" is defined in sponsorship research as consumer perceptions of a sponsor's or event's direct or indirect link (Pham and Johar, 2001). The approach of FIT, according to the researchers, may be impacted by both "functional-based similarity" (Gwinner, 1997) and "image-based similarity" (Benezra, 1996). Ellen et al. (2006) stated that a close fit among sponsors, as well as an activity, can lead to positive results since FIT allows the attitude of customers gained from the activity to the sponsor's CI. In other words, once an activity connects with the brand visually or functionally, the transfer system positively enhances, leading to the hypotheses:

Hence, the theoretical framework is indicated below:

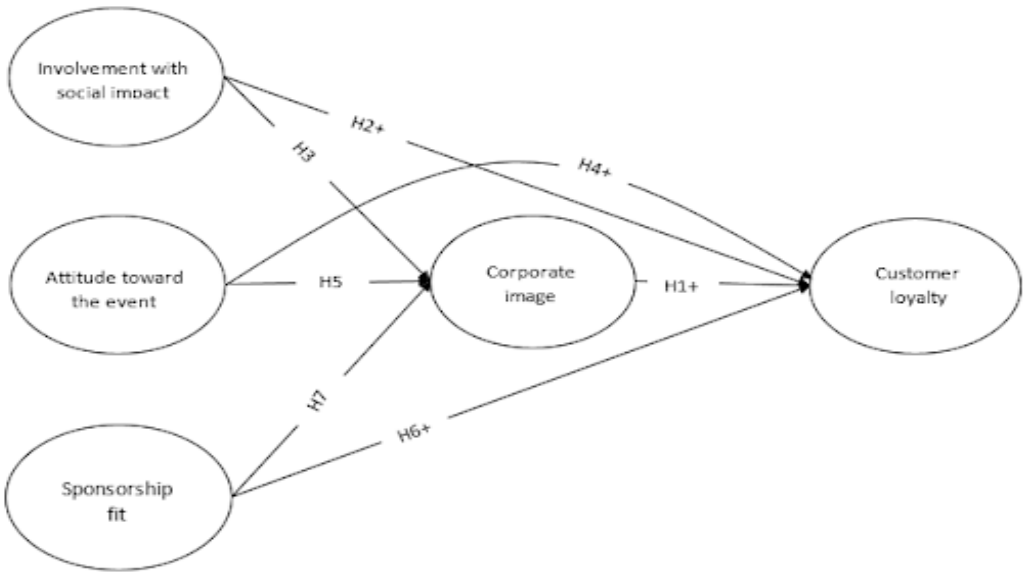



**Figure 1: The proposed model**

## III. METHODOLOGY

### 3.1 Sample and procedures

The survey design implemented a convenience sampling methodology, aiming to acquire a broad spectrum of participants (Oliver C.R, 2014). The selection of this technique was driven by its perceived advantages in terms of cost efficiency, rapid turnaround time, and reduced procedural complexity. Besides, individuals who took this survey would be ensured that they understand about sport-charity programs and online running events. In this research, primary data will be the main resource and observations, and they were collected by quantitative methods. Data were collected by

questionnaire structure, including four parts, 14 questions, collected online via the Qualtrics form, and offline via paper survey. The questionnaire was designed following the variables measured from previous studies. As this research is related to running events and the impacts of CSR initiatives on brand image and customer loyalty, the sample was narrowed to 250 people nationwide, who have joined UpRace online and offline running events in 2022 and before. After removing invalid and incorrect answers during the two-week data collection in March 2023, the survey received 237 valid forms from respondents, constituting a returned ratio of 94.8 percent. Both Vietnamese and foreigners, male and female participants who are above 18 years old were the target audiences for the data collection. To reduce participant response bias, individuals were carefully chosen and requested to complete the survey independently. The survey was only available to event attendees aged 18 and over, and attendees were asked in advance if they agreed to participate. A drafted survey questionnaire was created in English language, then translated into Vietnamese under the principles of double translation for the pilot test and data collection, then translated back to English for data analysis.

**3.2 Measurement**

The survey consisted of four main sections, First, two screening questions were used: 'Do you know about VNG Corporation?' and 'Do you know about the online running platform called UpRace?'. Next, general questions explored participants' running event frequency, distances, reasons for participation, and concerns about joining such events. Next, the five-point Likert-scale question collected opinions from joiners about distinct factors: AE, FIT, ISI, CI, and CL, which ranged from 1 – 'strongly disagree' to 5 – 'strongly agree'. Following this, a five-point Likert scale assessed opinions on the factors of AE, FIT, ISI, CI, and CL, with responses ranging from 1 ('strongly disagree') to 5 ('strongly agree'). Twenty-seven items were generated from these factors, revised and adjusted based on previous research. Finally, demographic questions collected data on participants' gender, age, education level, and salary.

In this research, partial least square structural equation modeling - PLS-SEM 3, designed by Ringle et al. (2015) - was used to uncover the correlations between variables. The acquired data was evaluated in two steps, beginning with examining the reliability and validity of questions using a range of indicators such as factor loadings, composite reliability, and average variance extracted. SEM was then used in the research to describe the structure's relationships, as it was considered useful for understanding hidden factors in markets (Haenlein and Kaplan, 2004). Each construct of this study employed measurement items from previous relevant research.

– ISI: Three scales adapted from Sung and Lee (2016) and two additional items from Junior et al. (2015).

– AE: Three items adapted from Mazodier and Merunka (2011), one item adapted from Kulczycki and Koenigstorfer (2016), and three additional items from Sung and Lee (2016).

– FIT: Even-sponsor fit scales were measured by five items from Gwinner and Bennett (2008).

– CI: The three measurement scales of the corporate image were adapted from studies of two groups of co-written authors - Mao and Zhang (2013); and the other three items from Gürlek, Düzgün, and Meydan Uygur (2017).

– CL: five items of corporate loyalty measurement scales were inherited from Mao and Zhang (2013), He and Lai (2014), and Aramburu and Pescador (2019).

**4.1 Demographic statistics**

Among 237 valid forms obtained, the proportion of males who joined UpRace was significant, which accounted for 65.6% of the total respondents. More than 75% of participants were from 19 – 30 year-olds, followed by 17% of people from 31 – 45 years old, and the remaining 8% of joiners from above 45 years old. The proportion of joiners who graduated with a bachelor's degree was significant, 85%, while other 13% were postgraduates, and other 2% were those who had an uncompleted high-school education. In terms of salary, around 43% of the participants had an income ranging from 10 - 25 million VND, followed by 26 – 40 million VND, 0 – under 10 million VND, and above 40 million VND (24.5%, 22%, and 10.5% respectively). Besides, insights extracted from the respondents indicate that most people prefer the running distance of 5 kilometers (46.7%), followed by 10 kilometers (19%), and half-marathon (16%). Meanwhile, around 58% of runners join the running events 1-3 times a year, and 25% of other people join running 4-6 times. Most participants choose running for health and delight benefits, and many of them prefer the race-kit and the scenery of running roads.

**4.2 Measurement model assessment**

The measurement model evaluation, which included reliability and validity testing, was applied to all constructs. Two methodologies were utilized to measure the reliability of the construct: Cronbach's alpha and composite reliability (CR). The reliability criteria for both ways need to be greater than 0.7 (Hair, Howard, and Nitzl, 2020). In Table 1, the values of Cronbach alpha ranged from 0.904 to 0.947, which were desirable. Besides, all measures of CR varied from 0.908 to 0.948, which were good as recommended. The outer loadings of all indicators were greater than 0.708, which means that the correlation between those observed variables and the factors was ideal (Hair, 2010).

**Table 1. Outer Loadings, CR, CA, and AVE Results**

| Construct | Items | Outer Loadings | Cronbach's Alpha | CR | AVE |
|---|---|---|---|---|---|
| Attitude toward the event (AE) | 6 | 0.725 – 0.884 | 0.908 | 0.911 | 0.687 |
| Sponsorship Fit (FIT) | 5 | 0.894 – 0.921 | 0.947 | 0.948 | 0.826 |
| Involvement with social impact (ISI) | 5 | 0.812 – 0.880 | 0.904 | 0.908 | 0.722 |
| Corporate image (CI) | 6 | 0.862 – 0.895 | 0.935 | 0.936 | 0.756 |
| Customer loyalty (CL) | 5 | 0.868 – 0.925 | 0.939 | 0.940 | 0.805 |

Next, the research applied Average Variance Extracted (AVE) to indicate convergent validity. All the indicators ranged from 0.687 to 0.826, which measured the sufficient average variance shared between each item and the constructs, exceeding the suggested measurement of 0.5 (Fornell and Larker, 1981). From the results of Table 1, the validity and reliability tests were adequate for the reflective constructs. To measure the distinctiveness of the construct, the research applied two criteria - the heterotrait-monotrait ratio of correlations (HTMT) and Fornell-Larcker. For Fornell Larker's criterion, the cross-loading indicator is suggested to exceed the opposed constructions. Meanwhile, if the AVE square root for each construct would be higher than the absolute value for the correlation of other constructs, the scale discriminability is guaranteed (Fornell and Larcker, 1981). For HTMT, Henseler et al. (2015) state that the HTMT value between two constructs should be less than 0.85. Table 2 and Table 3 show the discriminant validity supported by the total constructs of two criterions.

**Table 2: Discriminant validity – Fornell-Larcker criterion**

| Constructs | AE | FIT | ISI | CI | CL |
|---|---|---|---|---|---|
| AE | 0.829 | | | | |
| FIT | 0.716 | 0.869 | | | |
| ISI | 0.677 | 0.827 | 0.897 | | |
| CI | 0.789 | 0.719 | 0.662 | 0.909 | |
| CL | 0.586 | 0.630 | 0.603 | 0.574<br>0.850 | |

*Notes: AE = Attitude toward the event; FIT = Sponsorship Fit; ISI = Involvement with social impact; CI = Corporate image of the Sponsor; CL = Customer loyalty*

**Table 3: Discriminant validity – HTMT criterion**

| | AE | CI | CL | FIT | ISI |
|---|---|---|---|---|---|
| AE | | | | | |
| CI | 0.773 | | | | |
| CL | 0.730 | 0.882 | | | |
| FIT | 0.846 | 0.762 | 0.700 | | |
| ISI | 0.643 | 0.681 | 0.648 | 0.616 | |

***Notes:*** *AE = Attitude toward the event; FIT = Sponsorship Fit; ISI = Involvement with social impact; CI = Corporate image of the Sponsor; CL = Customer loyalty*

**4.3 Structural model assessment**

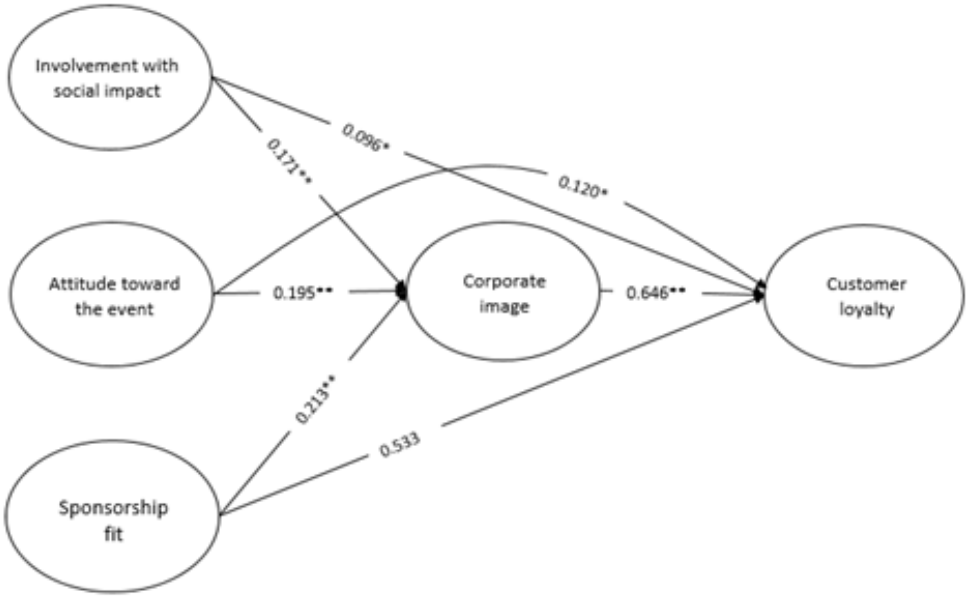
The structural model is evaluated once the measurement model has been accessed, while all good results have been obtained. Standard assessment criteria include the statistical significance and the relevance of the path coefficients, the measurement of cross-validated redundancy based on blindfolding (Q2), and the coefficient of determination (R2) (Hair et al., 2019). According to the findings, the model can account for 61.4% of the variance in CI and 70.1% of the variance in CL. Furthermore, the Q2 value of endogenous variables should be greater than 0.2 to confirm predictive significance. The study findings reveal that all Q2 values satisfy the requirement, indicating a satisfactory model fit (Hair et al, 2020). The value of f2 is considered useful for the model adjustment with the range of 0.016 – 0.541 since it exceeds the medium and large suggested values, which are 0.15 and 0.35 respectively (Junior et al., 2015).

**Table 4. Path coefficients – effects on corporate image and organization customer loyalty**

| Hypothesis | Relationship | Path coefficient | *p* values | f-square | Decision |
|---|---|---|---|---|---|
| *Direct effects* | | | | | |
| H1 | CI → CL | 0.646 | 0.000** | 0.541 | Supported |
| H2 | ISI → CL | 0.096 | 0.064* | 0.017 | Supported |
| H4 | AE → CL | 0.120 | 0.071* | 0.016 | Supported |
| H6 | FIT → CL | 0.048 | 0.533 | 0.003 | Rejected |
| - | ISI → CI | 0.265 | 0.002** | 0.115 | Supported |
| - | AE → CI | 0.301 | 0.000** | 0.084 | Supported |
| - | FIT → CI | 0.329 | 0.000** | 0.102 | Supported |
| *Indirect effects* | | | | | |
| H3 | ISI → CI → CL | 0.171 | 0.003** | - | Supported |
| H5 | AE → CI → CL | 0.195 | 0.000** | - | Supported |
| H7 | FIT → CI → CL | 0.213 | 0.001** | - | Supported |

**Notes:**

AE = Attitude toward the event; FIT = Sponsorship Fit; ISI = Involvement with social impact; CI = Corporate image of the Sponsor; CL = Customer loyalty; * *p* < 0.1; ** p < 0.05




**Note**: *p < 0.1; ** p < 0.05

**Figure 2: The PLS-SEM result**

Along with these recommendations, non-parametric bootstrapping (Preacher and Hayes, 2008) was applied with 1000 replications to determine the statistical significance with the acceptable level of ≤0.10. SEM was conducted using Smart-PLS to test H1-H7. Table 4 displays the direct and indirect effects of the proposed constructs. The indicator of

H1 presented a positive effect of CI on CL. H1 is supported with significant satisfaction from the confidence level. H2 showed that ISI has a small direct effect on CL, so H2 is supported. H3 anticipates the positive effect of ISI on CL through CI, and it is supported. Therefore, the total effects of ISI on CL would be higher than the sole direct and indirect effects (0.267), showing the empirical support of these hypotheses. H4 is supported, as AE has a positive direct effect on CL. H5 predicts that CI mediates the effect of AE on CL, and it is supported because AE's indicator has an indirect effect on CL. H4 and H5 had the total effect of AE on CL, and AE on CL via CI is higher than the supportive direct and indirect effects of AE on CL (0.315). H6 predicts FIT to affect directly on CL, but H6 is rejected because the confidence interval was unsatisfactory. The final prediction of H7 also indicates the indirect effect on CL via FIT, which is supported. In addition, CI had a considerable direct effect on CL ($\beta = 0.646$, $p^{**} = 0.000$, $f2 = 0.541$), while the direct path coefficient of ISI ($\beta = 0.096$, $p^{*} = 0.064$, $f2 = 0.017$), and AE ($\beta = 0.120$, $p^{*} = 0.071$, $f2 = 0.016$) on CL are small.

## V. DISCUSSION AND LIMITATIONS

In conclusion, the current study identified the theoretical relationship among the involvement of customers with social, the attitudes toward the sporting event, the perceptions of participants regarding the fit of sponsor and social impacts, and the customer behavior towards the corporate's products and services perceiving that the corporate is the sponsor for the sporting event. CSR initiatives for the marketing mix can enhance the positive image of the corporate, and there are significant roles of building a good image toward customer loyalty.

### 5.1 Academic application

From academic application, while many previous studies investigated the effectiveness of CSR on general customers, this research investigates the attitudes and perceptions of those who are the customers and also the actual participants of an event created by CSR initiatives. In addition, the present research becomes notable given that the majority of investigations on CSR and sponsorship for charitable sports events have been geographically centered on English-speaking countries (Matten and Moon, 2004). Since corporate activities are expanding internationally, it is significant for firms to recognize CSR initiatives and their effectiveness in different countries with diverse cultures. Vietnamese is a collectivist country that emphasizes interdependence and promotes a harmonious environment between individuals (Nguyen and Truong, 2016). Most Vietnamese believe that big companies should invest more to build a better society, and it would gain the loyalty from people in the society when using corporate products (Tran, 2022). Therefore, investigating CSR practices, especially in sport sponsorship events for social impacts is obligatory for corporations to effectively build the reputation and endure customer loyalty towards its products and services.

### 5.2 Practical application

For practical application, this research results indicate the essential of CSR initiatives in the marketing industry. For corporations, before sponsoring for a social impact-related sport event for CSR purposes, the company should target joiners who are involved with social impacts. The results collected from insight questions indicate that choosing the meaningful impacts addressed by trustworthy non-profit organizations for funding would evolve the interests of customers to join the event. Among those customers who are less involved in social causes, marketing, and communication campaigns would help deliver messages and responsibility of the corporate effectively. The campaign message should involve the benefits of sports for health. Image and content activations created before the event should have a friendly tone and mood to deliver delightful and meaningful messages. In addition, for CSR initiatives to maximize values, the company should support events that receive positive attitudes from participants. Attitudes towards the event can be analyzed through surveys from previous events, feedback, and sharing of joiners on social media channels. To create positive attitudes, the sport, particularly the running event, should choose the running roads that have stunning scenes, and provide a useful race-kit for runners to attract their interests.

### 5.3 Limitations

There are some limitations of this research. First, the findings can reflect a certain company's cause-related sports event in Vietnam. If these findings are transferred to other firms, the possible impact of other criteria defining corporations and CSR initiatives must be investigated. Moreover, due to cultural differences, there would be a variable in CSR motivations for practices among nations. Therefore, further studies should consider these aspects to evaluate the

effectiveness when applying to other contexts of sports events.

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# THE IMPACT OF DIGITAL MARKETING ON BRAND SUSTAINABILITY IN THE TELECOMMUNICATIONS INDUSTRY: THROUGH BRAND LOYALTY AND BRAND STRENGTH

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**ABSTRACT**

Today, the utilization of digital marketing within the telecommunications service sector exhibits numerous favorable indicators. Digital marketing serves to fortify brand loyalty, thus augmenting a firm's competitive advantages within the marketplace and facilitating the attainment of a sustainable brand position relative to its competitors. Consequently, this study was undertaken to meticulously analyze the correlation between digital marketing and competitive advantage as well as sustainable branding, incorporating the mediating influences of brand loyalty and brand strength. Research data were gathered through the administration of a survey involving 418 consumers of telecommunications services located in the southern provinces of Vietnam. Partial least squares structural equation modeling was utilized to evaluate the proposed theoretical framework. The findings indicate that digital marketing exerts a beneficial influence on brand strength, brand loyalty, competitive advantage, and sustainable branding. Specifically, the findings fill the gap in previous research by exploring the mediating roles of brand loyalty and brand strength in the relationship between digital marketing and both sustainable branding and competitive advantage, in the context of consumers in the telecommunications service industry in Vietnam. In light of these findings, the research proffers several recommendations for managers operating within the telecommunications services sector aimed at enhancing competitive advantage and fostering sustainable branding.

*Keywords:* "Brand Loyalty", "Brand Sustainability", "Brand Strength", "Competitive Advantage", "Digital Marketing", "Telecommunications".

## I. INTRODUCTION

With the rapid development of modern society, the Internet has become extremely important, especially in business (Becherer & Halstead, 2004). E-commerce has opened up many new opportunities for industries, and Marketing has always played a key role in building brand image and promoting revenue. Jackson and Ahuja (2016) pointed out that Digital Marketing is gradually replacing Traditional Marketing, with the trend of digital transformation becoming increasingly important to compete and develop in the digital age, research on Digital Marketing is extremely necessary.

In recent years, the rapid development of information technology and the economy has significantly impacted customer loyalty to brands, making it an important issue in marketing research. Doostar & Mohammadi (2014) point out that many studies have used different methods to demonstrate the value of loyalty to businesses. However, current theories have not fully explained the strategies that help customers return to businesses. Therefore, research on brand loyalty is extremely necessary, as it directly affects revenue and the survival of businesses.

In business, competitive advantage is an important factor that helps businesses survive and develop. Švárová and Vrchota (2014) believe that businesses use their competitive advantages to build business strategies, create differentiation and gain advantages in the market. And businesses can build their competitive advantage through advertising and introducing the advantages of the brand. Advanced strategies, leveraging digital content and improving digital skills also help businesses increase competitiveness and expand market share (Mohammad, 2022).

Building customer loyalty not only helps maintain stable revenue but also promotes the sustainable development of a brand in the context of intense competition. Research on sustainable development helps businesses identify the necessary factors to maintain and strengthen customer relationships, while also creating long-term value. Therefore, sustainability is not just about creating quality products/services but also about strategies for retaining customers and

building long-lasting relationships. Studies show that the combination of long-term benefits for both customers and businesses can create sustainable competitive advantages for businesses in the future (Kotler et al., 2017).

Although the three main definitions related to brand value (total brand value, brand strength, and brand image) were asserted by Feldwick (1996) as distinct, there is a special consistency between these concepts. Specifically, brand image influences brand strength, which in turn impacts brand value (Aaker, 1992; Keller, 1993). Therefore, it cannot be denied that brand strength is one of the strategic factors in brand management, and also a measure to evaluate brand value (Wymer, 2013). Moreover, a strong consumer attachment to the brand is linked to positive brand consideration, purchase intention, actual purchasing behavior, and brand choice (Priester et al., 2004; Suh & Youjae, 2006). However, the relationship between brand strength and other aspects of consumer attitudes, such as loyalty, remains limited in previous studies.

The telecommunications industry has undergone significant changes due to a combination of deregulation (the removal of government restrictions on competition), technological advancements, legislation, and organization. This sector has witnessed unprecedented transformations as global monopolies were dismantled, leading to mergers and restructuring (David et al., 1994). In this rapidly evolving environment, digital technologies have emerged as a driving force, fundamentally reshaping the landscape and compelling enterprises to reconsider their strategic objectives and business practices (Bruhn et al., 2012; Ianenko et al., 2023). Against the backdrop of these profound shifts, telecommunications companies now face the pressing challenge of maintaining their brand sustainability and competitive advantage in a highly dynamic market (Hamdoun et al., 2014; Meena & Geng, 2022). The rise of digital marketing has been a critical factor in this transformation, enabling companies to engage with customers in more personalized and interactive ways (Rao, 2001; Ianenko et al., 2023). As digital platforms and channels become increasingly prominent, telecommunications firms must explore how to effectively leverage these tools to strengthen their brand and gain a competitive advantage and brand sustainability (Leeflang et al., 2014). And telecommunications businesses in Vietnam are no exception. Vietnam's telecommunications sector has undergone approximately 27 years since entering the international market and has achieved significant milestones. According to a report from the Ministry of Information and Communications of Vietnam (2023), the total revenue from telecommunications services is estimated at around 139.26 trillion Vietnamese dong, a 0.41% increase compared to the same period in 2022, achieving 99.5% of the plan for 2023. Currently, competitors in the telecommunications sector are fiercely racing to increase revenue and market share through expanding infrastructure and implementing promotional and communication policies. Among them, Mobifone is currently facing a shrinking market share due to the rapid growth of Viettel and VinaPhone. One of the reasons behind this decline in market share and competitive capability is directly related to marketing activities. With the strong development of the Fourth Industrial Revolution, the issue receiving attention from telecom company managers is how digital marketing activities influence competitive strategies to retain customers and ensure sustainable development in the future (Mahalaxmi & Ranjith., 2016; Hawary & Harahsheh, 2014). Therefore, telecommunications enterprises need to intensify their digital marketing efforts to enhance market competitiveness and build brand sustainability to secure their market share. Additionally, companies in the telecommunications market also need to actively develop digital marketing to strengthen the intermediary impact of brand strength and brand loyalty, aiming for competitive advantage and brand sustainability goals (Bedi & Chopra, 2018; Diez-Martin et al., 2019).

Although many studies have demonstrated the positive impact of digital marketing on competitive advantage and brand sustainability, there is still a limitation in exploring the mediating roles of brand strength and brand loyalty in these relationships (Khan & Islam, 2017; Ahmed et al., 2019; Makau, 2021). In particular, previous studies often did not focus on the relationship between digital marketing and brand strength. Moreover, most research has been conducted in specific contexts, lacking representativeness for the unique characteristics of the Vietnamese market and the telecommunications sector. This study aims to investigate the impact of digital marketing on brand sustainability and competitive advantage in the telecommunications industry, with a focus on the mediating role of brand strength and brand loyalty. Specifically, this research will explore how telecommunications companies can strategically utilize digital marketing techniques to bolster their brand strength, which in turn can contribute to the achievement of customer loyalty, brand sustainability and competitive advantage.

## II. MATERIAL AND METHOD

### 2.1. The theory of sustainable competitive advantage.

Sustainable competitive advantage is a key tool in strategic management which any serious organization cannot afford to ignore. Sustainable competitive advantage is a business's ability to deliver unique value that competitors cannot replicate (Porter, 1985). There are two types: cost advantage (lower costs with equal quality) and differentiation advantage (unique products/services). According to the VRIN model (Barney, 1991), sustainable resources must be valuable, rare, inimitable, and non-substitutable. This advantage enables businesses to maintain high profits and growth through differentiation, quality, innovation, excellent service, and strong branding. This theory is applied to establish hypotheses about the relationship between digital marketing, brand strength, brand loyalty, and competitive advantage.

### 2.2. Conceptual foundation

#### Digital marketing

In the current era where technology is thriving, Marketing has expanded beyond sales and advertising at the point of sale to include digital marketing. The rapid advancements in technology and changes in market dynamics have contributed to this growth (Mort & Drennan, 2002). Chaffey et al. (2019) describe digital marketing as communication supported through content and interactive services provided by various digital technology platforms. The Digital Marketing Institute (DMI) outlines it as utilizing digital technologies to create a comprehensive, focused, and measurable communication strategy. Digital Marketing is divided into Internet Marketing, which includes online channels such as social media and web banners, and Non-Internet Marketing, which involves offline techniques such as MMS and video marketing (Atshaya & Rungta, 2016). Digital Marketing also positively impacts cost efficiency by maintaining effective information delivery to customers when businesses introduce their best products (Dwivedi et al., 2020).

#### Brand strength

Brand strength measures a brand's ability to generate customer loyalty (Rocha,2012). It is an economic asset of the brand that describes the current value of future ownership benefits (Birkin, 1994; Sinclair & Keller, 2014). The brand strength model is used to determine the value of a brand based on the assumption that a stronger, more reliable brand will generate future income with less risk (Rocha, 2012). Building a strong brand relies crucially on establishing enduring brand-customer relationships (Kollmann & Suckow, 2008). Brand strength is a tool that conveys customer online evaluation and impacts sales volume layer by layer (Ho-Dac et al., 2013). Consumer behavior impacts brand strength based on the image when consumers develop personal and novel activities related to the brand (Rindell et al., 2011). Customer-based measures of brand strength help uncover customer segments and analyze market reactions to assumed changes in the market (François & MacLachlan, 1995).

#### Brand loyalty

Brand loyalty is the result of overall customer satisfaction. Therefore, loyal customers are satisfied and motivated to purchase products and services (Al-Dmour et al., 2019). Aspects of customer loyalty are categorized into two types: attitude and behavioral aspects (Shammout, 2018). Attitudinal customer loyalty develops based on customer perceptions, emotional consciousness, and purposefulness. These three stages lead to behavioral customer loyalty. Attitudinal loyalty can be described as positive recommendations, word-of-mouth advocacy, repeat purchase intentions, and willingness to pay a premium for specific products or services compared to competitors' offerings (Oliver, 1999; Ong et al., 2016). Co-creation services with business customers improve customer relationships and lead to customer loyalty (Jouny-Rivier et al., 2017). Brand loyalty is when customers continue to buy products repeatedly from the same brand, regardless of whether competitors also offer the product similar products or services. Don't just keep interacting and buying from the same brand, customers also express positive emotions towards that brand.

#### Brand sustainability

Brand Sustainability is demonstrated by a business's ability to deliver superior value to the market that no competitor can replicate. This superior value can be manifested in lower prices, higher quality, or some unique differentiation (Porter, 1985). A sustainable brand is the ability of a brand to continue growing and thriving over time without being destroyed, emphasizing that Brand Sustainability is not just about long-term survival, but also the ability to develop and evolve over time (Schultz & Block, 2013).

**Competitive advantage**

Competitive advantage is “the unique position that an organization develops in comparison to its competitors.” Competitive advantage primarily arises from a company's resources and capabilities (Hofer & Schendel, 1978). Sustainable competitive advantage is created by utilizing a company's resources and capabilities, specifically how the company uses and leverages its resources (Porter, 1985). Competitive advantage is the ability of a business to create greater economic value compared to its competitors (Peteraf & Barney, 2003).

### 2.3 Proposed model

#### 2.3.1 The relationship between digital marketing and brand sustainability

Digital marketing allows professionals in the field to target customers more precisely than ever before. It also offers many superior features compared to traditional marketing. One of the standout features of digital marketing is its ability to reach a vast customer base anytime, in any manner, and anywhere (Bellman et al., 2011) Thus, it can be said that digital marketing has helped companies enhance brand value through connection, conversation, and community building (Fetais et al., 2022). As a result, brands can sustainably exist and grow in a competitive market. Therefore, it can be seen that digital marketing plays a crucial role in building brand sustainability. Hence, the research team proposes the hypothesis:

H1: Digital marketing has a positive impact on brand sustainability.

#### 2.3.2 The relationship between digital marketing and brand strength

Digital marketing helps businesses enhance brand strength through networking, conversations, and community building (Krishnaprabha & Tarunika, 2020). Digital marketing underscores that a consistent multisensory marketing strategy has significant potential to create memorable brand experiences, thereby enhancing customer perception and brand strength (Wiedmann et al., 2017). Therefore, it can be argued that digital marketing positively impacts brand strength. Through building brand awareness by providing tools and channels for brands to reach and engage potential customers, creating various experiences through online platforms, the study expects that digital marketing positively impacts brand strength.

H2: Digital marketing positively influences brand strength.

#### 2.3.3 The relationship between digital marketing and competitive advantage

Digital marketing offers significant benefits including faster response times, higher response rates, global reach, efficient market access and cost-effectiveness, higher conversion rates, 24-hour operation, and ease of campaign tracking and expansion (Chaffey et al., 2019), contributing to a brand's competitive advantage. Additionally, Digital marketing opens new markets for existing companies, creates new business models like virtual organizations, and provides users with easier and more convenient interaction capabilities (Krishnamurthy & Singh, 2005). Digital marketing has also been confirmed to enable organizations to achieve increasing efficiency and effectiveness through customer interaction (Harridge-March, 2004). Therefore, the research proposes the hypothesis:

H3: Digital marketing has a positive impact on competitive advantage.

#### 2.3.4 The relationship between brand strength and brand loyalty

Brand strength builds customer trust in the brand (Urde, 1994; Aaker, 1996), leading to repeat purchases (Aaker, 1996; Veloutsou, 2015) and positive word-of-mouth advertising (Kollmann & Suckow, 2008; Rosenbloom & Haefner, 2009; Yadav & Rahman, 2018). Thus, the strength of the relationship between the brand and customers influences behavioral intentions, and brand attachment has been shown to significantly impact future purchasing behavior (Esch et al., 2006). A strong brand strength is a predictor of brand loyalty (Veloutsou, 2015; Salinas, 2016). Therefore, the study expects that brand strength will positively influence brand loyalty.

H4: Brand strength positively affects Brand Loyalty.

#### 2.3.5. The relationship between brand strength and brand sustainability

Brand strength is a crucial tool for businesses to better understand their brand. It provides insights into strengths and weaknesses in areas such as consumer perception, customer loyalty, and brand competitiveness (Rocha, 2012).

Strong brands are closely linked to positive business outcomes, as they tend to attract more consumer choices, generate higher profits, and are more resilient against competitors (Aaker, 1996; Birkin, 1994; Tiwari, 2010). Strong brands also lead to cost leadership and differentiation, allowing businesses to negotiate better prices from suppliers and charge higher prices for their products or services. Additionally, strong brands can attract more loyal customers who are less price-sensitive, helping to create a sustainable competitive advantage (Aaker, 1996; Kotler, 2011). Furthermore, brand strength helps develop a solid customer base, driving repeat purchases and long-term profitability (Wang & Jiang, 2019). In conclusion, brand strength plays a vital role in a business's success, leading to sustainable demand and profits, cost leadership, differentiation, and a strong customer base. Therefore, it is expected that brand strength positively impacts brand sustainability.

H5: Brand strength positively impacts brand sustainability.

**2.3.6 The relationship between brand strength and competitive advantage**

Brands can be classified into weak and strong brands based on brand strength factors, with strong brands characterized by high brand recognition, good reputation, and a strong connection between the brand and customers' minds (Keller, 1993; Wang & Barnes, 2017). Strong brands provide key differentiators among competitive products, enhance perceptions of service quality among buyers, and contribute to the financial effectiveness of sellers (Wang & Barnes, 2017; Ballantyne et al., 2006; Kumar et al,. 2014). Therefore, Brand Strength influences the competitive advantage of a business by enhancing users' perceptions of the brand's benefits compared to others and the financial effectiveness of brands with varying strengths. Based on the statements above, the research expects that Brand Strength will have a positive relationship with the brand's competitive advantage.

H6: Brand strength positively influences competitive advantage.

**2.3.7 The relationship between brand loyalty and brand sustainability**

A market-leading brand has a good opportunity to maintain brand recognition and trust, which contributes to the brand's sustainability (Vukasovič, 2012). Brand loyalty leads to customer trust in the brand, resulting in repeat purchases and positive word-of-mouth. Therefore, brand loyalty is a tool ensuring sustainable demand and profitability for any brand in the future (Aaker, 1996; Birkin, 1994; Tiwari, 2010). A large number of loyal customers globally contribute to the brand's sustainability (Saroha & Diwan, 2020); thus, in the global service economy, brand loyalty positively impacts brand sustainability (Alam, 2002). Brand loyalty effectively maximizes revenue towards brand sustainability (Panneer Selvam et al., 2010).

H7: Brand loyalty has a positive impact on brand sustainability.

**2.3.8 The relationship between customer loyalty and competitive advantage**

Brand loyalty is the willingness of customers to continue purchasing a company's goods and services over an extended period and voluntarily recommend the company's products to friends and colleagues (Lovelock et al., 1999). Brand loyalty can be formed as an attitude or favorable belief towards a brand, manifested in emotional attachment to the brand (Dowling & Uncles, 1997). The long-term success (including advantages to compete with other competitors) of a business depends on the loyalty of its foundational customers (Jacoby & Fisher, 1978). The research group proposes the hypothesis:

H8: Brand loyalty positively influences competitive advantage.

**2.3.9 The relationship between digital marketing and customer loyalty**

Many previous studies have shown that factors of digital marketing, such as content quality, customer service, value-added attributes, and constant presence, have a significant impact on customer satisfaction and brand loyalty. Specifically, Khan and Islam (2017) emphasize that these digital marketing factors can enhance customer loyalty by building strong relationships with customers, fostering trust, and promoting long-term engagement. Other studies, such as those by Adam et al. (2020) and Dilham et al. (2018), also confirm that when digital marketing is effectively utilized, particularly in improving customer satisfaction and relationships, it can drive customer loyalty and repeat purchases. Therefore, implementing effective digital marketing strategies not only helps attract customers but also strengthens their loyalty to the brand over the long term. Thus, the authors propose the following relationship:

H9: Digital marketing has a positive impact on brand loyalty.

**2.3.10 The mediating role of brand strength**

Digital marketing is increasingly being adopted by companies to promote products and services, as traditional marketing methods have become less effective in the modern era (Prodea & Constantin, 2023). Through digital marketing activities, businesses increase customer exposure to their brand name, logo, and slogan, thus strengthening brand power (Hoeffler et al., 2003). This highlights the crucial role of digital marketing in building a strong brand.

Brand strength helps companies establish a good reputation and position in customers' minds (Salinas, 2016), boosting competitive advantage. A strong brand enables competitive advantage through cost leadership and service differentiation (Hamdan, 2017). It also enhances brand sustainability by creating a positive perception of the business (Dumitriu et al., 2019). The research group proposes the hypothesis:

H10: Digital Marketing has a positive impact on brand sustainability through brand strength.

H11: Digital Marketing has a positive impact on competitive advantage through brand strength.

**2.3.11 The mediating role of brand loyalty**

Brand loyalty has become a core element in maintaining and developing sustainable relationships with customers (Chaudhuri & Holbrook, 2001). With the rapid growth of digital marketing, promotional strategies through digital channels such as social media, online advertising, and email marketing have had significant effects on customer loyalty (Keller, 2013). This loyalty not only helps increase brand sustainability but also plays a crucial role in creating a competitive advantage in the modern marketplace (Porter, 1985).

The theory of brand loyalty has been widely supported in research as an intermediary factor, bridging the gap between digital marketing and business outcomes, such as brand sustainability and competitive advantage. Specifically, two research hypotheses are proposed:

H12: Digital marketing has a positive impact on competitive advantage through brand loyalty

H13: Digital marketing has a positive impact on brand sustainability through brand loyalty

**2.4 Method**

**Research design**

The objective of this study is to gain a comprehensive understanding of the impact of digital marketing on the sustainability and competitive advantage through the intermediary variable of brand strength in telecommunications businesses.The relationships in the model have been hypothesized and their accuracy will be assessed through the collection of survey samples from telecommunications users in Vietnam.

Through previous studies and theories, the author team has collected observational variables to measure concepts in the proposed research model. However, they found that existing scales in previous studies are not entirely suitable for the current context in Vietnam, given the cultural, economic, and developmental differences from predominantly developing countries. Therefore, a qualitative study was conducted to validate appropriate observational variables to describe the variables in the research model, including digital marketing, brand strength, brand loyalty, brand sustainability, and competitive advantage (Table 1). Next, quantitative research methods was carried out to test the research model.

**Table 1. The original scales of the observed variables**

| Observed variables | Original scales |
|---|---|
| Digital marketing | Dewi & Cangara (2023) (70) |
| Brand strength | Wang & Zhang (2018) (27) |
| Competitive advantage | Lone et al,. (2015) (72) |
| Brand loyalty | Ismail (2017) (73) |

| | |
|---|---|
| Brand sustainability | Ray & Sharma (2020) (13) |

*Source: Compilation by the group of authors*

**Samples and sampling method**

We applied a convenient, non-probability sampling method to explore and observe survey subjects. To align with the theoretical foundation of the research topic, ensuring realism and wide applicability, the subjects chosen for the survey were consumers of telecommunications services residing and working in southern provinces. Survey participants were accessed online through a questionnaire created on Google Form. Data collection lasted for 5 weeks. Instructions emphasized that the study focused solely on individual opinions to minimize bias.

After excluding invalid responses, the authors collected a total of 418 survey responses. Through calculations, the survey obtained a sample size considered good (Hair et al., 2014), ensuring reliability. Therefore, the valid survey sample size used for research data is 418 individuals.

The statistical data shows: there were 182 male respondents, accounting for 43.54%, and 236 female respondents, accounting for 56.46%. There were 213 respondents under 20 years old, making up 50.96%, 143 respondents aged 20-30, accounting for 34.21%, 24 respondents aged 31-40, accounting for 5.74%, and 38 respondents over 40 years old, accounting for the lowest proportion at 9.09%. Regarding income levels, there were 294 respondents earning less than 10 million VND, making up 70.33% of the total respondents; 77 respondents earning between 10 and 20 million VND, accounting for 18.42%; 30 respondents earning between 20 and 30 million VND, accounting for 7.18%; 5 respondents earning between 30 and 40 million VND, accounting for 1.2%; and 12 respondents earning over 40 million VND, accounting for 2.87%.

## III. RESULT AND DISCUSSION

### 3.1. Results of the reliability and validity assessment of the measurement scale:

To verify the reliability of the relationships and variables, we use measurement indicators through Cronbach's alpha coefficient and average variance extracted (AVE) (Table 2). Accordingly, the Cronbach's alpha values are all above the threshold of 0.8 and none exceed 0.95. This indicates that the values in the model have high reliability, and there is a low likelihood of observation variable overlap. Specifically, the Cronbach's Alpha values for variables range from 0.865 (brand sustainability) to 0.907 (brand loyalty), with fluctuations at 0.867 (brand strength), 0.889 (digital marketing), and 0.890 (competitive advantage). It can be seen that these figures are extremely promising, demonstrating that the measures have achieved the necessary reliability for proceeding with subsequent testing steps. Regarding AVE – a measure of how much the observed variables explain the variance of the underlying construct – all values exceed the recommended threshold of 0.5, ranging from 0.643 (digital marketing) to 0.819 (competitive advantage). The lowest AVE value for digital marketing (0.643) suggests that customers' perceptions of digital marketing activities can be diverse, due to differences in how they approach or understand these activities. In contrast, the highest AVE value for competitive advantage (0.819) highlights that customers clearly recognize the distinctiveness in strategies aimed at enhancing the competitiveness of brands in the market. These observations highlight the importance of linking reliability and validity indicators to the theoretical framework. This alignment with theoretical insights reinforces the robustness of the measurement model and provides a solid foundation for subsequent hypothesis testing.

**Table 2. The results of measuring the reliability of the scale and extracting the average variance extracted**

| Research variable | Cronbach's alpha coefficient | Average variance extracted (AVE) |
|---|---|---|
| **Digital marketing** | 0.889 | 0.643 |
| **Brand strength** | 0.867 | 0.655 |
| **Brand loyalty** | 0.907 | 0.782 |
| **Brand sustainability** | 0.865 | 0.778 |
| **Competitive advantage** | 0.89 | 0.819 |

*Source: Analysis results from SmartPLS 4.0 software*

**3.2 Evaluation results of outer loadings**

To assess the convergence validity of the measurement scale, the authors rely on the outer loadings, which are extracted from the variance-covariance matrix. If the outer loadings of a measurement variable are high, it may indicate that the measurement variable converges well with the common underlying construct it seeks to measure. Conversely, if outer loadings have low values, it might suggest that the measurement variable contributes less to capturing the overall shared information and may need reconsideration or removal from the measurement model. Through the analysis, the research team found that all convergence values exceeded the threshold of 0.7 (Table 2), specifically ranging from 0.720 to 0.914. This indicates that the convergence values for variables (digital marketing, brand strength, brand loyalty, brand sustainability, competitive advantage) are consistently ensured.

**Table 3. Evaluation results of outer loadings**

| | **Outer loadings** |
|---|---|
| **Digital marketing (DM00)** | |
| DM01 ← DM00 | 0.817 |
| DM02 ← DM00 | 0.720 |
| DM03 ← DM00 | 0.799 |
| DM04 ← DM00 | 0.843 |
| DM05 ← DM00 | 0.809 |
| DM06 ← DM00 | 0.819 |
| **Brand strength (BS00)** | |
| BS01 ← BS00 | 0.807 |
| BS02 ← BS00 | 0.852 |
| BS03 ← BS00 | 0.868 |
| BS04 ← BS00 | 0.729 |
| BS05 ← BS00 | 0.784 |
| **Brand loyalty (BL00)** | |
| BL01 ← LTT00 | 0.914 |
| BL02 ← LTT00 | 0.853 |
| BL03 ← LTT00 | 0.896 |
| BL04 ← LTT00 | 0.891 |
| **Competitive advantage (CA00)** | |
| CA01 ← CA00 | 0.904 |
| CA02 ← CA00 | 0.905 |
| CA03 ← CA00 | 0.906 |
| **Brand sustainability (SB00)** | |
| SB01 ← SB00 | 0.891 |

| | |
|---|---|
| SB02 ← SB00 | 0.865 |
| SB03 ← SB00 | 0.906 |

*(Source: Results derived from the analysis using SmartPLS 4.0 software)*

**3.3 The results of the discriminant validity test**

Continuing the examination of discriminant validity, which assesses the extent to which factors are distinct and unrelated to each other. In Table 4, the discriminant validity of the measurement scale appears highly satisfactory as all values are below the threshold of 0.9 (Henseler et al., 2016), specifically ranging from 0.897 or lower. Thus, all factors meet the criteria for discriminant validity.

**Table 4. The results of the discriminant validity test**

| | BS00 | DM00 | CA00 | BL00 | SB00 |
|---|---|---|---|---|---|
| **BS00** | | | | | |
| **DM00** | 0.786 | | | | |
| **CA00** | 0.820 | 0.846 | | | |
| **BL00** | 0.868 | 0.740 | 0.756 | | |
| **SB00** | 0.846 | 0.809 | 0.897 | 0.782 | |

*(Source: Results derived from the analysis using SmartPLS 4.0 software)*

Upon conducting analysis and statistically testing the gathered data, the research team observed that the reliability, convergence, and discriminant validity of the measurement scale all meet the necessary conditions for the study concepts. Therefore, to validate the research hypotheses, both the measurement scales and research concepts were utilized.

**3.4 The significance testing of path coefficients and evaluation of mediating factors**

Initially, the authors conducted tests for multicollinearity among the independent variables. In cases of collinearity or multicollinearity, regression coefficients and p-values for significant effects may be distorted, leading to erroneous conclusions about relationships within the model. According to Hair et al. (2019), a VIF value of < 5 suggests the absence of multicollinearity issues in the research model (Hair et al., 2011). In the proposed research model, the authors found that all VIF values (Table 5) were below 3 following the tests, with the highest value of 2.868 observed in the relationships between brand strength and competitive advantage, as well as brand strength and brand sustainability. Consequently, it can be inferred that multicollinearity issues are unlikely to occur.

Based on Table 5, it can be seen that all relationships have mutual impacts on each other. The statistical significance of a relationship's impact (path coefficient) depends on its standard error. The authors assess this based on the p-value for all path coefficients in the structural model. As the commonly used significance level is 5% (0.05), p-values are compared against this threshold. It can be observed that the p-values for all relationships are less than 0.05. Specifically, the values range from 0.000 to 0.031, indicating that all relationships are statistically significant. The research team conducted an experiment on the presence of mediating roles in the model (Table 5). With a p-value of less than 0.05, the model demonstrates the mediating roles of brand strength and brand loyalty.

**Table 5. The results of testing the significance level of the path coefficients, multicollinearity test and evaluation of mediating factors**

| Hypothesis | Relationship | VIF | Original Sample | $f^2$ | t-value | P-value | Result |
|---|---|---|---|---|---|---|---|
| **H1** | DM00 → SB00 | 2.098 | 0.339 | 0.151 | 6.191 | 0.000 | Accept |
| **H2** | DM00 → BS00 | 1.000 | 0.690 | 0.907 | 18.742 | 0.000 | Accept |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **H3** | DM00 → CA00 | 1.907 | 0.447 | 0.274 | 9.273 | 0.000 | Accept |
| **H4** | BS00 → BL00 | 1.907 | 0.594 | 0.504 | 11.715 | 0.000 | Accept |
| **H5** | BS00 → SB00 | 2.868 | 0.345 | 0.114 | 5.754 | 0.000 | Accept |
| **H6** | BS00 → CA00 | 2.868 | 0.290 | 0.084 | 5.150 | 0.000 | Accept |
| **H7** | BL00 → SB00 | 2.721 | 0.202 | 0.041 | 3.436 | 0.001 | Accept |
| **H8** | BL00 → CA00 | 2.721 | 0.158 | 0.026 | 2.756 | 0.006 | Accept |
| **H9** | DM00 → BL00 | 1.907 | 0.259 | 0.096 | 5.007 | 0.000 | Accept |
| **H10** | DM00 → BS00 → SB00 | - | 0.238 | - | 5.205 | 0.000 | Accept |
| **H11** | DM00 → BS00 → CA00 | - | 0.200 | - | 2.161 | 0.031 | Accept |
| **H12** | DM00 → BL00 → CA00 | - | 0.041 | - | 3.303 | 0.001 | Accept |
| **H13** | DM00 → BL00 → SB00 | - | 0.052 | - | 2.577 | 0.000 | Accept |

*(Source: Results derived from the analysis using SmartPLS 4.0 software)*

The results of the significance testing of path coefficients (Table 5) affirm the importance of digital marketing, brand strength, and brand loyalty in building competitive advantage and brand sustainability. First, the relationship between digital marketing (DM00) and dependent variables is clearly demonstrated through hypotheses H1, H2, and H3. Specifically, DM00 → SB00 (β = 0.339, p-value = 0.000) indicates that digital marketing has a significant impact on brand sustainability. This aligns with the perspective of Bellman et al. (2011) and Fetais et al. (2022), where digital marketing helps strengthen customer connections through online channels, thereby promoting sustainable brand development. Similarly, the strong impact of DM00 → BS00 (β = 0.690, p-value = 0.000) supports Wiedmann et al.'s (2017) perspective that digital marketing underscores that a consistent multisensory marketing strategy has significant potential to create memorable brand experiences, thereby enhancing customer perception and brand strength. Furthermore, DM00 → CA00 (β = 0.447, p-value = 0.000) shows that digital marketing plays a critical role in creating competitive advantage, consistent with Chaffey et al.'s (2019) perspective on the cost-efficiency and rapid customer reach enabled by digital marketing. Next, the role of brand strength (BS00) is highlighted through the relationships in H4, H5, and H6. BS00 → BL00 (β = 0.594, p-value = 0.000) confirms that brand strength has a significant influence on brand loyalty, aligning with Veloutsou's (2015) perspective, which asserts that a strong brand fosters trust and encourages customers to return for brand loyalty. Moreover, the impact of BS00 → SB00 (β = 0.345, p-value = 0.000) and BS00 → CA00 (β = 0.290, p-value = 0.000) also confirms that brand strength acts as a variable in enhancing brand sustainability and competitive advantage. These results reinforce Aaker's (1996) perspective that a strong brand not only attracts customers but also reduces price sensitivity, paving the way for long-term and sustainable growth. Furthermore, brand loyalty (BL00) is also demonstrated to be a crucial factor through hypotheses H7 and H8. The relationships BL00 → SB00 (β = 0.202, p-value = 0.001) and BL00 → CA00 (β = 0158, p-value = 0.006) support the perspectives of Aaker (1996) and Vukasovič (2012), which suggest that brand loyalty helps build competitive advantage and ensures long-term demand, thus creating stability for the brand in a highly competitive environment. Finally, hypotheses H10, H11, H12 and H13 are accepted. These prove that there are the mediating roles of brand loyalty and brand strength in the relationship between digital marketing and both sustainable branding and competitive advantage. This is the contribution of this research.

Overall, these results not only align with the researchers presented earlier but also reinforce the mediating roles of brand strength and brand loyalty in the relationship between digital marketing, brand sustainability, and competitive advantage. This underscores the importance of investing in digital marketing and brand building in the telecommunications industry.

**3.5 The results of evaluating the coefficient of R-square, and R-square adjusted**

Based on A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), assessing the structural

model is a crucial criterion in the PLS-SEM method, and it is suggested to evaluate it through the coefficient of determination ($R^2$). The explanatory power of $R^2$ increases as its values get higher, typically ranging from 0 to 1. Values such as 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, respectively (Hair et al., 2011). So, based on the results in Table 6, all observed variables have an average predictive ability. Therefore, the relationships in the research model exhibit an explanation level suitable for the impact of digital marketing techniques. The adjusted R-square is utilized to assess the importance of independent variables. If the adjusted R-square value is less than 0.02, the impact is extremely small or negligible. If it falls within the range of 0.02 to 0.15, the impact is considered small, from 0.15 to 0.35 is considered moderate, and equal to or greater than 0.35 is considered substantial. Therefore, based on Table 6, all the adjusted R-square values for the variables are greater than 0.35. This indicates that the relationships proposed in the model have a substantial impact.

**Table 6. The coefficient of R-square and R- square adjusted**

| | R-square | R-square adjusted |
|---|---|---|
| **BS00** | 0.476 | 0.474 |
| **CA00** | 0.651 | 0.649 |
| **BL00** | 0.633 | 0.631 |
| **SB00** | 0.635 | 0.633 |

*(Source: Results derived from the analysis using SmartPLS 4.0 software)*

## IV. CONCLUSION

This study contributes to both the theory and practice of digital marketing while providing clear practical implications for businesses. First, the findings confirm that digital marketing has a significant positive impact on brand sustainability and competitive advantage. This reinforces the theoretical foundation of digital marketing, emphasizing the importance of leveraging modern technology to enhance brand performance and maintain a competitive edge in the market. The study offers a fresh perspective on digital marketing by focusing on building long-term customer relationships and fostering brand loyalty, which ultimately creates sustainable business value. Additionally, the study highlights the mediating role of brand loyalty and brand strength in the relationship between digital marketing, brand sustainability, and competitive advantage. These findings not only suggest that brand loyalty and brand strength explain the effects of digital marketing strategies but also provide practical insights for businesses to develop more effective marketing approaches. Specifically, companies should focus on improving customer experience, strengthening emotional connections, and reinforcing brand value through digital channels such as social media, websites, and online communication tools. Furthermore, the study offers specific recommendations for telecommunications companies in Vietnam. To maintain sustainability and competitive advantage, businesses should maximize the potential of digital marketing by personalizing customer experiences, utilizing advanced technologies such as AI and big data analytics, and developing creative content tailored to different target audiences. These strategies not only enhance marketing effectiveness but also establish long-term brand differentiation in a highly competitive market. In this context, the study not only enriches the theoretical foundation of digital marketing but also provides actionable strategies for businesses to optimize their marketing efforts, enhance brand loyalty, and strengthen brand equity. By implementing these strategies, companies can achieve sustainable growth and long-term success in the digital era.

In addition to its theoretical contributions, this study provides important practical implications. First, customer loyalty is a key factor that helps businesses increase revenue and achieve sustainable growth. To enhance customer loyalty, businesses need to improve customer experience at all touchpoints, from information access to post-sales services. Second, brand strength is a crucial factor for Vietnamese telecommunications companies to create a competitive advantage. Digital marketing helps build brand strength by enhancing presence on digital channels, creating professional websites, engaging on social media, and using email marketing to provide information and promotions. Creative content, tailored to target customers, such as articles, videos, and high-quality images, along with an engaging brand story, strengthens brand recognition and creates emotional connections with customers. Third, businesses need a

well-structured digital marketing strategy, clearly defining goals, target audiences, and messaging. Selecting appropriate channels, creating high-quality content, and tracking and evaluating campaign effectiveness are essential to improve performance. Fourth, businesses should leverage advanced technologies such as AI and big data to analyze customer behavior, use chatbots for 24/7 support, and utilize online advertising tools to reach customers effectively. Measuring KPIs such as website traffic, conversion rates, and sales revenue helps optimize the strategy. Fifth, training human resources in digital marketing is crucial. Businesses need to invest in research, optimize service costs, and implement community-focused campaigns. This helps build a sustainable brand, create a competitive advantage, and generate high profits. Digital marketing allows businesses to interact and connect with customers through channels such as social media, email, and messaging, while personalizing the experience based on behavioral data, creating a sense of being cared for and increasing customer loyalty.

In conclusion, this study not only enriches our understanding of the impact of digital marketing on brand effectiveness but also proposes new theoretical models focusing on the mediating role of brand loyalty, brand strength, and relational factors in digital marketing. These contributions pave the way for future research on the intersection of digital marketing, brand management, and business strategy.

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# SUSTAINABLE PLACE BRANDING STRATEGIES: INTEGRATING GREEN MARKETING PRINCIPLES FOR URBAN REGENERATION IN SOUTHEAST ASIA CITIES

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**ABSTRACT**

Urban areas serve as vital centers for social, economic, and environmental activities, making them crucial for reimagining our future in terms of sustainable development. This study aims to explore the interplay between place branding techniques and green marketing concepts in fostering sustainable urban regeneration. By focusing on Southeast Asian cities, it seeks to contribute to the discourse on local-level sustainable transformation by investigating how these cities can leverage their unique characteristics and sustainable initiatives to cultivate attractive place identities. Additionally, the study will assess the effectiveness of these strategies in promoting sustainable development and identify key factors contributing to the success of these cities. It also delves into the significant precursors influencing urban revitalization, such as social equity, sustainable development, and economic prosperity. Drawing from various literature reviews, this article offers insights into best practices for crafting sustainable place brands that resonate with both residents and visitors, thereby fostering a more socially and environmentally conscious urban landscape. Ultimately, it provides a comprehensive framework for exploring avenues to reimagine our collective future and achieve sustainable transformation.

*Key words*: “Place branding”, “sustainability”, “green marketing”, “urban regeneration”, “Southeast Asia cities digitalization”.

## I. INTRODUCTION

### 1.1 Background of the study

In an era marked by social injustice, environmental degradation, and rapid urbanization, it becomes imperative for cities across Southeast Asia and beyond to prioritize sustainable urban regeneration. A promising avenue to tackle these multifaceted challenges lies in sustainable place branding, which involves strategically communicating a location's distinctive attributes and values to attract residents, visitors, and investments while fostering social equity and environmental stewardship (Kavaratzis & Kalandides, 2015). Concurrently, green marketing principles—emphasizing the promotion of eco-friendly products, services, and behaviors—offer valuable strategies for promoting sustainability initiatives and engaging consumers (Polonsky, 2011).

Southeast Asia offers significant potential alongside unique challenges concerning sustainable place branding and urban regeneration. While cities like Bangkok, Singapore, and Kuala Lumpur rank among the world's top tourism destinations, many others in the region grapple with rapid urbanization, population growth, and economic development, leading to issues such as traffic congestion, social inequality, and environmental degradation (Hashmi et al., 2021). For instance, as of 2024, the population of the Manila metro area stands at 14,942,000, reflecting a 1.87% increase from the previous year, while Jakarta's population reached 11,436,000, marking a 1.66% increase over the same period. Consequently, there is a growing need to implement sustainable place branding strategies that promote social inclusion, environmental stewardship, and economic resilience. However, Southeast Asia also presents distinct challenges, including cultural diversity, administrative complexities, and resource constraints, which may impede the effective execution of sustainable place branding efforts (Kavaratzis, 2012).

Comprehensive and integrated approaches to urban regeneration face obstacles such as competing development

agendas, fragmented governance structures, and limited access to data and resources (Booth & Richardson, 2001). Furthermore, cultural perspectives on sustainability and green marketing vary among nations and communities in the region, necessitating tailored approaches to stakeholder engagement and the dissemination of sustainability messages (Salleh et al., 2022). Despite these challenges, Southeast Asia presents unique opportunities for innovation and collaboration in sustainable place branding, with growing interest and funding for sustainable development projects at local, regional, and national levels (Holzhacker & Agussalim, 2019). By leveraging the region's cultural diversity, economic dynamism, and commitment to sustainability, Southeast Asian cities can fully harness the benefits of sustainable place branding, stimulating urban renewal and fostering a more resilient and livable future.

The concept of stakeholder participation and co-creation serves as a foundational element in addressing the issues explored in this study, as it plays a pivotal role in determining the effectiveness and longevity of sustainable place branding strategies (Kavaratzis & Kalandides, 2015). Stakeholder engagement, which involves actively involving a diverse range of stakeholders such as locals, businesses, government entities, and non-profit organizations in the co-design and implementation of place branding projects, is essential. By engaging stakeholders in meaningful communication and collaboration, cities can ensure that sustainability objectives align with the needs, values, and priorities of local communities. This not only enhances the legitimacy and relevance of place branding initiatives but also maximizes their long-term impact. Furthermore, methodologies emphasizing co-creation underscore the importance of involving stakeholders in participatory decision-making processes, empowering them to contribute their ideas, resources, and expertise to the development of sustainable place branding strategies (Reed, 2008).

**1.2 Research Problem**

While the importance of sustainability in urban development is increasingly recognized, there remains a theoretical gap regarding the effective integration of green marketing principles into place branding strategies to facilitate urban regeneration. Despite extensive theoretical frameworks existing for both fields independently, there is a notable scarcity of empirical research that systematically investigates the convergence of sustainable place branding and green marketing within the context of urban regeneration initiatives (Bianchi & Pike, 2011). This gap in the literature hinders the development of comprehensive strategies that capitalize on the synergies between green marketing and sustainable place branding to address the environmental, social, and economic challenges faced by metropolitan areas. Additionally, as highlighted by Kavaratzis and Kalandides (2015), theoretical models often overlook the complex network of stakeholders involved in urban regeneration initiatives, as well as the contextual and temporal dynamics that shape the effectiveness of sustainability messaging across different geographical contexts and over time. Consequently, there is a pressing need for empirical research to bridge the theoretical gap between green marketing and sustainable place branding.

Furthermore, cities aiming to demonstrate tangible results of their sustainability efforts encounter practical barriers due to limited access to data and resources for assessing the impact of sustainable place branding projects (Crippa et al., 2023). To address these practical obstacles, stakeholders must collaborate closely to develop useful toolkits and resources. Additionally, establishing robust frameworks for measurement and evaluation is crucial to monitor the effectiveness of sustainable place branding tactics in achieving urban regeneration objectives. Only through concerted efforts to overcome these pragmatic challenges can cities successfully implement sustainable place branding strategies that contribute to meaningful urban regeneration.

The integration of green marketing principles into sustainable place branding strategies to support urban regeneration is an area that needs more theoretical understanding and practical application, despite the growing recognition of the significance of sustainability in urban development (Bianchi & Pike, 2011; Zenker & Petersen, 2017). Addressing this gap, the aim of this study is to explore the intersection of green marketing and sustainable place branding with urban regeneration. The objective is to provide actionable strategies and best practices for cities seeking to enhance their competitiveness in the global market while achieving sustainability goals. This article also delves into the concept of sustainable place branding, with a specific focus on the role of green marketing in urban regeneration—a topic rooted in the significant challenges mentioned earlier. Additionally, it elaborates on three key sustainability impacts: economic development, social equity, and environmental sustainability.

## II. LITERATURE REVIEW

The literature review section of this article explores the foundational concepts and empirical research surrounding sustainable place branding strategies, green marketing principles, and urban regeneration, particularly within the context of Southeast Asian cities.

### 2.1. Place Branding

Place branding has emerged as a pivotal strategy for cities aiming to distinguish themselves in the global arena, attracting investment, tourism, and talent (Zenker & Braun, 2010). As cities increasingly prioritize sustainable development, they integrate sustainability principles into their branding endeavors, striving to cultivate identities that are economically competitive and environmentally responsible (Bianchini & Landry, 1995). This involves a conscious effort by cities and regions to shape and promote their image, identity, and reputation to attract citizens, tourists, investors, and businesses. For instance, the Tourism Authority of Thailand (TAT) has led the "Amazing Thailand" campaign, positioning Bangkok as a vibrant gateway to the country's rich cultural heritage, diverse culinary scene, and bustling urban life. Similarly, "Enjoy Jakarta" serves as a prominent theme in the place branding efforts of Jakarta, the capital city of Indonesia. This slogan encapsulates the city's vibrant culture, diverse attractions, and dynamic urban lifestyle, aiming to attract tourists, investors, and businesses to Jakarta. Through initiatives such as the "Enjoy Jakarta" campaign, the Jakarta Tourism and Creative Economy Office (JTCO) promotes the city's rich cultural heritage, culinary delights, and modern amenities to both domestic and international audiences. Place branding involves deliberately communicating a place's unique qualities, promises, and ideals to establish a favorable reputation and gain a competitive edge in the international market.

In Southeast Asian cities, place branding incorporates sustainability principles to address pressing urban issues such as pollution, traffic congestion, and social inequality, while also highlighting the city's cultural heritage, natural resources, and economic opportunities (Anholt, 2005). These cities leverage their historical sites, culinary offerings, and cultural diversity to differentiate themselves in the global market and create a distinct sense of place (Zenker & Braun, 2017). However, place branding in Southeast Asia goes beyond mere promotion and advertising; it involves engaging stakeholders in the co-creation of a shared vision and narrative for the city's future, including businesses, residents, government agencies, and civil society organizations (Mackrodt & Kalandides, 2014). By adopting an inclusive and participatory approach to place branding, Southeast Asian cities can harness the collective creativity, skills, and resources of multiple stakeholders to develop sustainable solutions to urban challenges and enhance their global competitiveness.

### 2.2 Sustainability

Sustainability has become increasingly vital for urban development, driven by concerns about environmental degradation, resource depletion, and climate change (Bulkeley & Betsill, 2005). In response, cities are progressively integrating sustainability principles into their planning and governance frameworks, aiming to create resilient, equitable, and environmentally responsible urban environments (Bulkeley & Castán Broto, 2013). The Singapore government has implemented various policies and programs across sectors like urban planning, transportation, energy, and waste management to promote sustainability. For example, the Sustainable Singapore Blueprint outlines long-term goals and strategies for achieving a sustainable and livable environment (National Climate Change Secretariat, 2014). At its core, sustainability means meeting present needs without compromising the ability of future generations to meet their own, encompassing environmental, social, and economic dimensions.

In the context of place branding, sustainability involves incorporating principles of social justice, economic growth, and environmental preservation into the development and promotion of cities or regions. Fudge and Fien (2015) describe sustainability in Southeast Asian cities as a multifaceted strategy for urban development that seeks to balance social justice, environmental conservation, and economic feasibility. In Southeast Asian contexts, sustainability encompasses measures aimed at enhancing long-term resilience, livability, and inclusivity, while addressing pressing urban challenges such as pollution, traffic congestion, inadequate infrastructure, and social inequality. This involves initiatives focused on improving environmental sustainability through the reduction of greenhouse gas emissions, conservation of natural resources, and promotion of environmentally friendly infrastructure and transportation options

(Webster, 1995).

Moreover, sustainability in Southeast Asian cities encompasses efforts to address poverty, inequality, and access to essential services such as healthcare, education, and housing, thereby promoting social inclusion and community cohesion (Croissant & Walkenhorst, 2019). Additionally, economic sustainability—encompassing initiatives to support economic growth, job creation, and entrepreneurship while ensuring an equitable distribution of income and opportunities—is a critical aspect of urban development in Southeast Asia (Parker, 2015). By embracing a holistic approach to sustainability that integrates environmental, social, and economic components, Southeast Asian cities can enhance their resilience, competitiveness, and quality of life for present and future generations.

**2.3 Green Marketing Principles**

Green marketing principles provide a strategic framework for cities to communicate their sustainability commitments to stakeholders and encourage consumer preferences for eco-friendly products and services (Peattie & Crane, 2005). By integrating green marketing strategies into place branding initiatives, cities can bolster their reputation as sustainable destinations while promoting environmental stewardship (Govers & Go, 2009). Green marketing entails the advertising and promotion of goods, services, or projects that align with sustainability objectives or benefit the environment. This encompasses tactics such as waste minimization, sustainable packaging, renewable energy usage, environmentally friendly product design, and responsible consumption. In the context of place branding, green marketing concepts are utilized to inform locals, tourists, and stakeholders about a city's sustainability programs, policies, and achievements. In Southeast Asian cities, green marketing principles are applied through various tactics and methods to reduce environmental degradation and promote sustainable development (Baktash & Talib, 2019). These strategies play a crucial role in encouraging eco-friendly consumption habits, reducing resource consumption, and minimizing waste production in the face of serious environmental challenges posed by rapid urbanization, industrialization, and population growth in the region (Davis, 2015).

Examples of green marketing strategies in Southeast Asian cities include corporate social responsibility (CSR) programs, product certification, and eco-labeling aimed at improving firms' environmental performance and influencing consumer behavior (Huang et al., 2024). Additionally, efforts to encourage sustainable lifestyles, raise public awareness of environmental issues, and promote community involvement in sustainability projects are integral components of green marketing strategies in Southeast Asia (Rao, 2002). By implementing these strategies, Southeast Asian cities can address environmental issues, enhance their competitiveness, attract investment, and position themselves as regional leaders in sustainable development.

**2.4 Urban Regeneration**

Urban regeneration involves revitalizing and renewing urban areas to enhance economic, social, and environmental well-being (Roberts & Sykes, 2000). Sustainable urban regeneration takes this concept further by integrating place-based strategies that prioritize environmental sustainability, social equity, and economic prosperity (Evans & Shaw, 2004). It encompasses the revival, redevelopment, and rejuvenation of urban areas, aiming to address environmental, social, and economic challenges while fostering vibrant, sustainable communities. Singapore provides a notable example of this approach, renowned for its comprehensive and innovative urban planning and development efforts. Initiatives such as the redevelopment of former industrial areas like Tanjong Pagar into vibrant mixed-use districts and the rejuvenation of public housing estates through programs like Remaking Our Heartland have transformed the city-state's urban landscape (Urban Redevelopment Authority, 2020). Sustainable place branding techniques have significant potential to contribute to urban regeneration by attracting investment, engaging communities, promoting environmental stewardship, and enhancing overall quality of city life.

In Southeast Asian cities, urban regeneration involves deliberate efforts to revive and transform metropolitan areas, addressing social, cultural, and economic issues while promoting sustainable growth and improving the standard of living for residents (Roberts & Sykes, 2000). Urban regeneration is essential for revitalizing deteriorating neighborhoods, enhancing urban resilience, and fostering inclusive growth in Southeast Asia, where rapid urbanization, population growth, and infrastructural shortages are prevalent (Roy & AlSayyad, 2004). To tackle poverty, unemployment, and social exclusion, a combination of social and economic interventions alongside physical

interventions—such as infrastructure upgrades, brownfield redevelopment, and the creation of green spaces—are employed (Vanolo, 2018).

Furthermore, to ensure that redevelopment projects support long-term environmental, social, and economic sustainability, urban regeneration in Southeast Asian cities often integrates sustainability principles such as eco-friendly design, energy efficiency, and community engagement (Ali et al., 2021). By incorporating sustainability concepts into urban regeneration initiatives, Southeast Asian communities can develop dynamic, resilient, and livable urban environments that enhance their competitiveness and attractiveness as places to live, work, and invest.

### 2.5 Underpinning Theory

Stakeholder Theory provides a crucial framework for examining sustainable place branding strategies, especially within the context of urban regeneration in Southeast Asian cities. According to Freeman (1984), stakeholders are individuals or groups who can influence or are influenced by an organization's objectives. In the realm of sustainable place branding, stakeholders encompass a diverse range of actors, including local residents, businesses, government agencies, non-governmental organizations (NGOs), and tourists. These stakeholders possess varying interests, expectations, and power dynamics that shape the development and implementation of place branding initiatives aimed at urban regeneration. By employing Stakeholder Theory, researchers can identify and analyze the multifaceted perspectives, needs, and concerns of stakeholders to inform the creation of effective and inclusive sustainable place branding strategies.

In the context of this study, Stakeholder Theory is applied to understand and engage the diverse stakeholders involved in developing and implementing sustainable place branding strategies. For instance, local residents are crucial stakeholders whose perspectives and needs must be considered to ensure the legitimacy and acceptance of place branding initiatives within the community. Through surveys, focus groups, or participatory workshops with residents, researchers can gather insights into their perceptions of the city's identity, values, and priorities. This information can then guide the development of place branding strategies that align with local aspirations (Buhmann & Ingenhoff, 2015).

Similarly, businesses operating within the city are essential stakeholders whose support and engagement are vital for the success of place branding efforts. Researchers can collaborate with local businesses through interviews, forums, or partnerships to understand their sustainability practices, marketing strategies, and preferences for branding initiatives. By aligning place branding strategies with the interests and objectives of businesses, researchers can foster buy-in and collaboration, leading to more effective and sustainable urban regeneration outcomes (Freeman, 1984).

Government agencies and NGOs also play critical roles as stakeholders in sustainable place branding initiatives. Researchers can engage with these organizations through interviews, policy analysis, or collaborative projects to understand their mandates, priorities, and initiatives related to urban regeneration and sustainability. By incorporating the perspectives and expertise of government agencies and NGOs into place branding strategies, researchers can leverage their resources, networks, and credibility to amplify the impact of branding efforts and drive positive change at the local level (Zenker & Braun, 2010).

## III. RESULT AND DISCUSSION

### 3.1 The Antecedents

The integration of green marketing principles in urban regeneration across Southeast Asian cities is driven by three key factors: environmental sustainability, social equity, and economic development.

#### 3.1.1. Environmental Sustainability

Combining environmental sustainability with green marketing and urban regeneration programs presents an opportunity to create dynamic and resilient urban settings in Southeast Asian cities. Green marketing techniques can effectively promote ecologically friendly goods, services, and behaviors among locals, businesses, and tourists. These techniques include eco-labeling, product certification, and corporate social responsibility (CSR) initiatives (Rao, 2002). By highlighting the environmental benefits of sustainable goods and services, green marketing can stimulate demand for eco-friendly alternatives and encourage consumer adoption of environmentally responsible behaviors.

Simultaneously, urban regeneration initiatives aimed at improving environmental sustainability and enhancing

livability may incorporate green infrastructure, energy-efficient architecture, and sustainable transport systems (Ali et al., 2021). For instance, brownfield rehabilitation initiatives have the potential to transform abandoned industrial sites into parks, green spaces, and mixed-use developments, mitigating urban heat islands, improving air quality, and enhancing community well-being (Vanolo, 2018). By integrating green marketing concepts into urban regeneration activities, cities can effectively communicate the environmental benefits of redevelopment projects to residents and stakeholders, generating support and involvement.

Furthermore, aligning green marketing campaigns with urban regeneration goals can enhance a city's attractiveness as an eco-friendly destination, attract investment, and strengthen its place branding as an environmentally conscious urban hub (Baktash & Talib, 2019). Through the integration of green marketing and urban regeneration, Southeast Asian cities can create a win-win scenario where social well-being, economic development, and environmental sustainability reinforce each other.

Singapore provides a compelling example of how green marketing techniques have been successfully integrated into urban renewal initiatives to support environmental sustainability and elevate the city's profile. The Gardens by the Bay project, a flagship endeavor in Singapore's urban regeneration efforts, leverages green marketing strategies to inform both locals and tourists about the environmental advantages of the development (Chang, 2006). Sustainable design features incorporated into The Gardens by the Bay, such as rainwater harvesting systems, energy-efficient lighting, and native plant species, not only reduce energy and water consumption but also promote biodiversity and air quality in the surrounding area.

Furthermore, Singapore's green marketing campaigns extend beyond individual projects to encompass city-wide sustainability initiatives. The city-state has implemented green building guidelines, including the Green Mark program offered by the Building and Construction Authority, which incentivizes developers to incorporate eco-friendly elements into their structures (Siva et al., 2017). Moreover, Singapore promotes the use of eco-friendly transportation options, such as its extensive public transportation network and the adoption of electric vehicles, to reduce carbon emissions and alleviate traffic congestion (Siva et al., 2017). By merging green marketing principles with city-wide sustainability programs and urban regeneration projects like the Gardens by the Bay, Singapore has effectively enhanced its environmental sustainability while bolstering its reputation as a green and livable city in Southeast Asia.

#### 3.1.2. Social Equity

Encouraging inclusive and sustainable development in Southeast Asian cities necessitates integrating social equality considerations into green marketing and urban regeneration projects. Green marketing techniques can play a significant role in addressing issues of social justice by facilitating access to eco-friendly goods and services for people from diverse socioeconomic backgrounds (Laroche et al., 2001). To ensure that all citizens, particularly those in low-income neighborhoods, have access to sustainable living options, projects such as community gardens, affordable eco-housing initiatives, and renewable energy programs can be promoted through targeted green marketing campaigns (Chan et al., 2016). Furthermore, urban regeneration initiatives can incorporate principles of social justice by prioritizing the needs of marginalized communities, such as access to affordable housing, accessible transportation, and community facilities (Singh et al, 2021). By combining green marketing with urban redevelopment efforts, Southeast Asian cities can address social inequality while advancing environmental sustainability and enhancing community well-being. Moreover, involving people and stakeholders in the co-creation of inclusive and sustainable urban landscapes can foster a sense of empowerment and ownership among various populations, leading to more resilient and cohesive societies.

In Jakarta, green marketing techniques have been employed to promote access to eco-friendly goods and services across various socioeconomic classes. For instance, through targeted marketing initiatives, the city government has partnered with local businesses to promote affordable, environmentally friendly housing solutions for low-income neighborhoods. By highlighting the financial and environmental benefits of water-saving technologies, renewable energy systems, and energy-efficient building designs, marginalized populations gain greater access to sustainable living options (Wijaya & Ng, 2021).

Additionally, urban regeneration projects in Jakarta have prioritized social fairness by addressing the needs of

marginalized communities and improving access to essential amenities. For example, the revitalization of waterfront areas along the Ciliwung River has not only enhanced environmental sustainability but also fostered social inclusion by providing public spaces, recreational areas, and affordable housing options to residents of informal settlements (Wijaya & Ng, 2021).

Through the fusion of green marketing ideas with urban reconstruction activities, Jakarta has successfully alleviated socioeconomic inequities while promoting environmental sustainability and enhancing community well-being. These initiatives serve as exemplars of how cities in Southeast Asia can become more resilient and inclusive by taking proactive measures to advance social fairness.

### 3.1.3. Economic Development

Fostering resilient and sustainable growth in Southeast Asian cities necessitates integrating green marketing and urban regeneration programs into economic development strategies. Green marketing principles can play a crucial role in supporting economic development by encouraging the adoption of eco-friendly behaviors and products, thereby increasing demand for green technologies, renewable energy sources, and sustainable goods and services (Bansal & Sharma, 2018). For instance, green marketing efforts can incentivize companies to invest in waste reduction programs, energy-efficient technology, and environmentally friendly supply chains, leading to enhanced competitiveness, innovation, and cost-effectiveness (Rao, 2002).

Moreover, urban regeneration projects can contribute to economic development by revitalizing underutilized areas, attracting investment, and creating job opportunities in industries such as construction, renewable energy, and green infrastructure development (Ali et al., 2021). By incorporating green marketing ideas into urban regeneration initiatives, Southeast Asian cities can reap economic benefits including improved market demand, job creation, and business innovation. Additionally, by fostering a green economy, cities can promote social well-being and environmental sustainability while enhancing competitiveness, attracting investment, and achieving long-term success.

In Ho Chi Minh City, green marketing strategies have been deployed to encourage companies and consumers to embrace eco-friendly practices and products (Souguir et al., 2024). For example, the city government has initiated green marketing campaigns to incentivize companies to adopt energy-efficient technologies, waste reduction strategies, and sustainable production methods, emphasizing the financial benefits of going green, such as lower operating costs, enhanced brand recognition, and access to new markets (Nguyen et al., 2019).

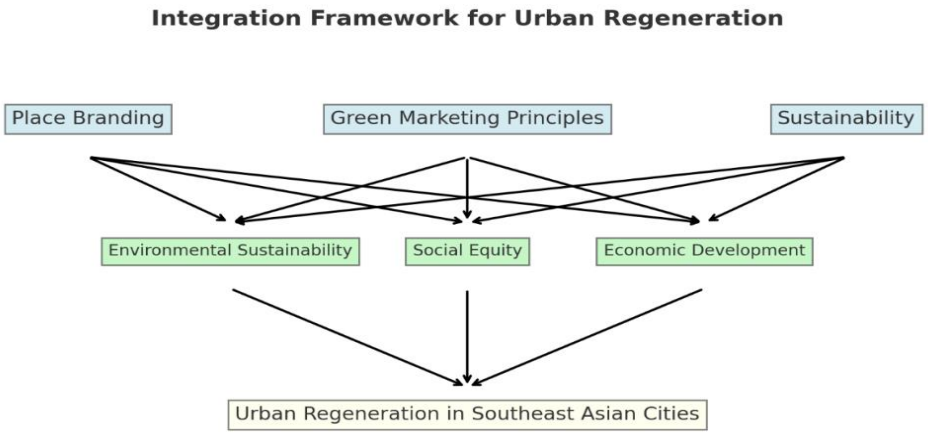



**Figure 1: The Framework of Integrating Green Marketing Principles for Urban Regeneration in Southeast Asia Cities**

Furthermore, urban regeneration initiatives in Ho Chi Minh City have played a pivotal role in advancing sustainability and economic growth. For instance, the restoration of the Saigon River shoreline has attracted investment for mixed-use projects, business complexes, and recreational facilities, creating employment opportunities and boosting the local economy (Nguyen et al., 2016). Additionally, the development of urban parks and green corridors, along with other green infrastructure projects, has not only improved the city's environmental quality but also contributed to the

expansion of the tourism industry, creating jobs and income (Nguyen et al., 2016).

Ho Chi Minh City has effectively combined environmental resilience, social well-being, and economic benefits of sustainability by integrating green marketing concepts into urban regeneration initiatives. These programs demonstrate how vigorously promoting a green economy can stimulate economic growth and elevate the overall standard of living in Southeast Asian cities.

### 3.2 The Challenges

The integration of sustainable place branding activities with green marketing and urban regeneration efforts presents several challenges in Southeast Asian cities, despite their potential benefits. A significant issue faced by stakeholders, including businesses, the public, and policymakers, is a lack of knowledge and understanding of sustainability concepts (Grimm et al., 2020). This can hinder the implementation of sustainable urban regeneration projects and the adoption of green marketing strategies, as there may be skepticism about the revenue-generating potential of sustainability efforts or resistance to change (Vanolo, 2018). Additionally, major obstacles to the execution of sustainable place branding projects include insufficient funding and technical expertise, particularly in cities with limited resources (Bolay, 2018). Moreover, the fragmented governance framework and conflicting interests of various stakeholders may impede cooperation and coordination in sustainability initiatives, making it challenging to develop integrated strategies that comprehensively address social, economic, and environmental issues (Ali et al., 2021).

Identifying specific Southeast Asian cities facing challenges with sustainable place branding initiatives requires in-depth study, but it's acknowledged that several cities encounter difficulties. Jakarta, Indonesia, is one such example, grappling with issues like dispersed governance and conflicting stakeholder interests. The lack of coordination and collaboration among government agencies, businesses, and communities poses a challenge to the city's sustainable place branding project. This disarray can lead to inconsistent messaging, disjointed tactics, and sluggish implementation of sustainable projects and practices. For instance, the absence of a cohesive strategy for sustainability branding and planning may perpetuate inadequate infrastructure development, environmental degradation, and social inequality in certain parts of Jakarta, despite efforts to portray the city as green and livable. Thus, Jakarta exemplifies the challenges Southeast Asian cities face in implementing sustainable place branding strategies due to complex governance and stakeholder conflicts.

Cities in Southeast Asia like Bangkok, Manila, Ho Chi Minh City, and Phnom Penh encounter various obstacles when implementing sustainable place branding strategies. Despite efforts to promote environmental sustainability, Manila, Philippines, struggles to project an image of resilience and greenness due to issues with air and water pollution, inadequate waste management, and vulnerability to natural disasters (World Bank, 2016). Similar challenges affecting Bangkok, Thailand's livability and environmental sustainability include flooding, air pollution, and traffic congestion (Ross & Poungsomlee, 1995). Bangkok's aspirations to establish itself as a sustainable metropolis are hindered by these issues, exacerbated by rapid urbanization and deficient urban planning. Meanwhile, Ho Chi Minh City, Vietnam, grapples with growing urbanization, inadequate infrastructure, and environmental pollution, making it challenging to balance economic growth, environmental preservation, and social equity (Deakin, 2001). The city's environmental branding is hindered by inconsistent land use regulations and insufficient funding for public transit, despite efforts to support sustainable development. Sustainable place branding initiatives in Phnom Penh, Cambodia, face hurdles from the city's rapid urbanization, informal settlements, and environmental degradation (Flower et al., 2018). The city's efforts to become more sustainable are hampered by urban growth and infrastructure deficiencies, and its endeavors to project an image of inclusivity and greenness are further complicated by issues such as water pollution. Overall, these cities grapple with complex and interconnected challenges that necessitate comprehensive strategies and collaborative efforts to address sustainability concerns and effectively position themselves as resilient and environmentally friendly urban areas.

### 3.3 The City for future: Way forward

To effectively address urgent environmental, social, and economic concerns, Southeast Asian cities must continue prioritizing sustainability efforts that integrate green marketing and urban regeneration. Green marketing techniques, as highlighted by Baktash and Talib (2019) have the potential to encourage businesses and consumers to adopt eco-

friendly practices and products, thereby promoting sustainable consumption and production patterns. Public-private collaborations, incentives for sustainable innovation, and targeted marketing campaigns, as suggested by Dapice et al. (2009), can all contribute to accelerating the transition to a green economy.

In parallel, urban regeneration initiatives should prioritize sustainability principles by integrating affordable housing, green infrastructure, and community facilities, as emphasized by Wijaya & Ng (2021). By promoting cooperation among enterprises, government agencies, civil society organizations, and communities, Southeast Asian cities can develop comprehensive sustainability policies that address the interconnected challenges of urbanization, inequality, and climate change (Ali et al., 2021). Furthermore, by adapting successful projects to local contexts and objectives, cities can learn from best practices in green marketing and urban regeneration, as demonstrated by Nguyen et al., (2016). Adopting a proactive and integrated approach to sustainability will enable Southeast Asian cities to build more resilient, equitable, and livable urban environments for current and future generations.

Singapore serves as a notable example of a Southeast Asian city that has effectively leveraged sustainable place branding tactics, integrating green marketing principles to promote environmental stewardship and urban renewal. Through strategic positioning as a "Garden City" and "City in a Garden," Singapore has enhanced its global reputation and attracted talent, investment, and tourism (Chang, 2006). Policies such as green building standards, eco-friendly transport systems, and biodiversity conservation efforts have further supported Singapore's sustainable place branding initiatives (Siva et al., 2017). Through effective communication and engagement with stakeholders, including residents, businesses, and government agencies, Singapore has strengthened social cohesion, economic competitiveness, and environmental resilience, demonstrating the transformative potential of sustainable place branding for urban regeneration in Southeast Asia.

While Bangkok, Kuala Lumpur, and Jakarta have made varying degrees of progress in implementing sustainable place branding initiatives, they face substantial obstacles related to urbanization and sustainability. Bangkok, for instance, is investing in green spaces and mass transit systems to combat urban heat islands and traffic congestion, positioning itself as a "Green Metropolis" (Adulkongkaew et al., 2020). Kuala Lumpur is prioritizing sustainable development through initiatives like the River of Life project and the Kuala Lumpur Green City Action Plan, aiming to improve environmental sustainability and attract investment and tourists (Kanniah, 2017). Jakarta, despite environmental challenges, is implementing programs such as the Transjakarta Bus Rapid Transit system and the Jakarta Green and Blue Open Space Development Programme to address air quality, floods, and urbanization impacts, aligning with its branding as an "Emerging Global City" committed to sustainable development (Indraprahasta, 2018).

## IV. CONCLUSION

In conclusion, the integration of green marketing with urban regeneration initiatives is intricately linked to the sustainable place branding of Southeast Asian cities. By adopting a comprehensive strategy that encompasses environmental sustainability, social equality, and economic development, cities in Southeast Asia can enhance their global competitiveness while fostering livability, resilience, and inclusivity (Zenker & Braun, 2017).

Green marketing tactics play a crucial role in increasing the demand for eco-friendly products and services and promoting a sustainable culture among locals, businesses, and tourists by highlighting the environmental benefits of sustainable practices and products (Rao, 2002). Simultaneously, urban regeneration initiatives offer opportunities to enhance environmental quality, address social injustices, and revitalize urban areas, contributing to the creation of resilient and vibrant urban environments (Vanolo, 2015).

By integrating green marketing strategies with urban revitalization projects, Southeast Asian cities can effectively demonstrate their commitment to sustainability, attract investment, and cultivate a favorable reputation as environmentally conscious and forward-thinking urban centers (Chang, 2006). Furthermore, by involving stakeholders in the co-creation of inclusive and sustainable urban environments, cities can strengthen communities and ensure that the benefits of development are equitably distributed among all citizens (Singh et al, 2021). In summary, sustainable place branding offers a promising path forward for the future prosperity, equity, and environmental sustainability of Southeast Asian cities.

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# TRUST AND FLOW EXPERIENCE IN TIKTOK LIVE STREAMING: HOW STREAMERS BUILD CONSUMERS' INTERNAL STATES AND DRIVE ACTUAL PURCHASE BEHAVIOR THROUGH THEIR CHARACTERISTICS

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**ABSTRACT**

With Vietnam's rapidly growing e-commerce market and increasing internet penetration, live streaming has emerged as a powerful platform for brands to connect with consumers in real time. As a result, the live streaming industry in Vietnam has experienced explosive growth, especially on the TikTok platform, reshaping how consumers interact with brands and make purchasing decisions. This study investigates the streamers' characteristics influencing consumers' actual purchase behaviors in this dynamic context. There is a control variable, gender, to examine its impact on consumers' actual purchase behavior. Drawing on S-O-R theory, source credibility, and flow experience theories, this study aims to uncover the mechanisms driving purchases in TikTok live streaming among Vietnamese customers. Through rigorous empirical analysis using partial least squares path modeling PLS-SEM, this research highlights the complex interactions between variables, as well as the differences in gender that lead to varying purchase behaviors. Streamers' attractiveness and trustworthiness impact all variables except actual purchase behavior; conversely, streamers' expertise only affects cognitive trust and actual purchase behavior. The findings offer valuable insights for streamers, businesses and sellers, and the TikTok live streaming platform helping them optimize strategies and capitalize on opportunities in Vietnam's live streaming commerce.

*Key words:* "consumer trust", "flow experience", "live streaming", "streamers' source credibility", "purchase behavior".

## I. INTRODUCTION

### 1.1 Background of the study

The rapid evolution of the internet has led to the creation of numerous innovations, with social media being one of the most significant. According to a report by Datareportal (2024), there are 5.35 billion internet users globally, accounting for 66.2% of the world's population. Of these, 94.21% (5.04 billion users) engage with social media. The development of social media has greatly transformed communication and marketing practices, providing consumers with new channels to share and seek product information.

In recent years, the advent of live streaming has emerged as a powerful marketing tool on social media platforms. Live streaming refers to the real-time broadcast of video content online, allowing viewers to interact with the content through likes, comments, and sharing. Popular platforms such as Facebook, TikTok, YouTube, and Instagram have incorporated live streaming features, attracting vast audiences for viewing content. These platforms enable users to share daily activities, events, and interviews, thereby enhancing interaction within their communities.

The COVID-19 pandemic accelerated the growth of live streaming, transforming it from a simple content-sharing format into a thriving e-commerce tool. According to Ankit Gupta (2020), the live streaming industry is projected to reach a market value of $559.62 billion by 2032, driven by a robust compound annual growth rate of 25.6%. Live streaming now integrates with e-commerce, allowing businesses to sell products directly to viewers through live broadcasts. These live selling sessions often feature product showcases, demonstrations of product benefits, Q&A sessions, interactive mini-games, exclusive deals, and customer support—all in real-time. This type of shopping experience builds trust, fosters a sense of urgency, and encourages immediate purchasing decisions.

As a growing trend, live streaming has increasingly influenced traditional purchasing behaviors and become a vital marketing tool for major platforms. It has significantly altered how consumers engage with products, creating a more interactive, engaging, and transparent shopping experience. The rise of live streaming has made it an indispensable

component of brands' marketing strategies.

In Vietnam, live streaming is gaining significant traction. The live-streaming e-commerce market in Vietnam is projected to hit $11 billion by 2026, with an impressive annual growth rate of 28% (Asiacircles, 2024). More than 70% of internet users in Vietnam have watched a live stream, and half of them have made a purchase during or following the stream. This underscores the immense potential of live streaming as a marketing tool in Vietnam, making it a promising market for brands, influencers, and e-commerce platforms.

Live streaming in e-commerce typically operates under two models: in-house live streaming and influencer live streaming (Xin et al., 2023). In - house live streaming involves brands using their own employees to showcase and sell their products, giving the brand control over the content and communication strategy. In contrast, influencer live streaming features collaborations with influencers who promote products. This can either be in the form of influencer-led special live streams, where influencers exclusively promote a brand, or influencer-led mixed live streams, where influencers feature products from various brands. The streamer appears and interacts with the audiences therefore, their role is crucial in shaping consumer behavior. The interaction between the streamer and the audience - whether through product demonstrations or engagement tactics - can significantly impact viewers' willingness to make a purchase (Huang et al., 2023).

Even though many previous studies have examined the relationship between source credibility of streamers and consumer trust or purchase behavior (Li et al., 2024; Faizza & Roostika, 2024; Rungruangjit, 2022). However, the impact of source credibility of streamers on consumer flow experience is not be considered significantly, and traditional research on consumer flow experience and purchase behavior is not fully applicable to live streaming scenarios, particularly in the context of Vietnam and TikTok live streaming platform. Therefore, the impact of source credibility of streamers on both consumers' trust, flow experience, and purchase behavior and the influence of gender in consumers' purchase decision in TikTok live streaming are determined and evaluated in this study.

### 1.2 Research Questions and objectives

To fill this gap, the research aims to investigate consumer purchase behavior under the impact of streamers' source credibility through live streaming in TikTok. There are several main objectives of the research:

– RO1: Assess the extent to which the source credibility factors of streamers influence trust, flow experience, and purchase behavior of viewers.

– RO2: Examine how gender differences among viewers affect their behavior.

– To accomplish the above-mentioned goals. The following are some of the most important questions that will be answered:

– RQ1: How do the source credibility factors of streamers influence trust, flow experience, and purchase behavior of viewers?

– RQ2: How do gender differences among viewers affect their behavior?

## II. MATERIAL AND METHODOLOGY

This section is to review theoretical backgrounds and hypotheses development. The proposed research methods and models are also captured in the pieces of literature which include hypotheses and relations between attributes.

### 2.1. Conceptual Foundation

#### Source credibility theory

In the realm of traditional marketing and advertising, the source of a message plays a pivotal role in its persuasiveness and the subsequent actions of the receiver. This phenomenon, known as source credibility, has been extensively studied for its impact on attitude change and consumer behavior. Positive traits of a message's source that affect a receiver's response to the message are commonly referred to as source credibility (Ohanian, 1990). The majority of research has concurred that source credibility is a multidimensional concept that centers on trust, expertise, and attractiveness of the source, despite differences in findings and names for aspects (Eisend, 2006).

Numerous academic disciplines have undergone radical change as a result of social media's increasing popularity

(Qualman, 2012). Previous research (Cunningham & Bright, 2012; Edwards et al., 2013) that attempted to comprehend the function of source credibility in online contexts primarily examined the perceived credibility of an individual publishing static information online (bloggers, for example, or the person who publishes a specific message on Facebook or Twitter). Other research investigated the veracity of the messages themselves or the social media platform where they were placed (Lee & Ahn, 2013). Regarding e-commerce, the audience's perceptions of the information sources for goods and services mostly indicate the reliability of information sources. According to the aforementioned situations, people are more likely to be persuaded by high source credibility while they are less likely to be persuaded by low source credibility (Li et al., 2024). Higher perceived credibility streamers have been shown to positively influence followers' opinions toward businesses and buy intentions. Therefore, in live streaming, viewer behavior and decisions are likely to be influenced by the credibility of streamers who interact with viewers in real-time (Lee et al., 2024).

**Flow experience**

According to Csikszentmihalyi (2000), flow is "the comprehensive sensation that appears when we act with total engagement in a point of time." Users in this condition will have a high degree of control over their own conduct, disregard the existence of nearby objects, filter out unpleasant sensations, and be unaffected by the outside environment while working on activities.

The flow theory was first expanded in the online setting by Hoffman and Novak (1996). According to Hoffman and Novak (2009), when one is fully engaged in an online activity, they might experience online flow. According to Hyun et al. (2022), the flow experience on the Internet is characterized by a feeling of control, curiosity, concentration, enjoyment, internal skills, and personal difficulties. In addition, Chen and Lin (2018) investigated live-stream usage intention and discovered that entertainment improves viewers' flow during live streaming. According to this research, when viewers watch live streaming, the streamer depends on their own performance to allow viewers to engage, create an immersive experience, and then encourage them to indulge, focus, and enjoy it, forget their problems, experience a state of flow, and produce purchase behavior.

**SOR**

SOR theory is a theoretical framework for interpreting consumer behavior which was originally proposed by Mehrabian (1974). The model contains three key elements, namely “Stimulus, Organism, Response”, various external environmental factors act as stimuli (S) that influence an individual's internal psychological states (O), which then leads to their corresponding behavioral responses (R) (Jacoby, 2002).

The framework has been applied in many fields: instant messaging social software (Li et al. 2024), user adoption studies of mobile apps (Ashraf et al. 2021; Wu et al. 2021), e-commerce (Lin et al. 2021). In the realm of live streaming, this research employs the S-O-R model to explore the psychological state between the streamer and the viewer's impulsive buying behavior, considering the streamer as the external stimulus (S), the flow experience and trust as the consumer's internal state (O), and the customer's purchase behavior as the resulting response (R).

### 2.2 Hypotheses development

#### 2.2.1. Streamers’ characteristics on Purchase behavior

In recent years, live streaming has increased gradually and streamers are assessed to play a crucial role in shaping users' purchase behavior. Attractive streamers are perceived as more credible, which increases the likelihood of viewers trusting their recommendations (Hui, 2017; Sokolova & Kefi, 2019). The physical appeal of streamers can boost the impact of live streaming, making them more persuasive. Research shows that attractive streamers are more likely to increase consumer awareness and purchase intention (Schouten et al., 2020). In addition, the "halo effect" (Lee & Watkins, 2016) explains why attractive streamers are perceived as more intelligent and reliable, further boosting purchase behavior. Thus, streamer attractiveness, through increased credibility and the halo effect, significantly enhances consumer purchase behavior.

Schouten et al. (2020) argue that streamers, who have established themselves as domain experts, are more trusted than those whose endorsements may lack relevance. When streamers have direct experience with the products they introduce, their knowledge enhances their credibility, distinguishing them from streamers who often lack personal

product experience. As Hu et al. (2016) suggest, when users perceive a streamer as an expert, they rely on their judgment and are less likely to seek additional information, trusting the endorsement as a reliable source. Research by Gao and coauthors (2023) and Thompson and Johnson (2017) further supports the idea that expertise of a streamer boosts purchase intention, as users are more likely to trust, and increase purchase behavior.

Streamers who are relatable, unbiased, and transparent with their content tend to build stronger trust with their audience (Temperley & Tangen, 2006). When streamers are perceived as genuine and credible, their followers are more likely to trust their product recommendations, leading to higher purchase intent (Erdem & Swait, 2004). Cheung et al. (2008) note that trustworthiness defines the expected value of the information shared, impacting purchase behavior. Studies confirm the positive relationship between trustworthiness and purchase behavior (He et al., 2022). Thus, hypothesis H1 is as follows:

*H1. The streamer's (a) attractiveness, (b) expertise, (c) trustworthiness has a positive impact on consumers' purchase behavior.*

**2.2.2 Streamers' characteristics on Trust**

The physical attractiveness of a communicator plays a significant role in shaping how they are perceived, influencing both initial judgments and ongoing opinion agreement (Snyder & Rothbart, 1971). Attractively perceived individuals are often seen as more sociable, kind, logical, and informed, which boosts their credibility and message acceptance (Dipboye et al., 1977). These positive traits make attractive individuals more trustworthy and persuasive in the eyes of their audience. Thus, the physical attractiveness of a social media influencer increases followers' trust. In addition to cognitive trust, attractiveness also plays a role in fostering emotional trust. A streamer's appearance can positively shape viewers' emotional perceptions, leading to more favorable impressions. This emotional trust is further strengthened by the streamer's perceived goodwill, which is associated with their charm and positive image (Li et al., 2024).

Similar to how online medical credentials influence perceptions of skill, platform-bestowed titles in live streaming signal professionalism and expertise. Research on source credibility in social media supports this. For example, Djafarova and Rushworth (2017) found that Instagram users trusted celebrity product reviews based on perceived expertise. In live streaming, viewers are likely to trust streamers who display expertise, whether through credentials or demonstrated knowledge. Specifically, these indicators shape emotional trust, as viewers assume that a skilled streamer will behave honorably. Moreover, expertise enhances cognitive trust, as viewers perceive the streamer as more dependable and capable (Li et al., 2024).

Similar to attractiveness and expertise, streamer trustworthiness has a positive impact on consumers' trust (Lou & Yuan, 2019). For example, Breves et al. (2019) found that online consumers' evaluations of brands and products can be positively influenced by the expertise and trustworthiness of streamers. Lou and Yuan (2019) also observed that the trustworthiness and attractiveness of streamers can enhance consumers' trust. Furthermore, Wiedmann and Mettenheim (2021) argued that a key factor behind streamers' success is the positive transfer of their trustworthiness and attractiveness, which increases brand trust.

*H2. The streamer's (a) attractiveness, (b) expertise, (c) trustworthiness has a positive impact on consumers' cognitive trust.*

*H3. The streamer's (a) attractiveness, (b) expertise, (c) trustworthiness has a positive impact on consumers' emotional trust.*

**2.2.3 Streamers' characteristics on Flow experience**

According to Source Credibility Theory, factors such as attractiveness, expertise, and trustworthiness of the information source can positively influence the perceptions and behaviors of the audience (Hovland et al., 1953). In the context of livestreaming commerce, highly trustworthy streamers often foster positive interactive experiences, facilitating viewers' attainment of a "flow" state - a condition characterized by enjoyment and intense focus (Csikszentmihalyi, 1990). Specifically, streamer attractiveness, through physical appearance or communication style, can enhance viewers' enjoyment and concentration on the livestream content (Ohanian, 1990). Similarly, streamer expertise, demonstrated by in-depth knowledge of the product or service, instills confidence in viewers, thereby

increasing their focus and satisfaction during the livestream (Sternthal et al., 1978). Furthermore, streamer trustworthiness helps build trust and connection, creating an environment conducive to viewers achieving an immersive experience (McCroskey & Teven, 1999). Thus, the following hypothesis is derived.

*H4. The streamer's (a) attractiveness, (b) expertise, (c) trustworthiness has a positive impact on consumers' enjoyment.*

*H5. The streamer's (a) attractiveness, (b) expertise, (c) trustworthiness has a positive impact on consumers' concentration.*

**2.2.4 Trust on Purchase behavior**

Just as trust in a salesperson can reduce uncertainty and lead to a higher likelihood of purchase (Crosby, 1990), trust in a streamer influences followers' attitudes toward the products they recommend. Research consistently supports this connection between trust and purchase intention (Chao et al., 2015), indicating that viewers are more likely to engage with a product when they trust the streamer's integrity, competence, and benevolence (Budyastuti & Iskandar, 2018).

In the context of live streaming, viewers' decisions to follow, engage, or support a streamer are driven by their trust in the streamer's behavior and ability to fulfill their commitments (Chen et al., 2024). As seen in e-commerce, where trust is essential for consumer purchase decisions (Putra et al., 2017), viewers similarly need to trust that their engagement with a streamer will be rewarding and beneficial. Therefore, trust plays a critical role in determining whether viewers will act on the influencer's product recommendations, with stronger trust leading to greater engagement and a higher likelihood of purchase.

*H6. The consumers' (a) cognitive trust and (b) emotional trust has a positive impact on purchase behavior.*

**2.2.5 Flow experience on Purchase behavior**

Research by Rettie (2001) shows that flow prolongs internet use, and Hsu and Lu (2004) demonstrate that flow positively impacts intentions to engage with online content, such as games. Wu and Chang (2005) found that flow enhances transaction intentions, a pattern observable in online shopping, where users are more likely to generate transaction intentions. Additionally, flow significantly impacts online shopping behaviors such as purchase behavior (Kim et al., 2022). This holds true in live streaming, where viewers experiencing flow are more likely to form purchase behavior due to increased emotional engagement and immersion.

*H7. The consumers' (a) enjoyment and (b) concentration has a positive impact on purchase behavior.*

**2.3. Research model**

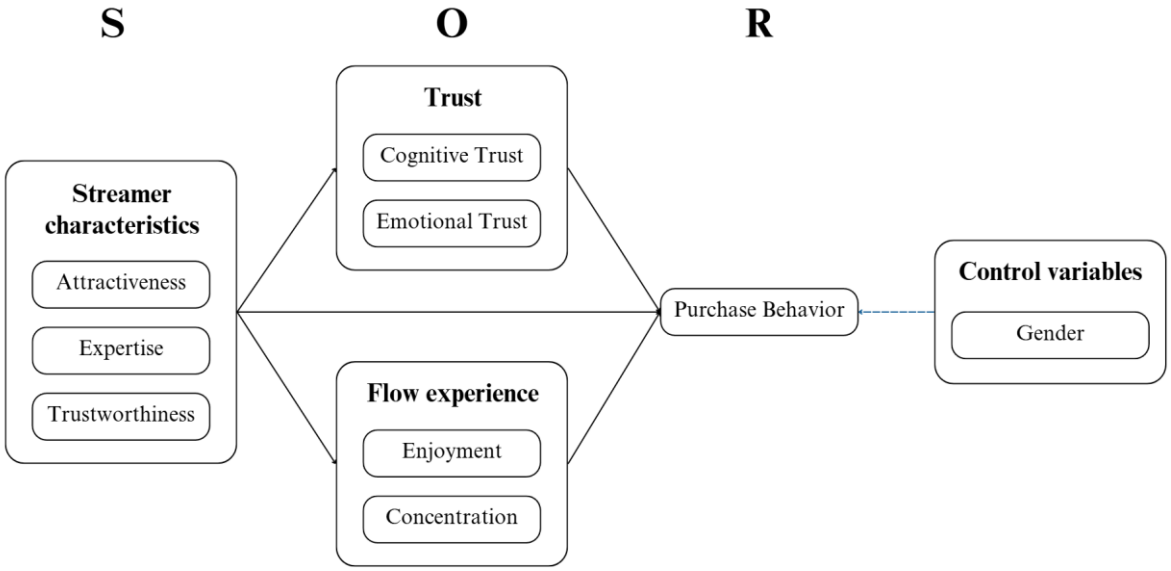



**Fig 2. 1 - Proposed Conceptual Model**

**III. RESULT AND DISCUSSION**

**3.1. Study design**

Consumers over 18 years old who watched and made a purchase directly in TikTok live streaming are targeted for this study. A convenience sampling method was employed for this study. We measured the constructs on a 5-point Likert scale and questionnaires were distributed online using Google Forms. This sampling procedure yielded 334 usable responses. According to the survey results, the gender distribution of participants reveals that the majority are females, accounting for 72.5% of the total respondents, while male participants make up only 27.5%. Although the percentage of females is much greater than that of male, it makes sense because prior research has shown that women are frequently more prone than males to make online purchases (Pradhana & Sastiono, 2019).

### 3.3. Model results

To analyze the causal relationships and evaluate the conceptual model, we employed structural equation modeling (SEM) (Henseler et al., 2009). Partial Least Squares (PLS) was deemed the most suitable method due to: (a) the early stage of theoretical development, and (b) the novelty and complexity of the conceptual model. First, we assessed the measurement model to evaluate indicator reliability, construct reliability, convergent validity, and discriminant validity. Subsequently, we tested the structural relationships outlined in the proposed conceptual model.

#### 3.3.1. Measurement Model

To examine the item reliability, we used Cronbach's Alpha and composite reliability (CR) to measure items. With the threshold of Cronbach's Alpha and CR being higher than 0.70 (Henseler et al., 2009), all items satisfy the requirements. In order to analyze the indicator reliability, the outer loadings should be higher than 0.7 (Henseler et al., 2009). All item loadings exceed 0.7 (Appendix), confirming the indicator reliability. Moreover, the average variance extracted (AVE) is above the critical threshold of 0.50 (Hair et al., 2017), which confirms the reflective constructs' convergent validity and internal consistency (see Table 3.1). Finally, the discriminant validity has been assessed using HTMT criteria. The Hetrotrait–Monotrait ratio (HTMT) table is available upon request, and all values are lower than the threshold of 0.9 (Henseler et al., 2015). The assessment of the construct reliability, convergent validity and indicator reliability suggest satisfactory results, indicating that all constructs can be used to test the theoretical model.

**Table 3.1 - Reliability and validity of variables**

| | Reliability and convergent validity | | | Discriminant validity | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Alpha** | **CR** | **AVE** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| 1. Concentration | 0.915 | 0.939 | 0.795 | | | | | | | | |
| 2. Cognitive Trust | 0.892 | 0.925 | 0.755 | 0.691 | | | | | | | |
| 3. Enjoyment | 0.932 | 0.948 | 0.786 | 0.842 | 0.849 | | | | | | |
| 4. Emotional Trust | 0.880 | 0.917 | 0.735 | 0.768 | 0.872 | 0.849 | | | | | |
| 5. Purchase Behavior | 0.895 | 0.927 | 0.760 | 0.612 | 0.758 | 0.701 | 0.688 | | | | |
| 6. Attractiveness | 0.895 | 0.923 | 0.705 | 0.519 | 0.709 | 0.620 | 0.617 | 0.696 | | | |
| 7. Expertise | 0.934 | 0.950 | 0.791 | 0.414 | 0.667 | 0.521 | 0.556 | 0.716 | 0.752 | | |
| 8. Trustworthiness | 0.928 | 0.946 | 0.777 | 0.498 | 0.680 | 0.596 | 0.640 | 0.696 | 0.723 | 0.792 | |

#### 3.3.2. Structural Model

This study used a bootstrapping of 500 resamples to estimate the statistical significance of the path coefficients (Tenenhaus et al., 2005). Attractiveness had a positive but non-significant effect on purchase behavior (ß = 0.108; p = 0.079), and trustworthiness similarly showed a positive yet non-significant influence (ß = 0.109; p = 0.095), leading to both H1a and H1c being unsupported. In contrast, expertise demonstrated a significant positive impact on purchase behavior (ß = 0.269; p < 0.001), supporting H1b. Attractiveness had a positive and significant impact on cognitive trust (ß = 0.332; p < 0.001), supporting H2a (see Table 3.2). Among the antecedents, attractiveness presented the strongest influence on cognitive trust, indicating its critical role in shaping trust based on perceptions of credibility. Similarly, trustworthiness exhibited a significant positive effect on cognitive trust (ß = 0.261; p < 0.001), supporting H2c, and emotional trust (ß = 0.356; p < 0.001), supporting H3c. These findings suggest that individuals who perceive higher trustworthiness are more likely to experience both cognitive and emotional trust. Expertise also showed a significant positive effect on cognitive trust (ß = 0.192; p <0.01), supporting H2b. However, its effect on emotional trust was not

significant (ß = 0.059; p = 0.410), not supporting H3b. While expertise influences logical trust, it does not significantly contribute to emotional trust. Attractiveness had a significant impact on emotional trust (ß = 0.279; p < 0.001), supporting H3a, and enjoyment (ß = 0.352; p < 0.001), supporting H4a. These findings highlight attractiveness as a key driver of positive emotional responses. On the other hand, expertise did not have a significant effect on enjoyment (ß = 0.019; p = 0.807), not supporting H4b. Cognitive trust significantly influenced purchase behavior (ß = 0.172; p <0.5), supporting H6a. This highlights cognitive trust as a vital mediator in driving consumer decisions. However, emotional trust did not have a significant impact on purchase behavior (ß = 0.035; p = 0.644), not supporting H6b. Similarly, enjoyment (ß = 0.134; p = 0.098) and concentration (ß = 0.118; p = 0.056) also failed to show significant effects on purchase behavior, not supporting H7a and H7b.

In summary, hypotheses H1b, H2a, H2b, H2c, H3a, H3c, H4a, H4c, H5a, H5c and H6a are supported, while hypotheses H1a, H1c, H3b, H4b, H5b, H6b, H7a, and H7b are not supported. These results underscore the importance of cognitive trust and specific antecedents, such as attractiveness and trustworthiness, in shaping consumer behavior.

**Table 3.2 - Path coefficients of direct effects**

| Hypotheses | Relationship | | ß | P Values | |
|---|---|---|---|---|---|
| **1a** | Attractiveness | → Purchase Behavior | 0.108 | 0.079 | Not supported |
| **1b** | **Expertise** | **→ Purchase Behavior** | **0.269** | **0.000** | **Supported** |
| **1c** | Trustworthiness | → Purchase Behavior | 0.109 | 0.095 | Not supported |
| **2a** | **Attractiveness** | **→ Cognitive Trust** | **0.332** | **0.000** | **Supported** |
| **2b** | **Expertise** | **→ Cognitive Trust** | **0.192** | **0.007** | **Supported** |
| **2c** | **Trustworthiness** | **→ Cognitive Trust** | **0.261** | **0.000** | **Supported** |
| **3a** | **Attractiveness** | **→ Emotional Trust** | **0.279** | **0.000** | **Supported** |
| **3b** | Expertise | → Emotional Trust | 0.059 | 0.410 | Not supported |
| **3c** | **Trustworthiness** | **→ Emotional Trust** | **0.356** | **0.000** | **Supported** |
| **4a** | **Attractiveness** | **→ Enjoyment** | **0.352** | **0.000** | **Supported** |
| **4b** | Expertise | → Enjoyment | 0.019 | 0.807 | Not supported |
| **4c** | **Trustworthiness** | **→ Enjoyment** | **0.310** | **0.000** | **Supported** |
| **5a** | **Attractiveness** | **→ Concentration** | **0.312** | **0.000** | **Supported** |
| **5b** | Expertise | → Concentration | -0.026 | 0.708 | Not supported |
| **5c** | **Trustworthiness** | **→ Concentration** | **0.281** | **0.000** | **Supported** |
| **6a** | **Cognitive Trust** | **→ Purchase Behavior** | **0.172** | **0.032** | **Supported** |
| **6b** | Emotional Trust | → Purchase Behavior | 0.035 | 0.644 | Not supported |
| **7a** | Enjoyment | → Purchase Behavior | 0.134 | 0.098 | Not supported |
| **7b** | Concentration | → Purchase Behavior | 0.118 | 0.056 | Not supported |

### 3.3.3. Multi-Group Analysis

A multigroup analysis (MGA) was conducted to assess the effect of gender on the structural relationships in the model. The sample was divided into male and female groups, and differences in path coefficients were examined. As shown in the table, significant gender-based differences were observed in the relationships hypothesized in H1c, H2c, and H6b, as the p-values of the differences were below the 5% threshold. Specifically, the impact of trustworthiness on purchase behavior (H1c) was stronger for females (ß difference = -0.286; p = 0.037), while trustworthiness had a significantly greater effect on cognitive trust (H2c) for males (ß difference = 0.329; p = 0.010). Additionally, emotional trust was a significantly stronger predictor of purchase behavior (H6b) for females (ß difference = 0.458; p = 0.016). These findings indicate a significant moderating effect of gender on these relationships.

Conversely, the p-values for the differences in other hypothesized relationships, including H1a, H1b, H2a, H2b, H3a, H3b, H3c, H4a, H4b, H4c, H5a, H5b, H5c, H6a, H7a, and H7b, were above 5%, suggesting that gender does not significantly impact these structural relationships. These results imply that while gender plays a role in certain relationships, such as those involving trustworthiness and emotional trust, it does not universally moderate the pathways in the model.

**Table 3.3 - Results of the multi-group analysis (MGA) – Gender differences**

| | Relationship | | Path coefficient (Male) | Path coefficient (Female) | Difference \|Males-Females\| | p Value |
|---|---|---|---|---|---|---|
| **1a** | Attractiveness | → Purchase Behavior | 0.040* | 0.232 | 0.192 | 0.097 |
| **1b** | Expertise | → Purchase Behavior | 0.286 | 0.138*** | -0.148 | 0.200 |
| **1c** | Trustworthiness | → Purchase Behavior | **0.149** | **-0.138*** | **-0.286** | **0.037** |
| **2a** | Attractiveness | → Cognitive Trust | 0.403 | 0.145*** | -0.258 | 0.051 |
| **2b** | Expertise | → Cognitive Trust | 0.213 | 0.202* | -0.010 | 0.943 |
| **2c** | Trustworthiness | → Cognitive Trust | **0.160*** ** | **0.489*** | **0.329** | **0.010** |
| **3a** | Attractiveness | → Emotional Trust | 0.318 | 0.171*** | -0.146 | 0.265 |
| **3b** | Expertise | → Emotional Trust | 0.059 | 0.114 | 0.055 | 0.688 |
| **3c** | Trustworthiness | → Emotional Trust | 0.266*** | 0.567** | 0.301 | 0.074 |
| **4a** | Attractiveness | → Enjoyment | 0.331** | 0.404*** | 0.073 | 0.621 |
| **4b** | Expertise | → Enjoyment | 0.037 | 0.021 | -0.016 | 0.893 |
| **4c** | Trustworthiness | → Enjoyment | 0.313* | 0.323** | 0.009 | 0.934 |
| **5a** | Attractiveness | → Concentration | 0.291* | 0.362*** | 0.071 | 0.671 |
| **5b** | Expertise | → Concentration | -0.009 | -0.036 | -0.027 | 0.877 |
| **5c** | Trustworthiness | → Concentration | 0.243* | 0.391** | 0.148 | 0.395 |
| **6a** | Cognitive Trust | → Purchase Behavior | 0.254 | 0.083** | -0.172 | 0.325 |
| **6b** | Emotional Trust | → Purchase Behavior | **-0.052*** | **0.406** | **0.458** | **0.016** |
| **7a** | Enjoyment | → Purchase Behavior | 0.119 | 0.079 | -0.040 | 0.823 |
| **7b** | Concentration | → Purchase Behavior | 0.127 | 0.182 | 0.055 | 0.662 |

Note: ***p<0.001, **p<0.01, *p<0.05

## IV. CONCLUSION

The results of hypotheses H1b, H2a, H2b, H2c, H3a, H3b, H3c, H4a, H4c, H5a, H5c, H6a and H6b align with theoretical predictions. Streamers' expertise demonstrates a significant positive effect on purchase behavior and cognitive trust supporting the idea that streamers' expertise enhances consumer confidence in logical trust and purchase decisions that align to previous studies (Johnson & Grayson, 2005; Weismueller et al., 2020; AlFarraj et al., 2021). Different from streamers' expertise, attractiveness and trustworthiness show strong positive impacts on both trust (Kim & Kim, 2021; Zhou & Lou, 2024; Li et al., 2024) and flow experience of consumers, reaffirming its centrality in fostering deeper consumer engagement. Similar to the study of Li and coauthors (2024) which consider the impact of trust in impulsive buying behavior, only cognitive trust impacts purchase behavior, not emotional trust. Modern online shoppers, especially in live streaming, tend to adopt a more rational approach. When making purchasing decisions, they often evaluate their needs based on objective considerations. This trend highlights how consumers are increasingly focused on meeting their specific needs and reflects the ongoing improvement in the standards and quality of online shopping experiences.

In contrast, the results of hypotheses H1a, H1c, H2b, H2c, H3a, H6a, H7a, and H7b are not aligned with theoretical predictions. Streamers' attractiveness and trustworthiness do not influence consumers' purchase behavior while expertise does. Whereas attractiveness and trustworthiness can enhance the overall experience or create a positive

impression, they do not necessarily provide the specific, actionable information that consumers need to justify a purchase. Moreover, streamers' expertise does not influence consumers' flow experience (enjoyment, concentration). Flow experience is heavily influenced by entertainment and emotional connection while expertise is primarily focused on providing product-related information and answering questions exhibits. This engages consumers' cognitive processes but may not elicit emotional responses necessary for enjoyment. Finally, flow experience does not impact purchase behavior that can be explained TikTok live streams often serve as both entertainment and commerce platforms. Consumers may enjoy the content and stay engaged (flow) but treat the shopping aspect separately, requiring rational consideration, focusing on product details or offers when deciding to buy.

The Multi-Group Analysis (MGA) underscores gender as a control variable. The significant difference in the streamers' trustworthiness - purchase behavior relationship and influences male purchase behavior but is not significant for females. This highlights that for males, streamers' trustworthiness is crucial for purchase decisions, reflecting their focus on reliability and factual cues in decision-making. In contrast, for females, streamers' trustworthiness seems less influential, with emotional connections, social interactions, and experiential factors likely playing a greater role in purchase decisions. The relationship between streamers' trustworthiness and cognitive trust also experiences a difference in gender that males are more influenced by streamers' trustworthiness to have the cognitive trust. Furthermore, the significant gender difference in the emotional trust - purchase behavior link suggests that emotional trust has a statistically significant positive effect on purchase behavior for female consumers, whereas the relationship is not statistically significant for males. For female consumers, emotional trust—rooted in comfort, security, and connection with the streamer - plays a key role in purchase decisions, fostering loyalty and reducing perceived risks. Conversely, male consumers prioritize logical factors like product quality and streamer expertise, with emotional trust having less influence on their buying behavior.

These findings offer theoretical and practical implications. Theoretically, this study offers significant theoretical implications for understanding consumer behavior in TikTok live streaming commerce. Cognitive trust, driven primarily by streamer expertise, emerges as the dominant factor influencing purchase behavior, while emotional trust and flow experience (enjoyment, concentration) have limited impact. These findings challenge traditional Source Credibility Theory by emphasizing the superiority of expertise over attractiveness and trustworthiness in shaping consumer decisions. According to the gender differences in the relationship of trustworthiness impact purchase decisions, while streamers' trustworthiness is crucial for male audiences, streamers targeting female consumers may need to incorporate additional elements that foster emotional engagement and create a more immersive shopping experience. Due to the gender differences in the relationship of emotional trust impact purchase decisions, focusing on emotional connections for women and cognitive factors for men—can enhance the effectiveness of marketing in livestream shopping. In addition, flow experience (enjoyment and concentration) has no significant impact on purchase behavior. This finding challenges existing theories, such as Csikszentmihalyi's Flow Theory, which argue that an immersive, enjoyable experience leads to behavioral outcomes. Moreover, the results also refine the S-O-R framework, illustrating that cognitive trust impacts purchase behavior, with gender acting as a critical control variable. This underscores the growing rationality of online consumers and the need to account for demographic nuances in future research and practical applications. Practically, to optimize the effectiveness of TikTok live streaming commerce, streamers, businesses, and the platform must align their strategies. Streamers should focus on demonstrating expertise to build purchase behavior. To optimize gendered purchase behavior, streamers should tailor their approach: focus on expertise and transparency to build trust with male audiences, while using emotional storytelling and interactive engagement to connect with females. Businesses should prioritize collaborations with knowledgeable streamers, provide training on product knowledge and audience engagement, and design campaigns that cater to gender-based consumer behaviors. TikTok, as a platform, can enhance its role by promoting credible content through its algorithms, offering gender-specific audience insights, and integrating features like verified streamer badges and interactive tools to support cognitive trust-building. Together, these strategies can create a more trusted and effective live-streaming commerce ecosystem, enhancing purchase behavior.

This study has five key limitations, alongside recommendations for future research. First, it does not focus on specific industries, providing a holistic view of streamer credibility but limiting applicability to sectors with high-value

products or niche markets. Future studies could explore how streamer credibility impacts purchase behavior in specific industries. Second, using only TikTok restricts generalizability, as user behaviors vary across platforms. Future research could investigate factors influencing consumer behavior on different platforms. Third, additional elements like time constraints (Harahap & Wahyuni, 2024) and satisfaction (Wang et al., 2024), beyond flow experience and trust, may impact purchasing in live streaming. Exploring these factors in various scenarios could provide deeper insights into impulsive buying behavior. Fourthly, focusing solely on purchase behavior overlooks long-term benefits for streamers and platforms, such as repurchasing (Farida et al., 2024, and word-of-mouth (Chen et al., 2023). Future studies could examine these behaviors to support the sustainable growth of live-streaming commerce. Lastly, this study focuses on how gender influences purchase decisions in TikTok live streaming commerce. However, limiting the scope to gender overlooks other important control variables like age and income. Future research should include these variables to provide more comprehensive and diverse insights into consumer behavior in this context.

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# DIGITAL MARKETING FOR DEVELOPING PRIVATE PRESCHOOL BRANDING

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**ABSTRACT**

Internationalization and competition have become common trends in all aspects of socio-economic life, and private school education is invariably facing new challenges and opportunities. The increased competition requires preschool managers to equip more appropriate methods to develop their schools. The article applies a theoretical approach to digital marketing through strategies, actions, and controls in preschool branding development. This approach supports brand positioning, identification, attracting potential customers, finding clients, building customer relationships, and analyzing and evaluating the competitive market. Digital Marketing provides a significant opportunity for preschool branding development, fostering trust with parents, and achieving sustainable growth. The research results recommend a comprehensive strategy to optimize resources and increase marketing efficiency. On the other hand, it is possible to use digital tools flexibly, and the content supplied through them to reveal professionalism, i.e., sincerity and alignment with the preschool education features.

*Keywords:* "Digital Marketing", "brand development", "private prechools", "competitive market", "strategy".

## I. INTRODUCTION

After 10 years of implementing Resolution No. 29-NQ/TW, dated November 4, 2013, of the 11th Party Central Committee on "Fundamental and comprehensive innovation of education and training, meeting the requirements of industrialization and modernization in the context of a socialist-oriented market economy and international integration." Prime Minister Pham Minh Chinh said, "Building and developing human beings must be based on the foundation from the early years of life to comprehensively develop children in terms of physical strength, intelligence, and aesthetics, forming the first elements of personality, laying the foundation for the comprehensive development of Vietnamese people". This affirms that preschool education plays a crucial role in the national education system, in the strategy of human resource development, and in the development of Vietnamese people. Currently, the number of immigrants and the rate of preschool-age children in Ho Chi Minh City is increasing, leading to a trend of investment in private preschools in Ho Chi Minh City to meet the increasing demand. Private preschools provide an additional option for parents, helping to reduce pressure on public schools while creating a more diverse and flexible learning environment. In the future, the preschool education system in our country, especially in Ho Chi Minh City, will have developments in scale, quality, care-education services, and building reputation. Therefore, developing preschool brands is necessary and urgent.

The development of the internet has significantly transformed human behavior and lifestyles. Additionally, digital marketing tools have taken over the market helping businesses and organizations reach and interact with the public more effectively. The development of digital technology and educational globalization pose numerous challenges for educational institutions worldwide, including those in Vietnam. Beyond communication activities and providing professional knowledge, marketing, and branding activities in educational institutions to enhance the reputation and attract students are more competitive and create intense pressure. However, traditional marketing activities are no longer sufficient to meet the information demands of learners, businesses, and society. The emergence of digital marketing activities has opened up numerous opportunities and rapidly satisfied the need for educational information access. It helps educational organizations clearly understand their target customer, and information connectivity, as well as enhancing information sharing and having a better experience of educational qualification. Utilizing digital marketing tools has become a vital trend for educational organizations (Le Thi Hai Van, 2020, 276). Recent studies show that more than 90% of parents search for information before they decide to send their children to school or not through online channels such as websites, social networks, and reviews playing a crucial role in the decision-making

process (Nielsen, 2023). Every day, internet users in Ho Chi Minh City spend an average of 6.5 hours on activities online, creating great opportunities for digital marketing strategies to reach and interact with target customers (Statista, 2022).

According to Associate Professor Dr. Nguyen Xuan Nghi, former Rector of Hanoi University of Industrial Fine Arts, until now, society has been familiar with businesses building brands, while it is strange with educational institutions. If the products of businesses are goods, then for schools, their product is students — human beings. This fundamental difference makes education a special type of service, as the product of school is human (Ha An, 2019). Digital marketing is a fast and effective way for preschools to understand customer needs, provide services, and interact with customers. To develop a sustainable customer base, private preschools need to understand customer needs, which is a basis for building a marketing strategy suitable for the target market (Philip Kotler, 2013), (Harvard Business Review, 2019). This article presents how to apply digital marketing strategy to brand development for Ho Chi Minh City's private preschools focusing on brand positioning, brand recognition, attracting and retaining potential customers, building long-term relationships with parents, and analyzing the competitive market. The study uses the RACE Planning model to implement specific action steps and effective control tools.

## II. MATERIAL AND METHODOLOGY

### 2.1 Literature review

#### 2.1.1. The definition of Digital Marketing

In 2017, Philip Kotler updated the definition of marketing "Marketing is the science and art of exploring, creating, and delivering value to satisfy the needs of a target market, create interactions with target customers for profit". Compared to his 2005 definition, marketing not only evolved brand positioning by emphasizing product advantages, but it now also indicates concern for the community, and society, while enhancing customer interaction with the brand. In 2019, Dr. Nguyen Thi Minh Ha introduced comprehensive educational marketing on a digital platform: "The use of online IT platforms by educational institutions to establish an integrated, goal-oriented, and measurable interaction channel that attracts and retains customers, thereby building and developing sustainable customer relationships" (Le Thi Hai Van, 2020, 277).

In essence, Digital Marketing is a form of advertisement that takes advantage of the unique characteristics of digital platforms to bring messages from brands to the right target audience. Hence, Digital Marketing is an advertising method using electronic devices, such as personal computers, smartphones, mobile phones, tablets, etc. to interact with users. Digital Marketing uses digital technologies via multiple platforms, such as websites, emails, applications (both basic and mobile), and social networks. (Le Thi Hai Van, 2020, p. 277; Tran Thi Huong, 2022).

#### 2.1.2. Private preschool

In the field of education, the product of the education and training process is people with a combination of standards of personality, qualifications, skills, ethics, etc. that are extremely diverse, complex, and always changing and developing. Although individual learners share the same social regime, political system, training environment, and even study in the same school, class, etc., their personality development is completely different because they differ in motivations, attitudes, abilities, resilience, conditions, etc. No matter the approach, schools cannot create completely identical people; even if they can, that is not the goal that an advanced education system aims for (Nguyen Thi Ha, 2022).

With the current trend of viewing education as a service, private preschools are considered as a business unit providing educational services. The primary customers are learners (those who use the service). Thus, it is necessary to place private preschools in a competitive market, which means private preschools and learners themselves must know whether the service provider is good or not compared to other units.

#### 2.1.3. Enrollment Decision

According to Tran Thi Ngoc Quyen and colleagues (2022), enrollment decision is a complex psychological process for students and their parents. It is influenced by multiple factors and often requires a long period of consideration before deciding where to pursue their education. There are two primary factors affecting the enrollment decision:

personal factors related to students or their parents, and external factors. Among these are influences from surrounding individuals (family, friends, academic advisors, alumni, etc.), and the school's communication efforts with students and parents during the student recruitment campaigns are identified as the key target in digital marketing strategies for attracting potential students to the institution (pp. 70, 72, 73).

### 2.1.4. Brand and the brand of private preschool

According to the definition of the World Intellectual Property Organization (WIPO), "A brand is a special sign (tangible and intangible) to identify a product or service produced or provided by an individual or an organization. Therefore, a brand can be understood as an important form of intangible asset of businesses, organizations, and individuals." (Nguyen Thi Ha, 2022).

Aaker (1996) defined: "A brand is an absolute commitment to quality, service, and value over a long period, and it is validated through its effectiveness and customer satisfaction. A brand is also a cultural, rational, emotional, visual, and unique image that customers associate with when mentioning a product or organization" (David Aaker, 1996).

From the traditional opinion, a brand is considered a component of the product — its name, a combination of colors, symbols, images, and signs to distinguish it from other companies' products. However, from the modern perspective, a brand is also a unique style, values, beliefs, and the emotional connection between customers, the public, and a business. A brand represents an organization, reflecting its tradition, values, culture, people, and strategic direction (Aaker, 2004). Two points of view about product and brand perspectives are illustrated in the following figure (Nguyen Thi Nhu Quynh 2022).

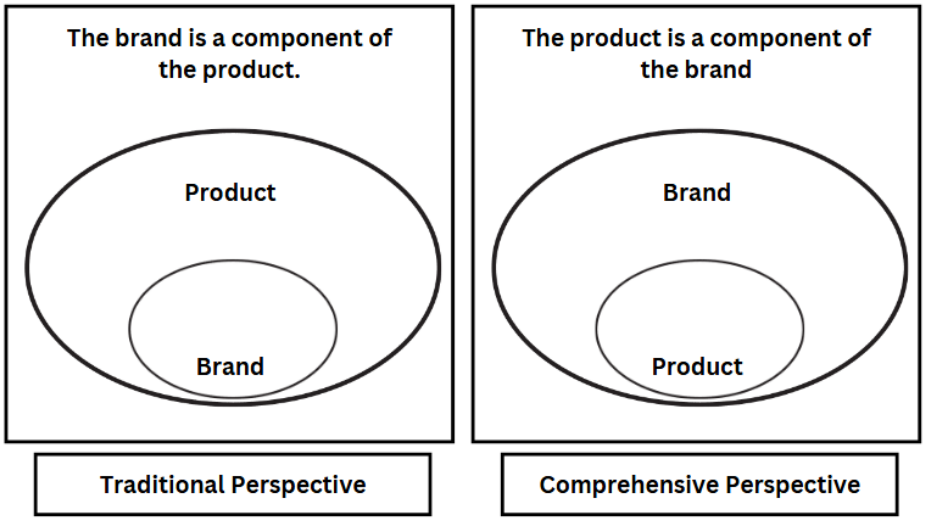



**Figure 1. Two Perspectives on the Relationship Between Product and Brand.**

It can be understood that "Preschool's brand is the holistic combination of identity factors, core elements, commitment and distinctiveness of a preschool institution. Identity factors (tangible aspects) include the preschool's name, logo, resources, educational quality, and service quality. Core elements (intangible aspects) include vision and mission, core values, educational philosophy, reputation, and trust from parents and society. A strong brand is not only identified through image, but also the commitment and distinctive value including human competencies, culture, and competitive strategies".

Development is a process of progressing from lower to higher levels, imperfection to perfection in all aspects. This movement happens both gradually and breakthroughs, leading to the emergence of new elements replacing the old ones (Marxist-Leninist Philosophy Textbook, 2017).

From these arguments, it can be summarized that: "Developing a preschool brand is a process of implementing breakthrough strategies and continuous improvements to enhance educational quality, establish credibility, and build sustainable value for the preschool brand".

## 2.2. Digital Marketing platforms in preschool brand development

### 2.2.1. Search Engine Marketing (SEM)

Search Engine Marketing (SEM) is marketing through search engines. This is a comprehensive solution to enhance the website's ranking and visibility of keywords for educational organizations on search engine result pages, helping to meet the information-seeking needs of potential customers. In Vietnam, Google is the most widely used search engine. SEM includes Search Engine Optimization (SEO), Content marketing, and Pay-Per-Click (PPC) Advertising. With SEO, the organization does not need to spend a significant amount on advertising, but it is necessary to identify the correct keywords, as well as follow Google's algorithm to ensure high-quality content (articles, images, and videos). Additionally, a marketing strategy for suitable and effective content is essential, including correct keywords that align with customers' needs and interests. It is represented in blogs, ebooks, whitepapers, infographics, etc. Unlike SEO, which focuses on organic search results, PPC advertising allows organizations to immediately appear and reach customers by investing in paid ads, boosting their website's ranking on search engine result pages.

### 2.2.2. Social Media Optimization (SMO)

Social Media Optimization (SMO) is an advertising activity on social media platforms, such as Facebook, Instagram, YouTube, Twitter, Zalo, etc. Customers use this tool to search the information. It achieves a high interaction and plays a crucial role in shaping customer perception, behavior, and attitudes toward the services and products of an educational institution's brand.

### 2.2.3. Customer Relation Manager (CRM)

Customer Relation Manager (CRM) is a customer relationship administrator tool based on technical connectivities between organizations and customers. With educational organizations, CRM allows customers to register for enrollment, track learning progress, make tuition payments, etc. on digital platforms. Therefore, educational institutions can build a database of learners, gaining insights into student needs and learning activities at any given time.

### 2.2.4. Website and mobile marketing refers

Website and mobile marketing refers to the use of websites and mobile devices to promote products, and services to customers. This approach encourages users to create and complete accounts to gain access to educational institution resources. The primary goals are to guide potential customers to explore information, build trust in the institution's operations, demonstrate social responsibility, and strengthen relationships. The main activities on marketing websites and mobile devices are email marketing, sms marketing, and display advertising on websites (including images, videos, animations, and text-based content). However, educational institutions need to pay attention to ad dimensions and formats to capture customers' attention and build emotional connections, particularly with customers who are parents and preschool-aged children (Le Thi Hai Van, 2020, pp. 277–278).

### 2.2.5. Video marketing:

YouTube has become a popular search engine thanks to its informative and interesting content, which attracts a large audience. Its fast-paced content delivery makes it more time-efficient compared to browsing websites. Today, many users are using YouTube to research products and services before making any purchase decisions or to gain knowledge on a specific topic. Besides YouTube, other platforms such as Facebook Video, Instagram, and Vimeo are also utilized for running video marketing campaigns (Tran Thi Huong, 2022).

## III. RESULT AND DISCUSSION

### 3.1. The impact of Digital Marketing on brand development in private preschools in Ho Chi Minh City

### 3.1.1. Brand Positioning

According to Lantabrand Branding Company, brand positioning is the process of creating the distinctive position of a brand in a competitive environment, ensuring that customers can differentiate it from its competitors (Nguyen Thi Hai Len, 2010, pp. 6).

Brand positioning involves determining the position of a brand in the market. In business practice, proactive positioning plays a vital role in shaping business marketing strategies for the following three reasons (P. Kotler, 2005): (1) If marketers do not select and proactively position their products, consumers will do it for them; (2) product positioning plays a crucial role in customers' purchasing decisions, and (3) positioning is a key factor for the best

combination of Marketing-mix variables (Tran Viet Dung, 2019, pp. 12)

Based on the selected brand development strategy (using Digital Marketing tools), brand positioning should be implemented by determining the brand's position relative to competitors in the market, as perceived by parents or students. There are eight steps in the brand positioning process:

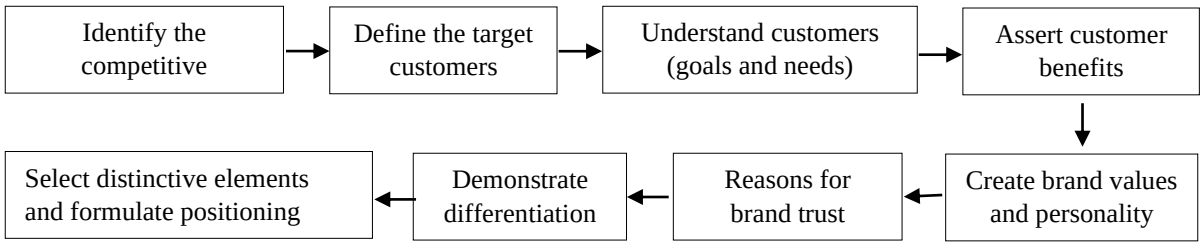



**Figure 2. The 8 Steps of Brand Positioning (Le Dang Lang, 2006)**

Preschool brand positioning should focus on the vision - mission, strengths, educational quality, etc. of the school. For example, the Vietnam Australia International School (VAS) pursues the vision of becoming an outstanding school system, providing students with a strong academic foundation by integrating the National Education Program with the Cambridge International Program. It may help students be well-prepared to face life's challenges and preserve the cultural, and traditional values of their country. This brand positioning is prominently advertised on the school's official website: https://www.vas.edu.vn/ve-vas. SEO supports effective positioning by optimizing online content, helping the school appear in prominent positions on Google when parents search for information about special education methods or creative learning environments. Using strategic keywords such as "International preschool" or "Cambridge International education programmes" not only increases search rankings but also affirms the school's reputation in modern education. SEO also helps enhance search visibility, attracting parents in the target area through keywords such as "Preschool in Ho Chi Minh City" or "International PreSchool in District 10". This creates a competitive advantage and expands its reach.

Some suggestions for using Digital Marketing platform for brand positioning:

Researching target customers: CRM allows data to be collected from many sources, such as surveys of parents, feedback from Open Day events, or data from social media. In Ho Chi Minh City, where most young parents deeply understand technology and use the internet to search for information, researching the market using CRM is especially useful. Schools can use CRM to identify trends in parents' behavior, such as: Priority criteria when choosing a school (curriculum, facilities, distance); Need for additional services (pick-up and drop-off, nutritious meals, or care after school); Expectations about educational methods (Montessori, STEM, or bilingual education). By analyzing this data, preschools can adjust their strategies to meet the right needs, thereby creating a difference in the market.

Personalize the customer experience: Particularly, parents in Ho Chi Minh City often have busy schedules, so providing messages appropriate to personal needs is key to making an impression. CRM can help automate thank-you notes after a visit to a school or send detailed information about programs tailored to their child's age and needs. These messages not only increase engagement but also demonstrate the school's professionalism and care, helping build trust and credibility.

Customer segmentation for brand development: CRM helps preschools better understand the needs, interests, and characteristics of each group of parents, thereby adopting appropriate outreach and care strategies. Collecting customer data CRM integrates information from many sources such as online registration forms, school tours, social media interactions, or feedback from advertising campaigns. This information includes: Personal information: Name, address, phone number, email, and age of children; Behavior: Frequency of parents attending events, viewing websites, or responding to email campaigns; Interests and needs: Desired curriculum (Montessori, STEM, bilingual), additional services (pick-up and drop-off, meals); Optimizing marketing resources: Customer segmentation helps preschools in Ho Chi Minh City focus their budget and efforts on the most potential customer groups. Instead of adopting a broad advertising strategy, CRM ensures that messages are delivered to the right audience, reducing costs and increasing reach effectiveness.

Personalize customer outreach strategies: After segmentation, CRM helps create personalized strategies that are

appropriate to each customer group: Send emails with content focused on the benefits of the curriculum that parents are interested in; Advertise on platforms like Facebook or Google Ads, targeting by area of living or interests; Organize events like "Open Day" specifically for each group of parents in different segments; Cooperate with famous parents, education experts, or parenting bloggers to help preschools increase their credibility and reach more potential customers.

Measure effectiveness and adjust strategies: CRM tracks the effectiveness of each strategy for each segment. Based on data such as email open rates, school visits, or enrollment conversion rates, schools can evaluate which strategies are effective and adjust plans accordingly. Ho Chi Minh City has a large disparity in income and educational priorities between regions. For example: District 1, District 3 and Phu Nhuan District: parents here are often willing to invest in international or bilingual education programs. CRM can focus on promoting the benefits of modern education methods and high-quality facilities. Meanwhile, parents in Binh Tan District, District 9 and Thu Duc City prioritize reasonable costs and amenities around their home. CRM helps optimize messages about competitive prices, shuttle services, and flexible schedules.

**3.1.2. Brand identity system**

The preschool brand identity system is a standardized framework that defines the images, colors, dimensions, logo utilization principles, slogans, office materials, public relations, e-commerce, outdoor graphics, and other related branding elements both inside and outside the preschool. The preschool brand identity system must maintain consistency based on the unified concept applied throughout the system. This is the visual expression of the brand (the face of the brand) representing what preschools want parents and students to perceive about the brand and embedding it in their minds (Tran Viet Dung, 2019, pp. 12). Content marketing is an important strategy that helps private preschools build their brand by creating quality articles, videos, and infographics that communicate core values, special educational methods, and a creative learning environment. High-quality content not only builds trust but also promotes interaction and enhances brand recognition. Posting on the right platforms: The act of posting content on the right platforms such as YouTube, Facebook, Instagram, and LinkedIn are an important strategy for reaching parents and building the brand of the preschool. Each platform has its distinctive advantages, for example, YouTube is an ideal channel for sharing videos introducing unique educational methods such as Montessori or STEAM, while Facebook and Instagram are suitable for sharing images, short articles, and short videos which are easy to access. On YouTube, it is necessary to optimize the title, description, and tags to make the video easily searchable, while on Instagram, using the right hashtags and posting regularly will increase visibility. On LinkedIn, sharing in-depth articles about educational methods helps establish a professional and reputable image. Optimizing content on these platforms not only increases accessibility but also strengthens brand awareness, thereby increasing the trust of parents in choosing a school for their children.

**3.1.3. Brand Promotion**

According to Lê Đăng Lăng (2006), the cost of brand promotion varies depending on the desired objectives and the branding tools used, which include: brand mission, resources, market size, market characteristics—target customers, and media channels (p. 22). According to Watkins et al. (2021), while workflow optimization is the state-owned enterprise's primary purpose, medium and small businesses, including private preschools prioritize enhancing customer experience. Customers of private preschools are students, parents, and teachers (whose importance is increasing due to growing competition and severe teacher shortages), government agencies, and the local community. Given their limited resources, small and medium-sized private preschools (with approximately fewer than 300 children) should analyze their value chain (Figure 2) based on their operational model and evaluate each stage in the value chain to maximize value creation while maintaining reasonable investment costs. It is essential to avoid the "cost trap," where efforts to cut short-term expenses result in higher long-term costs and inefficiencies. Digital Marketing serves as a key tool for effective brand promotion while also optimizing investment costs for the school's value chain (Do Thi Huong Nhu, 2024, pp. 58–61).

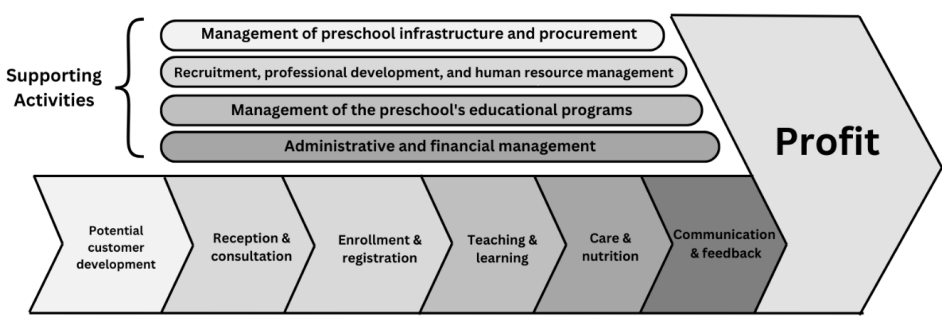


**Figure 3. Simulation of the Value Chain of a Preschool Based on Porter's Value Chain Model**

Effective Digital Marketing Tools for Preschool Brand Promotion:

Pay-per-click (PPC) and advertising on social media: In digital marketing strategies, paid advertising such as Google Ads and advertising on social platforms such as Facebook and Instagram serve an important role in reaching potential parents. These tools allow preschools to precisely target customers through specific classification criteria such as children's age, potential areas, and educational needs. Simultaneously, paid advertising helps highlight the school's unique factors, such as innovative teaching methods and professional teaching staff, thereby promoting brand awareness and building trust from parents.

**Content Marketing**: Content marketing is an important strategy that helps private preschools build their brand by creating quality articles, videos, and infographics that communicate core values, special educational methods, and a creative learning environment. High-quality content not only builds trust but also promotes interaction and enhances brand recognition.

**Diversifying content**: Creating articles, videos, and infographics to share unique educational methods, highly qualified teaching staff, and creative learning activities. For example: a video introducing a Montessori classroom or a STEAM project; an article sharing the benefits of the STEAM education method; an infographic summarizing the learning process according to each stage of child development.

**Posting on the right platforms**: The act of posting content on the right platforms such as YouTube, Facebook, Instagram, and LinkedIn are an important strategy for reaching parents and building the brand of the preschool. Each platform has its distinctive advantages, for example, YouTube is an ideal channel for sharing videos introducing unique educational methods such as Montessori or STEAM, while Facebook and Instagram are suitable for sharing images, short articles, and short videos which are easy to access. On YouTube, it is necessary to optimize the title, description, and tags to make the video easily searchable, while on Instagram, using the right hashtags and posting regularly will increase visibility. On LinkedIn, sharing in-depth articles about educational methods helps establish a professional and reputable image. Optimizing content on these platforms not only increases accessibility but also strengthens brand awareness, thereby increasing the trust of parents in choosing a school for their children.

**Demonstrate core values**: Include the educational mission, unique teaching methods, and key points of differentiation from competitors. By demonstrating these values through articles, videos, or other forms of content, parents can understand why they should choose the school for their children, while also building trust and loyalty from potential customers.

**Website and mobile marketing through**: Email marketing, Sms marketing, Display advertising. Sending valuable, useful, and personalized information helps parents feel the value provided by the school, thereby increasing loyalty and trust in the brand. Parents need not only information about tuition fees or study programs but also content that helps them better understand educational methods and their impact on the development of their children, which can be effectively conveyed through email. After collecting information from events such as seminars or Open Days, an email marketing strategy can be implemented to send free materials, monthly newsletters, and information about innovative educational methods. Personalizing email marketing based on customer data (such as child age, living area, and educational needs) will help enhance strategy effectiveness and encourage parents to take action such as enrolling in school or attending events. In fact, preschools today not only use email as a means of notification but also to provide valuable educational information, helping parents better understand special curriculums such as Montessori, STEAM methods, or extracurricular activities in the school, typically sending monthly newsletters on topics such as "Introducing STEAM projects: The Magic of Paper". These newsletters not only provide information about children's learning activities but also are an opportunity for preschools to affirm their core values, thereby building trust and support from parents. In addition, personalizing emails is also an important factor in enhancing the effectiveness of the strategy.

Preschools can create email marketing strategies to reach different groups of people based on the interests of parents. For example, parents can receive various emails depending on whether they are interested in Montessori, STEAM, or extracurricular activities. Not only does this make the message more relevant, but it also increases the likelihood that the recipient will feel cared for and build a stronger relationship. However, one of the practical challenges in applying Email Marketing, Sms Marketing, Display advertising in preschools is maintaining consistency and effectiveness in strategies. Sending too many emails might annoy parents while sending too few emails might cause schools to lose the opportunity to maintain a connection with parents. Therefore, determining the appropriate frequency and content is an important factor to ensure a highly effective email marketing strategy.

### 3.2. Digital Marketing planning for brand development in private preschools in Ho Chi Minh City

#### 3.2.1. Define clear goals and measure performance.

Define specific goals before implementing a marketing campaign, such as increasing brand awareness and school tour registrations, or improving enrollment rates. Set KPIs (Key Performance Indicators): Measure important indicators such as website visits, conversion rates from advertising, and the number of parents registering information via social networks. Analyze performance: Use tools such as Google Analytics and Meta Business Suite to monitor the effectiveness of marketing activities and adjust when necessary.

Performance Analytics: Tools such as Google Analytics, Meta Business Suite, or A/B testing can be used to monitor the effectiveness of marketing efforts and make adjustments as necessary. Google Analytics: Tracks traffic, user actions, and important metrics like bounce rate and average time on page. This enables the adjustment of content strategies and website optimization for improved customer attraction and retention.. Meta Business Suite: Use this tool to monitor the effectiveness of your Facebook and Instagram ad campaigns, looking at metrics like engagement, video views, and conversion rates from ads. A/B Testing: Run A/B testing to compare the effectiveness of different strategies, testing ads with different messages or different images to find the most effective strategy.

Adjust marketing strategy for better results: Change the advertising budget; if a campaign has a good conversion rate, the budget for that strategy can be increased. Adjust the message or image in advertising to better align with the demands and interests of customers. Use Google or Facebook targeting tools to target the potential customers, such as parents with preschool children in specific areas in Ho Chi Minh City.

#### 3.2.2. Controlling Media Content

Ensure Content Quality: All images, videos, and posts shared on social media must present a professional, positive image of the school. Content must accurately reflect the values and educational methods that the school aims for.

Check for appropriateness: Before posting, ensure that content is not misleading or violates the policies of platforms such as Facebook and Instagram.

#### 3.2.3. Cost management and budget optimization

Regular budget monitoring: Use tools to monitor daily advertising spending on Google Ads, and Facebook Ads. This helps control financial resources and avoid overspending on campaigns that do not bring expected results.

Plan reasonable spending for each month, week, or specific campaign. This will help schools easily adjust their budgets and ensure that marketing costs are always within the limit.

Track the spending situation of each strategy to identify which advertising channels are spending a lot of budget but not bringing the expected results. Regular monitoring and adjustment are very important in the rapidly changing digital marketing environment.

Optimize strategy: Use performance analytics tools like Google Analytics, Facebook Insights, and Meta Business Suite to track and evaluate advertising strategies on different channels. Key metrics to track include conversion rate, click-through rate (CTR), reach, and bounce rate. Based on performance analysis, preschool should focus its budget on channels that are likely to deliver high conversion rates and cost savings. For instance, if Facebook ads demonstrate higher conversion rates than Google ads, the budget can be adjusted to allocate more to Facebook ads while reducing spending on Google ads.

Improve conversion rates and reduce cost per acquisition (CPA) Optimize landing page: A well-designed landing

page will increase conversion rates, thereby reducing CPA. In Google Ads and Facebook Ads, schools can adjust bidding strategies to reduce cost per click (CPC) or cost per mille (CPM). These platforms' automated bidding strategies can help optimize advertising budgets based on campaign objectives.

**3.2.4. Controlling interactions with parents**

Follow comments and reviews on social media and websites to ensure that all feedback from parents is handled promptly and professionally. This demonstrates the school's care and responsibility for each relationship.

Responding quickly and sincerely will help build trust and strengthen the brand image. When receiving negative feedback from parents, it should be received openly and resolved quickly and professionally to minimize negative impacts on the school's reputation. Praise or positive reviews from parents should be acknowledged and thanked publicly, as this will encourage other parents to share their experiences. Positive reviews play an important role in building trust in the community.

Staff training: online feedback skills to handle sensitive situations, especially when there is negative feedback

A friendly and open online interactive environment, so that parents feel comfortable when contacting the school through channels such as Facebook, Instagram, or the website. Online seminars and sharing sessions on preschool education methods might be an effective way to connect with the parent community.

**3.2.5. Controlling legal compliance and privacy**

Advertising content and digital strategies must comply with legal regulations on educational advertising and customer protection.

Ensure that the data of both children and parents are kept confidential and used for the right purposes, avoiding violations of privacy regulations, which protects the benefits of parents but also maintains the school's reputation. Using reliable data management platforms such as CRM helps minimize the risk of information leakage. Any data collected from parents must be used for the original purpose as announced, such as sending information about the school's curriculum or events. Schools are not allowed to use data for sale or share it with third parties without agreement from parents. Employees who access personal data must be trained in legal regulations and security procedures. This helps limit the risk of information leakage due to subjective errors.

Publish the privacy policy on the school website and online platforms. Provide parents with data control, including the ability to allow or deny the use of personal information for purposes other than the original purpose.

**3.2.6. Monitor effectiveness through regular reporting**

Aggregating data from multiple sources for comprehensive evaluation: Data from advertising platforms such as Google Ads, Facebook Ads, and Instagram Ads provides detailed information on ad views, click-through rates (CTR), and cost per conversion (CPC). Using tools such as Google Analytics helps track traffic, bounce rates, and time on site. Engagement metrics (likes, shares, comments) and conversion rates from social media platforms provide a clear view of content effectiveness. Data from customer relationship management systems provides information on the number of parents registering for school tours, conversion rates from interest to enrollment, and post-service feedback. Tools such as Data Studio, HubSpot, or Tableau help consolidate data from multiple sources, allowing for comprehensive analysis and visualization of strategy effectiveness. Key performance indicators (KPI) such as ad views, number of parents visiting, and enrollment rates should be compared with initial goals to evaluate true effectiveness.

Evaluate and adjust campaigns: Consider effectiveness from awareness to action. For example, a high click-through rate containing a low conversion rate may indicate a problem with the landing page or sign-up process. Analyze ROI (Return on Investment): Measure the ROI of each marketing channel to identify which one is most cost-effective. Use the A/B testing with elements like headlines, images, and calls-to-action (CTA) to improve click-through and conversion rates. Adjust target audience: Use targeting tools to re-segment parent base based on real data, such as living area or children's age.

**3.2.7. Risk Management and Crisis Management**

Detect potential issues early: Use tools like Google Alerts, Brand24, or Mention to monitor keywords related to the school's name, curriculum, or other sensitive keywords. These tools help schools early detect potentially harmful posts,

comments, or rumors. Categorize the severity of the detected information to identify the priority level of handling.

Monitor social media activity: Observe Facebook groups, preschool parent forums, or review sites to detect negative comments and discussions related to the school. Use tools like Social Blade or BuzzSumo to evaluate the speed and reach of the spread of posts or misinformation.

## IV. CONCLUSION

Digital Marketing has proven to play an extremely important role in building and developing the brand of private preschools. By applying the right digital marketing strategies - ranging from content creation to the use of advertising tools and analytics - private preschools can not only quickly attract potential customers but also build trust and loyalty among parents, supporting the growth of the school's brand. To achieve maximum effectiveness, preschools need to focus on optimizing user experience, enhancing engagement, and utilizing analytical technology to continuously adjust their marketing strategies.

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# FROM DIGITAL TO ACTUAL: UNDERSTANDING THE PSYCHOLOGICAL PATHWAYS OF PRO-ENVIRONMENTAL BEHAVIOR

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**ABSTRACT**

Despite increasing environmental engagement on digital platforms, global environmental metrics continue to decline, presenting a paradox in digital environmental activism. To address this gap, this study investigates the psychological mechanisms mediating the relationship between digital pro-environmental behavior (D-PEB) and actual pro-environmental behavior (A-PEB). Through structural equation modeling analysis of survey data from 195 respondents, this study validates a comprehensive framework explaining how digital engagement translates into environmental actions. The findings reveal that D-PEB significantly influences both cognitive gratification (β = 0.193) and social gratification (β = 0.639), which subsequently shape environmental self-concept. This identity formation process drives actual pro-environmental behavior (β = 0.314), while D-PEB maintains a direct effect on A-PEB (β = 0.542). The model explains 50.3% of the variance in actual pro-environmental behavior. These findings advance theoretical understanding of behavioral change processes and suggest that digital environmental platforms should enhance both cognitive and social gratification elements to maximize their impact on actual behavior

*Keywords:* "digital engagement", "environmental behavior", "online platforms", "psychological mechanisms", "self-concept"

## I. INTRODUCTION

### 1.1. Background

Environment related content on digital platforms has reached more audiences than ever before. According to a 2021 Pew Research Center study, 45% of 18- to 24-year-old US adults on social media (Generation Z) have followed, liked or commented on posts that advocate for climate action, or shared content. This compares with 40 percent of Millennials (25-44), 27 percent of Generation X (41-56), and 21 percent of Baby Boomers (57 and older) (Blazina, 2024). Moreover, 21% follow accounts devoted to climate action, and 12% have recently shared posts dedicated to climate action (Nadeem, 2024). This phenomenon has caught academic interest as digital environmental and climate activism has evolving rapidly as a research topic, with more than a third of papers on the topic published between 2021 and the first half of 2022 (Baran & Stoltenberg, 2023). This is a sign of both broader practical and academic attention to and understanding of the importance of online environmental activism.

Conventional wisdom and literature recommend that such digital environmental activities promote sustainable behaviour through heightened consciousness (Adisa et al., 2024; Ballew et al., 2015), sharing knowledge (Boncu et al., 2022; Ermolaeva et al., 2020), and reinforcement of communities (McKenzie-Mohr, 2000; Zawieska et al., 2022). But there's been a baffling trend, too: despite growing environmental engagement on digital platform, environmental metrics around the world keep falling. In particular, global greenhouse gas emissions will reach 37.41 billion metric tons by 2024, up 1.08% from 2023, breaking an all-time record (Statista, 2025). Every hour, 300 football fields of forest are lost, further accelerating climate change through release of trapped carbon dioxide into the atmosphere (Rinkesh, 2016). The world produces approximately 300 million tons of plastic waste a year, 91% of which is never recycled (Robinson, 2024). This detrimental situation is likely to become significantly severe if nothing is done.

One might even claim that never has so much digital environmental engagement yielded so little environmental outcome. This paradox raises a critical question about the socio-psychological mechanisms underlying the relationship between pro-environment behavior (PEB) on digital platforms (hereafter referred to as **D-PEB)** and actual environmental behavior (hereafter referred to as **A-PEB)**. While digital platforms have successfully mobilized environmental engagement, the complexity of translating online participation into tangible environmental impact

remains inadequately understood. This phenomenon necessitates a systematic investigation of the psychological mechanisms mediating the relationship between digital and actual environmental behavior.

### 1.2 Research Gap and Significance

First, while extant literature has documented the direct relationship between D-PEB and A-PEB (M. Liu et al., 2024; Lu et al., 2024; Ruiu et al., 2024) the psychological mechanisms mediating this relationship remain insufficiently theorized. Moreover, while digital environmental engagement is believed to provide psychological benefits that may influence behavior (Byman et al., 2022; Van Houwelingen-Snippe et al., 2022), the specific nature and impact of these benefits on real-world environmental actions remain underexplored. This gap limits our understanding of the psychological processes that drive the transition from digital engagement to offline environmental behavior.

Second, pro-environment identity, or an individual's perception of themselves in relation to environmental values, has been recognized as a strong predictor of pro-environmental behavior (Moser & Kleinhückelkotten, 2017; Stets & Biga, 2003). However, there is limited research examining how this self-concept is shaped through digital engagement and how it influences real-world behavior. This gap constrains our understanding of how environmental self-concept functions as a mediating mechanism in pro-environmental behavior.

These gaps are particularly significant given the growing importance of digital platforms in environmental activism and the urgent need to understand how online engagement can more effectively translate into meaningful environmental action. This study addresses these gaps by developing and testing a comprehensive framework examining the psychological mechanisms mediating the relationship between digital and actual pro-environmental behavior.

### 1.3 Research Questions and objectives

Building upon established pro-environmental behavior frameworks and the identified research gaps, this study focuses on understanding the psychological mechanisms that mediate the relationship between digital environmental engagement and actual environmental behavior.

Research Objective 1: To examine the underlying psychological mechanisms that translate digital pro-environmental behavior into actual pro-environmental behavior.

Research Question 1: What are the key psychological mechanisms mediating the relationship between digital and actual pro-environmental behavior?

Research Objective 2: To analyze the role of environmental self-concept in facilitating the transition from digital engagement to actual environmental behavior.

Research Question 2: To what extent does environmental self-concept mediate the relationship between digital engagement and actual environmental behavior?

Drawing upon these research objectives and questions, we develop a theoretical framework and propose six hypotheses examining the interrelationships between digital engagement, psychological mechanisms, and behavioral outcomes. The subsequent sections detail our theoretical development and hypothesis formulation.

## II. MATERIAL AND METHOD

This section is to review concepts of pro-environment behavior (PEB), digital pro-environment behavior (D-PEB), and theories of media effects. The proposed research methods and models are also captured in the pieces of literature which include hypotheses and relations between attributes

### 2.1. Digital Pro-environment behavior (D-PEB) and media effects

Pro-environmental behavior (PEB) is a multifaceted concept that encompasses a range of actions aimed at minimizing negative impacts on the environment (Lu et al., 2024). At its core, PEB is driven by intrinsic motivation, where individuals pursue environmentally conscious actions based on personal satisfaction and ethical considerations rather than external rewards (Klaniecki et al., 2018; Silvi & Padilla, 2021), while environmental values and beliefs form the foundational basis for environmental identity and attitudes that directly influence such behaviors (Walton & Jones, 2022). The manifestation of PEB is further shaped by social norms that create societal expectations for environmentally responsible actions, alongside external conditions such as green infrastructure availability and monetary incentives that can amplify intrinsic motivations (Silvi & Padilla, 2021)

The complex nature of pro-environmental behavior, with its intricate interplay of psychological, social, and contextual factors, has undergone significant transformation in the digital age (Ruiu et al., 2024). While traditional frameworks of PEB have primarily focused on direct, observable actions in physical spaces, the emergence of digital platforms has fundamentally altered how individuals engage with environmental causes (Palacin et al., 2020). This study perceives D-PEB as the actions and attitudes that individuals exhibit online, which are aimed at promoting environmental sustainability (He et al., 2017). This particular behavior manifests in various ways across different digital contexts. For example, on social media and review platforms, users engage in pro-environmental discourse by sharing environmental concerns in their reviews and ratings of tourism and hospitality services (Mariani et al., 2022).

To understand how this digital engagement translates into actual environmental behavior, it is crucial to examine the theoretical mechanisms through which media effects operate in the contemporary digital landscape. Initially, media effects were perceived as strong and direct, impacting audiences in a straightforward manner. However, this view was later challenged by the minimal effects model, which suggested that media's influence was limited and often mediated by other factors such as personal predispositions and social networks (Neuman & Guggenheim, 2011). Recent research has further refined these models, acknowledging that media can exert both direct and indirect influences (Jin et al., 2018)

In the similar vein, research on digital media effects reveals both direct and indirect pathways through which online behavior influences offline actions. the transactional nature of communication in newer media environments, such as social media, has been recognized, highlighting the reciprocal and dynamic interactions between media and audiences (Valkenburg et al., 2016). Online activism, facilitated by social media, often translates into offline collective action, as seen in the positive relationship between online and offline activism, where social media posts can mobilize others for offline protests (Greijdanus et al., 2020). This is further supported by the dual pathway model, which suggests that, for instance, online petition campaigns can evoke emotions like compassion and anger, leading to both online support and offline negative word of mouth against companies' (Antonetti & Manika, 2017). Similarly, online communication about local issues can influence offline behavior, such as increased civic engagement and personal safety measures (Erete, 2015). Social networks also play a crucial role in influencing offline behavior, as demonstrated by a study on physical activity tracking applications, where new social connections led to increased offline physical activity (Althoff et al., 2017). Overall, these studies illustrate the multifaceted ways in which online behaviors can directly and indirectly shape offline actions, emphasizing the intertwined nature of digital and physical worlds.

### 2.2 Research method

Hypotheses Development based on Past Studies

#### 2.2.1 D-PEB, cognitive gratification and social gratification

The relationship between D-PEB and cognitive gratification is grounded in the educational potential of online social networks. When individuals engage in digital environmental activities, they transition from passive information consumers to active content creators and participants in environmental discourse (Ermolaeva et al., 2020). This active engagement through social media platforms facilitates environmental learning and knowledge acquisition in multiple ways.

Research has shown that social networks like Facebook serve as effective tools for environmental education, where users report increased understanding of environmental issues through sharing climate change news and engaging in peer interactions (Robelia et al., 2011). Furthermore, this digital engagement helps bridge the environmental knowledge gap, as studies demonstrate that internet access and usage positively correlate with environmental knowledge acquisition, particularly benefiting those with previously limited access to environmental information (Cheng, 2023). The cognitive satisfaction derived from this learning process and enhanced understanding of environmental issues represents a form of cognitive gratification, suggesting that digital pro-environmental behavior positively influences cognitive outcomes.

Likewise, digital pro-environmental behavior fosters social gratification through enhanced community engagement and social capital development. Research demonstrates that online platforms facilitate community-driven environmental initiatives, where social capital serves as a crucial motivator for pro-environmental behavior adoption, as evidenced in German community sustainability projects (Broska, 2021). These digital spaces enable peer role modeling and

environmental discourse through social networks like Facebook, where users experience increased social support through sharing and commenting on environmental issues (Robelia et al., 2011). The intentional design of online social networks further amplifies these effects by enabling collective pro-environmental actions and shifting environmental social norms, ultimately creating a stronger sense of community belonging and mutual support (Dickinson et al., 2013). This collective engagement and social reinforcement contribute to users' social gratification through meaningful community connections and shared environmental values.

H1: Digital Pro-environmental Behavior has a positive impact on cognitive gratification

H2: Digital Pro-environmental Behavior has a positive impact on social gratification

**2.2.2 Pro-identity environment**

The relationship between cognitive gratification and pro-environmental identity is grounded in both digital practices and cognitive processes. The concept of digital-environmental habitus suggests that individuals' digital engagement patterns reflect and reinforce their environmental orientations, linking digital behaviors with environmental identity formation (Ruiu et al., 2024). Media exposure and social networking involvement enhance environmental concern and personal responsibility, which are fundamental to developing environmental identity (Y. Liu & Li, 2021). Additionally, cognitive flexibility in processing environmental information leads to increased cognitive satisfaction from digital pro-environmental actions, contributing to a stronger and more adaptable environmental identity (Lange & Dewitte, 2019). Thus, cognitive gratification serves as a crucial mechanism in developing and strengthening pro-environmental identity through digital engagement and cognitive adaptation.

Social interactions through digital platforms play a vital role in environmental identity formation. Research shows that diverse social interactions, particularly with peers and those affected by climate change, enhance environmental identity salience and action motivation (Stapleton, 2015). Social media platforms facilitate this process by creating spaces where shared environmental values and behaviors reinforce identity development through peer influence and identity bubbles (Domalewska, 2021) Similar to successful online health communities, environmental digital platforms unite individuals under common environmental causes, fostering collective practices and strengthening members' commitment through social value creation (Chamakiotis et al., 2021). This digital social engagement cultivates a stronger pro-environmental identity through collective identification and shared purpose.

H3: Cognitive gratification has a positive impact on pro-environment Identity

H4: Social Gratification has a positive impact on Pro-environment Identity

**2.2.3 A-PEB**

Pro-environment identity serves as a powerful predictor of actual environmental behaviors across various contexts. Research demonstrates that individuals with strong environmental self-identity exhibit higher levels of pro-environmental purchasing behavior, particularly when influenced by cultural values like horizontal individualism and collectivism (Jung & Cho, 2023). This identity-behavior relationship extends to specific domains like sustainable clothing, where pro-environmental self-identity moderates psychosocial predictors differently by gender (Carfora et al., 2024). Furthermore, this relationship is particularly evident in urban settings, where nature connectedness strengthens the link between identity and behavior (Sierra-Barón et al., 2023) and within family dynamics, where environmental values and behaviors are mutually reinforcing (Balundė & Perlaviciute, 2023)

H5: Pro-environment Identity has a positive impact on Actual Pro-environment Behavior

**2.2.4 D-PEB and A-PEB: a direct relationship**

While the previous hypotheses establish the mediated pathways through gratifications and identity, digital pro-environmental behavior can also directly influence actual environmental actions. Digital environmental activism transforms individuals from passive information consumers to active environmental agents (Ermolaeva et al., 2020), while social media platforms facilitate civil discourse that influences offline environmental actions, as demonstrated in China's environmental movements (Zhang, 2017). This digital-to-actual behavior transition is further reinforced through environmental education in home settings (Lin & Ardoin, 2023) and gamification-based applications that promote practical environmental actions (Zawieska et al., 2022), suggesting that digital pro-environmental engagement directly

translates into real-world environmental behaviors.

H6: D-PEB has a positive impact on A-PEB

### 2.3. Research model

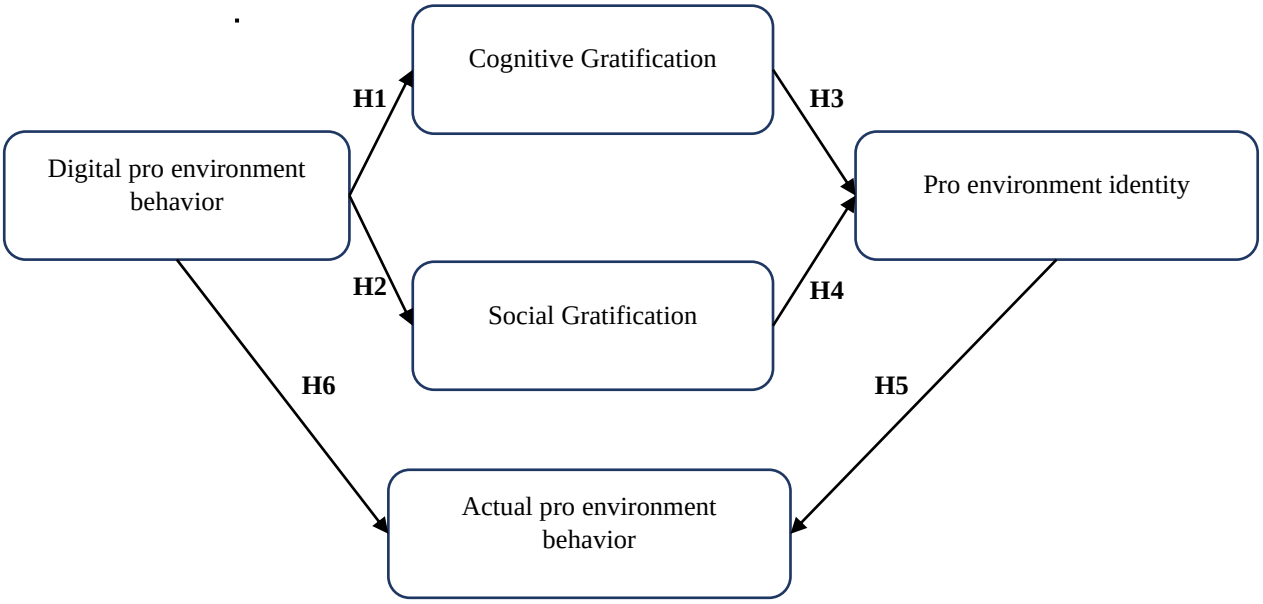



**Fig. 1 - Proposed Conceptual Model**

## III. RESULT AND DISCUSSION

### 3.1. Research subjects

**Table 1: Demographic Profile of Respondents**

| Item | | Frequency | Percent |
|---|---|---|---|
| Gender | Male | 38 | 19.49 % |
| | Female | 157 | 80.51 % |
| Age | < 18 | 1 | 0.51 % |
| | 18 - 25 | 180 | 92.31 % |
| | 26 - 35 | 9 | 4.62 % |
| | 36 - 45 | 3 | 1.54 % |
| | > 45 | 2 | 1.03 % |
| Highest education | High school graduate | 31 | 15.90 % |
| | Bachelor | 155 | 79.49 % |
| | Master | 9 | 4.62 % |
| In your opinion, can environmental activities on digital platforms create positive impacts on the environment? | Yes | 186 | 95.38 % |
| | No | 9 | 4.62 % |

The survey results indicate that the majority of participants were female (80.51%), while males accounted for only 19.49%. In terms of age, the 18-25 age group dominated with 92.31%, while other age groups (under 18, 26-35, 36-45, and over 45) represented very small percentages. Regarding educational background, 79.49% of participants held bachelor's degrees, 15.90% were high school graduates, and 4.62% had master's degrees. Notably, 95.38% of respondents believed that environmental activities on digital platforms could create positive impacts on the environment.

### 3.2. Measurement Model Assessment

The results of the model analysis show the potential impact of Digital pro environment behavior (D_PEB) on the

actual pro environment behavior (A_PEB), both directly and indirectly (Figure 2 )

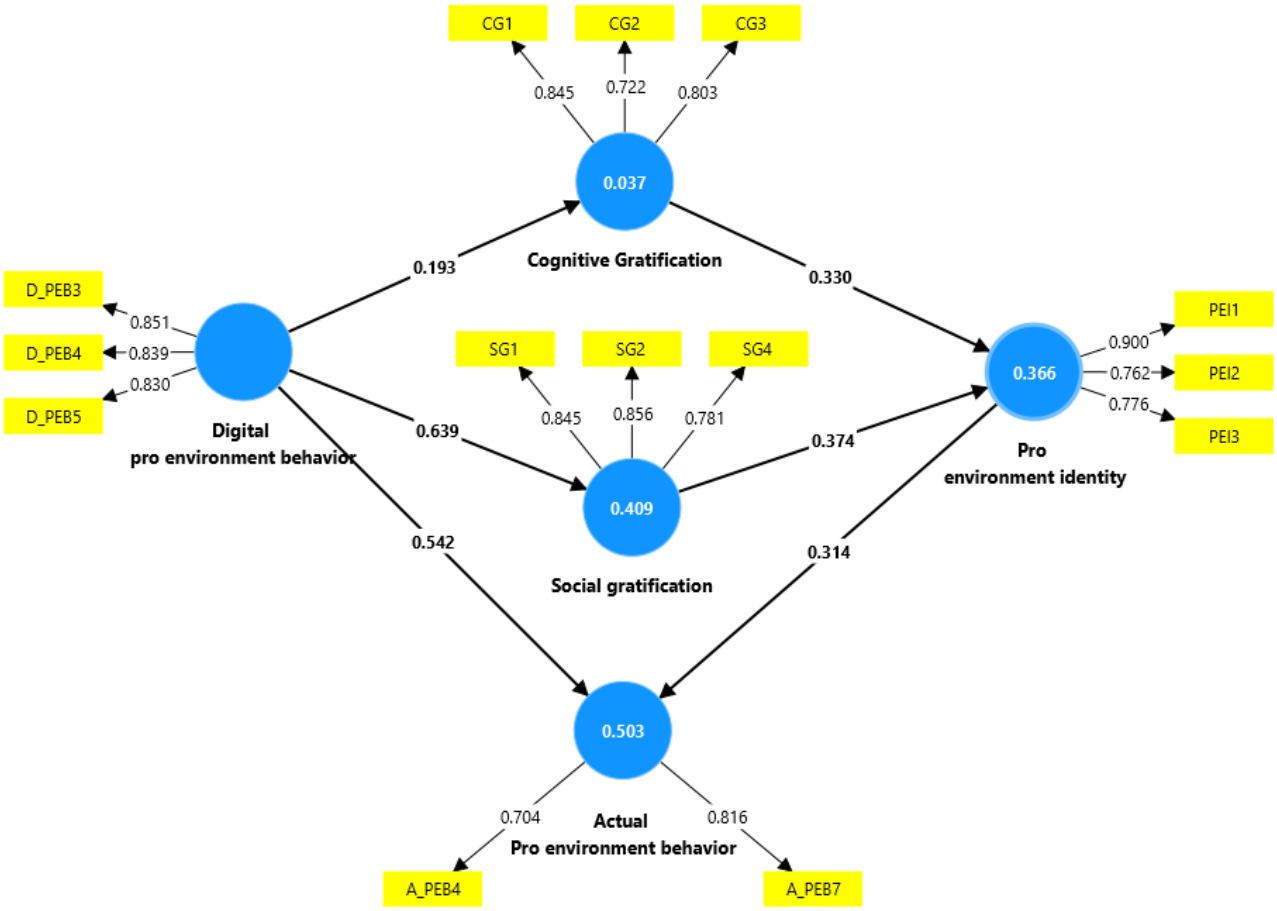



**Fig 2 – The result of Research model**

Table 2 assesses the reliability and validity of constructs related to pro-environmental behavior in both digital and actual contexts. All item loadings exceed the recommended threshold of 0.7, reflecting that indicators reliably measure their intended constructs such as actual pro-environment behavior (A_PEB), digital pro-environment behavior (D_PEB), social gratification (SG), cognitive gratification (CG), and pro-environment identity (PEI). The Cronbach's alpha values, ranging from 0.73 to 0.878, confirm internal consistency among the items within each construct. Similarly, composite reliability scores, exceeding the minimum standard of 0.7, ensure that the measurement model consistently captures the latent variables. Furthermore, the average variance extracted (AVE) values surpass the benchmark of 0.5, indicating sufficient convergent validity by showing that more than half of the variance in the indicators is attributable to their respective constructs. Finally, variance inflation factors (VIFs) remain well below 5, affirming the absence of multicollinearity.

**Table 2: Convergent Validity and Construct Reliability.**

| | Items | Loadings | Cronbach's alpha | Composite reliability (rho_a) | Composite reliability (rho_c) | Average variance extracted (AVE) | VIF |
|---|---|---|---|---|---|---|---|
| **A_PEB** | **A_PEB** | 0.704 | 0.73 | 0.741 | 0.734 | 0.581 | 1.492 |
| | **A_PEB** | 0.816 | | | | | 1.492 |
| **CG** | **CG1** | 0.845 | 0.837 | 0.838 | 0.834 | 0.627 | 1.772 |
| | **CG2** | 0.722 | | | | | 2.678 |
| | **CG3** | 0.803 | | | | | 2.084 |
| **D_PEB** | **D_PEB** | 0.851 | 0.878 | 0.878 | 0.878 | 0.706 | 2.287 |
| | **D_PEB** | 0.839 | | | | | 2.733 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **D_PEB** | 0.830 | | | | | 2.344 |
| | **PEI1** | 0.900 | 0.853 | 0.862 | 0.855 | 0.664 | 2.545 |
| **PEI** | **PEI2** | 0.762 | | | | | 2.362 |
| | **PEI3** | 0.776 | | | | | 1.79 |
| | **SG1** | 0.845 | 0.866 | 0.869 | 0.867 | 0.686 | 2.765 |
| **SG** | **SG2** | 0.856 | | | | | 2.829 |
| | **SG3** | 0.781 | | | | | 1.821 |

The discriminant validity of the constructs was evaluated using the HTMT criterion (Henseler et al., 2015). As shown in Table 3, all HTMT values are below the conservative threshold of 0.85, indicating adequate discriminant validity between all latent constructs. Notably, the HTMT values for D_PEB – A_PEB (0.646) and SG – A_PEB (0.699) are relatively higher but remain well within the acceptable range, confirming that these constructs are sufficiently distinct. Therefore, the measurement model satisfies the discriminant validity requirement, ensuring that each construct represents a unique theoretical concept.

**Table 3: Discriminant validity – HTMT matrix**

| | **A_PEB** | **CG** | **D_PEB** | **PEI** | **SG** |
|---|---|---|---|---|---|
| **A_PEB** | | | | | |
| **CG** | 0.226 | | | | |
| **D_PEB** | 0.646 | 0.193 | | | |
| **PEI** | 0.486 | 0.505 | 0.322 | | |
| **SG** | 0.699 | 0.477 | 0.641 | 0.534 | |

### 3.3. Structural Model Assessment

The results from Table 4 confirm that all proposed hypotheses in the study were statistically supported at the 5% significance level. The path from digital pro-environment behavior (D_PEB) to cognitive gratification (CG) was significant ($t = 2.149$, $\beta = 0.193$, $p < 0.05$), affirming hypothesis 1. Similarly, the relationship between D_PEB and social gratification (SG) was strongly supported ($t = 10.576$, $\beta = 0.639$, $p < 0.001$), validating hypothesis 2. Cognitive gratification (CG) demonstrated a significant positive effect on pro-environment identity (PEI) ($t = 3.510$, $\beta = 0.330$, $p < 0.001$), supporting hypothesis 3, while SG also significantly influenced PEI ($t = 4.101$, $\beta = 0.374$, $p < 0.001$), confirming hypothesis 4. Finally, both the direct path from PEI to actual pro-environment behavior (A_PEB) ($t = 4.127$, $\beta = 0.314$, $p < 0.001$) and the direct path from D_PEB to A_PEB ($t = 7.008$, $\beta = 0.542$, $p < 0.001$) were statistically significant, supporting hypotheses 5 and 6.

**Table 4: Results of hypotheses testing (Path coefficient after bootstrapping)**

| **Hypothesis** | **PLS Path** | **Original sample (O)** | **Sample mean (M)** | **Standard deviation (STDEV)** | **T statistics (\|O/STDEV\|)** | **P values** | **Remark** |
|---|---|---|---|---|---|---|---|
| **H1** | **D_PEB -> CG** | 0.193 | 0.196 | 0.090 | 2.149 | 0.032 | Supported |
| **H2** | **D_PEB -> SG** | 0.639 | 0.640 | 0.060 | 10.576 | 0.000 | Supported |
| **H3** | **CG -> PEI** | 0.330 | 0.329 | 0.094 | 3.510 | 0.000 | Supported |
| **H4** | **SG -> PEI** | 0.374 | 0.378 | 0.091 | 4.101 | 0.000 | Supported |
| **H5** | **PEI -> A_PEB** | 0.314 | 0.315 | 0.076 | 4.127 | 0.000 | Supported |
| **H6** | **D_PEB -> A_PEB** | 0.542 | 0.542 | 0.077 | 7.008 | 0.000 | Supported |

The results in Table 5 reveal varying levels of explanatory power among the constructs. Actual pro-environment behavior (A_PEB) achieved an $R^2$ value of 0.503, indicating that 50.3% of its variance was explained by its predictors, including PEI and D_PEB. This level of predictive accuracy is considered moderate and underscores the importance of both digital engagement and identity in shaping real-world environmental actions. Pro-environment identity (PEI) had an $R^2$ value of 0.366, also reflecting moderate explanatory power, primarily driven by cognitive gratification (CG) and social gratification (SG). However, cognitive gratification (CG) exhibited a much lower $R^2$ value of 0.037, suggesting

that only 3.7% of its variance is explained by D_PEB. This low value indicates that while D_PEB contributes positively to CG, other unexamined factors, such as individual cognitive capacities or external stimuli, may play a larger role in influencing cognitive outcomes.

Table 6 further assesses the effect sizes of individual predictors using $f^2$. The effect size of D_PEB on A_PEB was 0.53, indicating a large impact, while PEI had a moderate effect ($f^2 = 0.178$). However, the effect of D_PEB on CG was relatively small ($f^2 = 0.039$), implying that while D_PEB contributes to cognitive gratification, other external variables may play a more significant role. These findings suggest that digital environmental engagement has a strong direct impact on real-world environmental behavior, with identity formation playing a crucial mediating role.

The predictive relevance ($Q^2$ predict) for all constructs was positive, confirming the model's capability to predict outcomes beyond the sample data. A_PEB, for example, had a $Q^2$predict value of 0.261, reinforcing its predictive utility. In contrast, the low predictive relevance of CG suggests that its relationship with D_PEB and other constructs may need further theoretical refinement. However, the PLS-SEM model achieved high predictive performance since none of its root mean squared error (RMSE) indices was larger than the linear model benchmark in Table 6. These findings emphasize the robust predictive power of the overall structural model while identifying cognitive gratification as an area requiring additional exploration.

**Table 5: Predictive relevance ($Q^2$) and predictive accuracy ($R^2$)**

| | R-square | $Q^2$predict | RMSE | MAE |
|---|---|---|---|---|
| **A_PEB** | 0.503 | 0.261 | 0.869 | 0.683 |
| **CG** | 0.037 | 0.01 | 1.005 | 0.815 |
| **PEI** | 0.366 | 0.072 | 0.972 | 0.795 |
| **SG** | 0.409 | 0.304 | 0.845 | 0.666 |

**Table 6: f-square $f^2$**

| | A_PEB | CG | D_PEB | PEI | SG |
|---|---|---|---|---|---|
| **A_PEB** | | | | | |
| **CG** | | | | 0.133 | |
| **D_PEB** | 0.53 | 0.039 | | | 0.692 |
| **PEI** | 0.178 | | | | |
| **SG** | | | | 0.17 | |

## IV. CONCLUSION

This research illuminates the complex psychological mechanisms underlying the paradoxical relationship between digital pro-environmental behavior (D-PEB) and actual pro-environmental behavior (A-PEB). Through rigorous structural equation modeling, our findings validate a comprehensive framework that explains how digital engagement translates into environmental actions through multiple pathways, with psychological gratifications and environmental self-concept serving as crucial mediating mechanisms.

The empirical results reveal that D-PEB significantly influences both cognitive gratification ($\beta = 0.193$, $p < 0.05$) and social gratification ($\beta = 0.639$, $p < 0.001$), which subsequently shape environmental self-concept through distinct psychological pathways. This identity formation process, reinforced by both cognitive and social elements, drives actual pro-environmental behavior ($\beta = 0.314$, $p < 0.001$). Notably, D-PEB maintains a direct effect on A-PEB ($\beta = 0.542$, $p < 0.001$), suggesting parallel mechanisms of behavioral influence. The model demonstrates robust predictive power, explaining 50.3% of the variance in actual pro-environmental behavior.

These findings advance theoretical understanding in several ways. First, they elucidate the psychological mechanisms mediating the transformation of digital engagement into tangible environmental actions, extending previous work on behavioral change processes. Second, they demonstrate the dual role of cognitive and social gratifications in environmental identity formation, contributing to the literature on digital environmental psychology. Third, they validate environmental self-concept as a critical mediating mechanism in the digital-to-actual behavior transformation process.

From a practical perspective, these results suggest that digital environmental platforms should focus on enhancing both cognitive and social gratification elements to maximize their impact on actual behavior. Environmental organizations and digital platform designers should incorporate features that facilitate knowledge acquisition while fostering meaningful social connections among users, as these elements collectively strengthen environmental identity and drive real-world actions.

This study's limitations include its cross-sectional nature and reliance on self-reported measures. Future research should employ longitudinal designs to examine the temporal dynamics of behavioral transformation and incorporate objective behavioral measures. Additionally, investigating potential moderating effects of demographic and contextual factors could provide more nuanced insights into the D-PEB to A-PEB transformation process. Finally, exploring the role of emerging technologies and digital platforms in environmental behavior change could offer valuable insights for both theory and practice.

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# TOWARDS GREEN CONSUMPTION AND SUSTAINABLE DEVELOPMENT: THE ROLE OF GREEN ADVERTISING RECEPTIVITY AND GREEN BRAND IMAGE IN PROMOTING GREEN FOOD PURCHASE INTENTION

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**ABSTRACT**

With global environmental degradation driven by the demand and consumption of conventional foods, green food consumption offers a counteraction by increasing consumers' intake of sustainable foods. Given that the organic food industry in Vietnam is still in its infancy as a niche market, research on green marketing with local applications remains limited and has not significantly boosted demand for organic foods. This study aims to explore the role of green advertising receptivity and green brand image in driving green food purchase intentions, surveying 298 Gen Z green food consumers in Ho Chi Minh City through convenience sampling. The results indicate that green advertising receptivity positively influences green brand trust and green food purchase intentions. Furthermore, green brand image positively impacts both green brand trust and purchase intentions for green foods. Additionally, the study reveals that green brand trust has a positive effect on green food purchase intentions. These findings are valuable for marketers and green food producers in identifying effective green marketing strategies.

*Keywords*: “Green food; Green advertising; Green marketing; Green brand

## I. INTRODUCTION

In industrial economies, food consumption has shifted towards a range of socially balanced and diverse food choices, including organic foods (Latip et al., 2020; Naja & Hamadeh, 2020). The sustainability efforts of market participants in promoting their products and services are closely linked to green marketing, which incorporates specific elements of environmental sustainability. These efforts play a critical role in understanding consumers' purchase intentions for green foods (Latip et al., 2020).

In recent years, in response to the increasing environmental challenges, firms have been required to project a positive image and promise greater environmental benefits than they currently provide to environmentally conscious consumers (Sun et al., 2021). Simultaneously, public awareness of the importance of environmental protection has continuously improved, reaching the level of a gradual consensus among nations worldwide with the shared goal of achieving sustainable development (Wu & Long, 2024). Twenty-first-century consumers are increasingly aware of the impact of their consumption patterns on the environment and are thus shifting towards sustainable consumption models for the welfare of future generations (Jaiswal & Singh, 2018).

According to the Ministry of Industry and Trade, the demand for green products in Vietnam has grown at an average rate of 15% annually during the period from 2021 to 2023. Approximately 72% of Vietnamese consumers are willing to pay more for green products, indicating a growing awareness and concern among the population regarding environmental protection issues. According to a report by Euromonitor, the green food market in Vietnam reached a value of 100 million USD in 2023, reflecting a 20% growth compared to 2020. According to research findings by Nielsen Vietnam, brands with commitments to being "green" and "clean" have experienced higher growth rates, averaging around 4%. For instance, in the food and beverage sector, growth rates have outpaced the overall market, ranging from 2.5% to 11.4%. Additionally, the survey revealed that approximately 80% of Vietnamese consumers are willing to pay more for products that use environmentally friendly materials and carry "green" and "clean" brand.

Many businesses are currently developing green promotion strategies aimed at influencing consumers and stimulating the purchase of green products (Klockner, 2015). Green communication focuses on individuals' environmental awareness and how these perceptions shape their attitudes and behaviors toward the environment (Jarreau et al., 2017). This shift has led to the rise of green advertising campaigns, with marketers leveraging it to

encourage the adoption of environmentally friendly products (Bailey et al., 2016).

The rise of green advertising as an appealing promotion tool is increasing, attracting many individuals interested in purchasing green products (Bailey et al., 2016). However, despite the perceived advantages, consumer skepticism regarding the reliability of green advertising remains widespread. Doubts persist as to whether green products genuinely offer ecological benefits compared to non-green products (Moussa & Touzani, 2008; Peattie, 2010). Issues of trust and credibility have thus become central in this context (Moussa & Touzani, 2008; Nguyen-Viet, 2022).

Green advertising receptivity refers to the consumer's acceptance of green advertisements (Sun et al., 2021). According to Bailey et al. (2016), consumer responses to environmental communication and demands vary significantly depending on their receptivity to green communication, particularly green advertising. Several studies suggest that green advertising receptivity positively influences green brand trust (Nguyen-Viet, 2022; Sun et al., 2021; Nguyen-Viet & Thanh Tran, 2024) and affects consumers' intentions to adopt green products (Wu & Long, 2024; Nauman, 2024; Jog & Singhal, 2024; Nguyen-Viet & Thanh Tran, 2024). Furthermore, customers' green brand trust aligns positively with green consumption intentions (Amin & Tarun, 2021; Nguyen-Viet, 2022; Rahman & Nguyen-Viet, 2023; Nguyen-Viet & Thanh Tran, 2024).

Brand image can be defined as the mental representation of a brand in the consumer's mind, associated with a specific offering (Cretu & Brodie, 2007). Green brand image fulfills consumers' environmental expectations and mitigates arising issues (Khandelwal et al., 2019). In this way, a strong green brand image positively impacts consumer trust by reducing perceived risks (Chen, 2010; Rahman & Nguyen-Viet, 2023). Additionally, green brand image also positively influences green product consumption behavior (Sembiring, 2021; Ronaldo et al., 2018).

Previous studies have indicated that minimizing environmental harm through increased green consumption behavior is highly beneficial for the environment. Consequently, green consumption behavior plays a crucial role in establishing and maintaining environmental protection. This study aims to examine green advertising as a means to enhance corporate green brand trust, leading to Vietnamese consumers' intentions to purchase green food. Additionally, the research investigates how green brand image affects green brand trust and green food purchase intentions. The study employs the Stimulus-Organism-Response (SOR) model to provide empirical evidence. Furthermore, it offers recommendations to improve green advertising effectiveness in alignment with Vietnamese consumers' perceptions.

## II. LITERATURE REVIEW AND METHODOLOGY

This study is grounded in the Stimulus–Organism–Response (SOR) theory (Jacoby, 2002), which can explain behavioral differences arising from various marketing stimuli and cognitive factors (Sultan et al., 2021). Previous research on green consumption has applied the SOR framework to illustrate how external factors influence consumers' cognitive and emotional evaluations, thereby shaping their behavioral intentions (Gil & Jacob, 2018; Nguyen-Viet, 2022; Sun et al., 2021). In this study, green advertising receptivity and green brand image function as the stimuli, green brand trust is conceptualized as the organism component, and green purchase intention serves as the response factor.

### 2.1. Green advertising receptivity, green brand trust, and green food purchase intention

Green advertising refers to advertisements that typically emphasize the overall environmental benefits associated with purchasing specific products, such as reducing greenhouse gas emissions, lowering water pollution, and facilitating biodegradation (Nyilasy et al., 2014). Green advertising receptivity denotes the extent to which consumers accept green advertisements. When consumers are exposed to green advertising, their emotions and judgments are shaped, influencing their attitudes toward the green advertisements themselves and building trust in green brands or products (Bailey et al., 2016).

Accurate and truthful message delivery through advertising plays a crucial role in building brand trust and credibility (Nguyen Viet & Nguyen Anh, 2021; Nguyen-Viet, 2022). When exposed to advertisements, consumers develop emotions (affective responses) and judgments (cognitive evaluations), which influence their trust in the brand (Nagar, 2015). In the context of green advertising, the information provided often focuses on the environmental impacts of business activities, primarily revolving around raw materials, production processes, logistics, and post-use product activities (Leonidou et al., 2011). Consumers' receptivity to green advertising strengthens the connection between the appeal of green messages and brand trust, positively influencing consumer trust in green brands (Bailey et al., 2016;

Nguyen-Viet, 2022; Sun et al., 2021). Additionally, Nguyen-Viet & Thanh Tran (2024) suggest that greater green advertising receptivity enhances customer trust in green brands.

Previous studies indicate that the goal of green advertising is to influence consumer purchase intentions by encouraging consumers to buy green products and helping them recognize the positive impacts on both themselves and the environment (Rahbar & Abdul Wahid, 2011). Therefore, green advertising receptivity is positively associated with consumers' intentions to purchase green products (Chang et al., 2015). Findings by Sun et al. (2021) highlight that green advertising receptivity has a positive impact on consumers' green purchase intentions. Sun et al. (2021) explored the correlation between green advertising receptivity and consumers' intentions to purchase eco-labeled products, while Joyal-Desmarais et al. (2022) also suggest a positive relationship between green advertising receptivity and green purchase intentions. Furthermore, green advertising receptivity is positively correlated with green purchase intention (Wu & Long, 2024; Tewari et al., 2022; Latip et al., 2023; Nauman, 2024; Jog & Singhal, 2024; Nguyen-Viet & Thanh Tran, 2024). Based on the prior literature, this study hypothesizes that:

$H_1$: Green advertising receptivity positively influences green brand trust.

$H_2$: Green advertising receptivity positively impacts green food purchase intention.

**2.2. Green brand image, green brand trust, and green food purchase intention**

In a green context, green brand image is defined as a set of consumer perceptions about a brand's environmental commitments and concerns (Chen, 2010; Martínez, 2015). Green brand image is essential for companies, especially as consumers become more environmentally conscious and as strict international environmental regulations emerge (Delafrooz & Goli, 2015). A green brand image meets consumer environmental desires and mitigates emerging issues (Khandelwal et al., 2019). By reducing perceived risks, green brand image positively influences consumer trust (Chen, 2010). Prior studies have explored the relationship between green brand image and trust (Rahman & Nguyen-Viet, 2023; Bashir et al., 2020; Bekk et al., 2015). Furthermore, green brand image has a positive effect on green purchase intention, as noted by Ronaldo et al. (2018), Kijpanjasub & Jitkuekul (2019), Sembiring (2021), supporting the hypothesis:

$H_3$: Green brand image positively influences green brand trust.

$H_4$: Green brand image positively impacts green food purchase intention.

**2.3. Green brand trust and green food purchase intention**

Brand trust is founded on the consumer's belief that a brand is consistent, competent, honest, and responsible (Doney & Cannon, 1997). According to Chen (2010), green brand trust specifically refers to the trust and reliance consumers place on a brand's environmental claims, as well as its ability to fulfill ecological commitments associated with its products or services. In the green context, trust reflects consumers' willingness to rely on a brand based on the belief or expectation that it is reliable, considerate, and capable of effective environmental performance (Martínez, 2015).

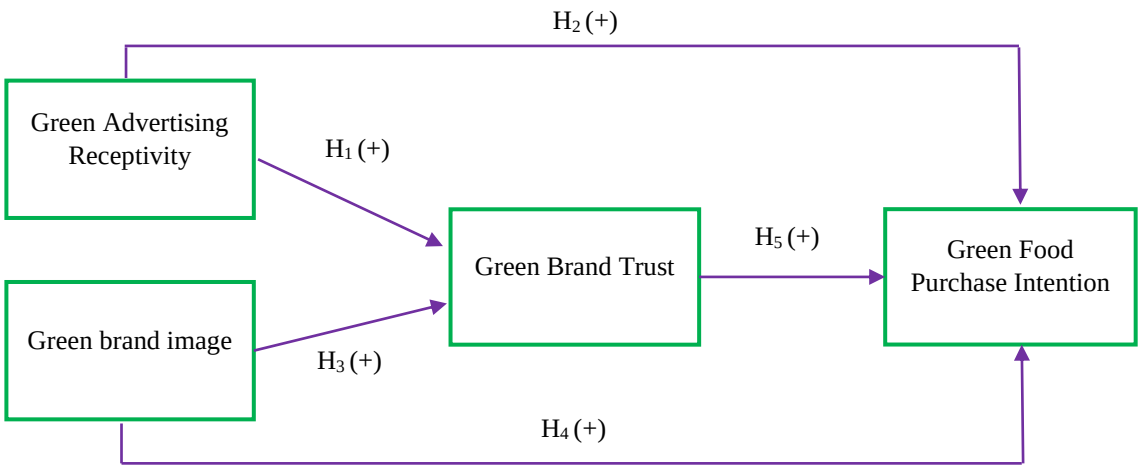



**Figure 1: The conceptual model**

Therefore, green trust can lead to stronger purchase intentions (Kahraman & Kazançoglu, 2019; Ng et al., 2018). Previous studies have shown that trust is one of the important factors determining consumers' green purchase intentions (Chen, 2010; Gil & Jacob, 2018; Konuk et al., 2015). Recent research supports these findings and shows that trust in green brands positively affects consumers' green purchase intentions (Amin & Tarun, 2021; Nguyen-Viet, 2022). Furthermore, Rahman & Nguyen-Viet (2023); Nguyen-Viet & Thanh Tran (2024) found that green brand trust has a positive effect on green purchase intentions. Based on these findings, it is hypothesized that:

$H_5$: Green brand trust positively influences green food purchase intention.

### 2.4. Methodology

#### 2.4.1. Measures

The questionnaire was created based on the English version collected from previous studies, then translated into Vietnamese. Next, the questionnaire was tested through interviews with a group of 10 people who are customers actively participating in green food consumption activities. The purpose of this interview was to adjust the scale to ensure its usability and reflect the actual context of the study. The survey questions were divided into two main parts: (1) detailed description of the personal characteristics of the survey participants and (2) detailed description of the research concepts.

Research scale: Green brand trust was measured by 4 observed variables and green food purchase intention was measured by 3 observed variables adopted from Konuk et al. (2015); Green advertising receptivity was measured by 4 observed variables adopted from Tewari et al. (2022); Green brand image was operationalized using 4 scale items from the study of Lin & Zhou (2022).

#### 2.4.2. Sample and data collection procedure

A survey on green food consumers of Gen Z in Ho Chi Minh City. Convenience sampling method was used to design the study. Then, the questionnaire was sent electronically to respondents who were university students in Ho Chi Minh City. Data collection was carried out for 3 months (from June 2024 to September 2024) and 298 sheets were used.

#### 2.4.3. Statistical technique

Using PLS-SEM model to measure collected data through measurement model to evaluate composite reliability index, convergent validity and discriminant validity. Structural model evaluates standardized root mean square residual (SRMR), multicollinearity coefficient (VIF), predictive relevance (Q2), and coefficient of determination (R2). SmartPLS 3 software is used for evaluation (Hair et al., 2021).

## III. RESULTS AND DISCUSSION

### 3.1. Demographics

The sample includes 298 respondents who consume green food belonging to Gen Z generation in Ho Chi Minh City. Shown in Table 1.

**Table 1. Demographics**

| Characteristic | Items | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 142 | 47,7 |
| | Female | 156 | 52,3 |
| View green ads | Viewed | 219 | 73,5 |
| | Unviewed | 79 | 29,5 |
| Purchase frequency | 1 - 5 times | 111 | 37,3 |
| | 6 - 10 times | 7 | 2,4 |
| | 11 - 15 times | 7 | 2,3 |
| | 16 - 20 times | 6 | 2,1 |
| | More than 20 times | 4 | 1,2 |
| | Daily | 14 | 4,8 |

| | | | |
|---|---|---|---|
| | Weekly | 4 | 1,2 |
| | Monthly | 29 | 9,6 |
| | Frequently | 25 | 8,4 |
| | Don't remember | 91 | 30,7 |

*Source: Result of data analysis*

### 3.2. Measurement model evaluation

#### 3.2.1. Results of scale reliability and convergent validity

The reliability results of the measurement scale (Table 2) assessed reliability using composite reliability, achieving values ranging from 0,874 to 0,901. Internal consistency, measured by Cronbach's Alpha, exceeded 0,6. Convergent validity was confirmed with standardized factor loadings ranging from 0,673 to 0,894 and an average variance extracted (AVE) from 0,663 to 0,698, thereby meeting the criteria for convergent validity.

**Table 2. Results of scale reliability**

| Constructs | Loading | Alpha | CR | AVE |
|---|---|---|---|---|
| **Green Brand Trust (GT)** | | | | |
| GT1. I feel that this brand's environmental commitments are generally trustworthy. | 0,843 | **0,837** | **0,891** | **0,672** |
| GT2. I feel that this brand's environmental performance is generally reliable. | 0,783 | | | |
| GT3. I feel that this brand's environmental claims are generally credible. | 0,825 | | | |
| GT4. This brand keeps its promises and commitments to environmental protection. | 0,827 | | | |
| **Green Advertising Receptivity (RGA)** | | | | |
| RGA1. I support brands that are environmentally friendly. | 0,894 | **0,829** | **0,886** | **0,663** |
| RGA2. The use of green messages in advertising affects my attitude toward the advertisement. | 0,776 | | | |
| RGA3. I am the type of consumer who responds positively when brands use green messages in their advertising. | 0,894 | | | |
| RGA4: I am the type of consumer who is willing to buy products marketed as green. | 0,673 | | | |
| **Green Brand Image (BI)** | | | | |
| BI1. This brand is professional in its environmental reputation. | 0,865 | **0,854** | **0,901** | **0,695** |
| BI2. This brand is successful in environmental performance. | 0,843 | | | |
| BI3. This brand is established in its environmental concern. | 0,798 | | | |
| BI4. This brand is trustworthy in its environmental commitments. | 0,828 | | | |
| **Green Food Purchase Intention (PI)** | | | | |
| PI1. I am willing to purchase this brand's products in the future because of its environmentally friendly performance. | 0,833 | **0,785** | **0,874** | **0,698** |
| PI2. I intend to buy this brand's products due to its environmental concern. | 0,838 | | | |
| PI3. I will make an effort to buy this brand's products because it is environmentally friendly. | 0,835 | | | |

*Source: Result of data analysis*

#### 3.2.2. Results of discriminant validity

Discriminant validity, measured by the Fornell-Larcker coefficient (Table 3), showed that all square roots of AVE values were higher than the correlation values with other concepts (Fornell & Larcker, 1981). The results presented in Table 4 shows that the Heterotrait-Monotrait ratios for all the constructs were less than the threshold value of 0.85

(Henseler et al., 2015). Discriminant validity was met.

**Table 3. Results of discriminant validity (Fornell-Larcker criterion)**

| | BI | GT | PI | RGA |
|---|---|---|---|---|
| **BI** | 0,834 | | | |
| **GT** | 0,560 | 0,820 | | |
| **PI** | 0,503 | 0,653 | 0,836 | |
| **RGA** | 0,458 | 0,433 | 0,468 | 0,814 |

*Source: Result of data analysis*

**Table 4. Results of discriminant validity (Heterotrait-Monotrait ratio)**

| | BI | GT | PI | RGA |
|---|---|---|---|---|
| **BI** | | | | |
| **GT** | 0,656 | | | |
| **PI** | 0,601 | 0,798 | | |
| **RGA** | 0,544 | 0,513 | 0,556 | |

*Source: Result of data analysis*

### 3.3. Structural model evaluation and hypotheses result

The model was evaluated with indices including SRMR (0.064), VIF (ranging from 1.427 to 2.968), $Q^2$ (0.232 and 0.322), and $R^2$ (0.352 and 0.481). The results indicate that the model aligns well with the research framework. Bootstrapping (5,000 samples) confirmed statistical significance, supporting hypotheses H1 - H5 (Table 5 and Figure 2).

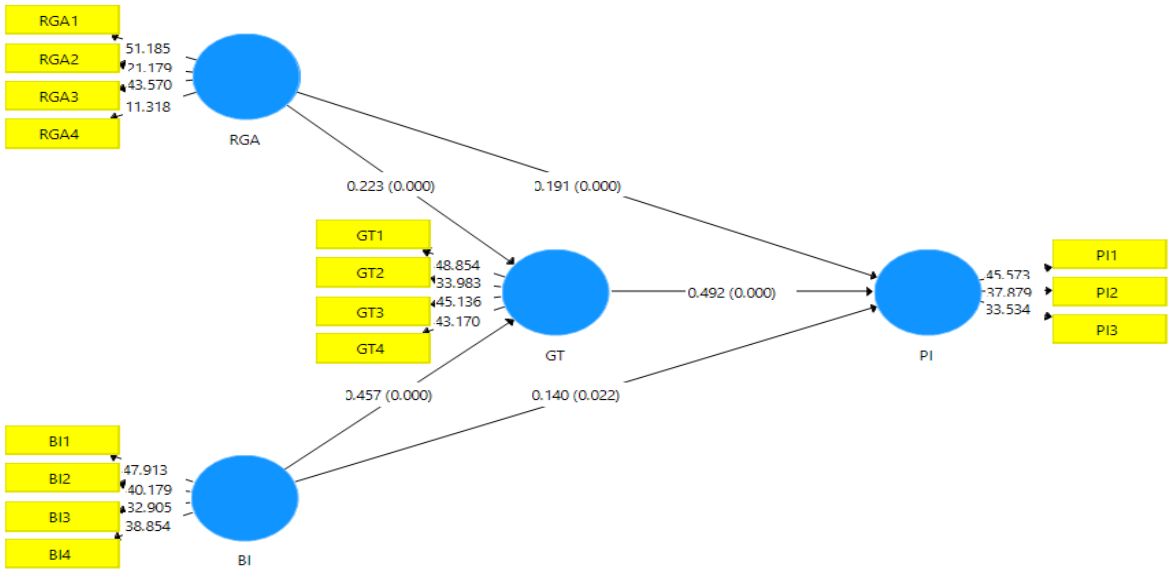



**Figure 2. Results of the research mode**

**Table 5. Hypotheses result**

| Hypotheses | Path | Estimat | P Values | Results |
|---|---|---|---|---|
| H1 | GRA➔GT | 0,223 | 0,000 | Supported |
| H2 | GRA➔PI | 0,191 | 0,000 | Supported |
| H3 | BI➔GT | 0,457 | 0,000 | Supported |
| H4 | BI➔PI | 0,140 | 0,022 | Supported |
| H5 | GT➔PI | 0,492 | 0,000 | Supported |

*Source: Result of data analysis*

### 3.4. Discussions

Table 5 indicated that GRA positively impacts GT with β = 0,223, supporting Hypothesis H1. This finding aligns with previous studies by Bailey et al. (2016), Nguyen-Viet (2022), Sun et al. (2021), and Nguyen-Viet & Thanh Tran (2024), which suggest that green advertising receptivity positively influences green brand trust.

H2: GRA positively impacts PI with β = 0,191 (Table 5), supporting the hypothesis. This result aligns with findings from Wu & Long (2024), Nauman (2024), Jog & Singhal (2024), and Nguyen-Viet & Thanh Tran (2024), indicating that green advertising receptivity positively impacts green food purchase intention.

Furthermore, Table 5 showed that BI positively influences GT with with β = 0,457, supporting Hypothesis H3. This result is consistent with Rahman & Nguyen-Viet (2023), Bashir et al. (2020), Bekk et al. (2015), which suggest that green brand image positively influences green brand trust.

Besides, data displayed in Table 5 show a statistically significant relationship between BI and PI with β = 0,140 (p=0,022) hypothesis H4 is supported. This result is consistent with by Ronaldo et al. (2018), Kijpanjasub & Jitkuekul (2019), Sembiring (2021), indicating that green brand image positively impacts green food purchase intention.

Addition, Table 4 shows that GT positively impacts PI with β = 0,492, supporting Hypothesis H5. This result is consistent with previous studies by Amin & Tarun (2021), Nguyen-Viet (2022), Rahman & Nguyen-Viet (2023), and Nguyen-Viet & Thanh Tran (2024), which indicate that green brand trust positively influences green food purchase intention.

## IV. CONCLUSIONS

Today, marketing strategies convey the green benefits of food companies' products to consumers through advertising. A critical point to consider here is whether consumers differ in their receptivity to such advertisements (Do Paco et al., 2019). Bailey et al. (2016) emphasize the importance of identifying green advertising receptivity for effective message delivery. From a marketing perspective, it is essential to develop differentiated communication strategies tailored to individuals based on their receptivity to green messages. Green brand mage meets consumers' environmental expectations and addresses emerging concerns (Khandelwal et al., 2019). Consequently, a robust green brand image enhances consumer trust by lowering perceived risks (Chen, 2010; Rahman & Nguyen-Viet, 2023). However, in consumer behavior research, this factor has received limited attention (Do Paco et al., 2019). Therefore, this study seeks to address this critical issue by examining the impact of green advertising receptivity, green brand image on green brand trust and the green food purchase intention of 298 Gen Z green consumers in Vietnam.

This study has expanded knowledge on green marketing strategies to enhance corporate green brand trust and promote green consumption towards sustainable development. However, the research has limitations due to its focus on Gen Z green food consumers and the use of measurement scales adapted from foreign sources.

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# EXAMINING THE ROLE OF SOCIALIZATION AGENTS ON YOUTH'S INTENTION TO CONSUME NON-ALCOHOLIC BEER IN VIETNAM

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**ABSTRACT**

This study extends socialization theory in investigating the roles of parents and social media on youth's intention to use non-alcoholic beer and applying socialization theory and and social learning theory to examine the direct and indirect roles of interpersonal and media health socialization agents in shaping the intention of consuming non-alcoholic beer. To analyze those hypotheses, this research used quantitative methods, from which the survey collected 603 young people aged 8-25 from the two largest cities in Vietnam. Our regression analysis results show that parents and social media are significantly and positively related to the intention of drinking non-alcoholic beer through the mediation of adolescent health literacy. Social media is proven to play a stronger role in consumption orientation, not much weaker than parental influence. From there, it emphasizes the need to provide implications or marketing strategy for non-alcoholic beer producers to increase non-alcoholic beer consumption.

*Keywords:* "non-alcoholic beer", "non-alcoholic purchase intention", "parents", "socialization agents", "social media".

## I. INTRODUCTION

Non-alcoholic or zero-alcohol beers contain no or very low amounts of alcohol (0.0–0.5% alcohol by volume) but share the appearance and taste of alcohol-containing beverages (Okaru & Lachenmeier, 2022). The global non-alcoholic beer market has witnessed significant growth in recent years, driven by increasing consumer interest in healthier beverage options and a shift towards moderate alcohol consumption. According to a report by Statista, the market generated approximately $34.1 billion in revenue in 2023, with projections estimating it will reach $50 billion by 2028. These findings highlight the sustained global expansion of non-alcoholic beer consumption and its increasing importance in the beverage industry (Statista, 2023).

Central to understanding consumer behavior in adolescents is the exploration of factors that shape their intentions and preferences. Adolescence is a critical developmental stage where social influences play an important role in shaping attitudes, beliefs, and behaviors (Moschis & Churchill, 1978). The consumption of non-alcoholic beer, an emerging category in the beverage industry, offers a unique context for studying these influences. While extensive research has examined the role of socialization agents in shaping adolescent behaviors related to health, education, and risk-taking (Albert Bandura et al., 1977; Arnett, 1995; Pechmann & Knight, 2002), less attention has been paid to their impact on consumer intentions of non-alcoholic beer (Scott & Ogilvie, 2020).

Given the increasing popularity of non-alcoholic beer as a healthier alternative to traditional alcoholic drinks (Baker, 2024), understanding the role of socialization agents - such as parents, peers, and social media - in influencing adolescents' intentions to consume these beverages is essential. The promotion of non-alcoholic beer has often aligned with themes of health consciousness, maturity, and social belonging, raising critical questions about how adolescents perceive and respond to such messages. Furthermore, studies have shown that the consumption intentions of adolescents are significantly influenced by the interplay of interpersonal interactions and media exposure (Albert Bandura et al., 1977; Arnett, 1995). These findings underscore the need for a deeper understanding of how adolescents process and internalize marketing messages, particularly those that frame consumption as socially and personally beneficial.

The overall purpose of this study is to investigate the roles of parents in shaping adolescents' intentions to consume

non-alcoholic beer. Drawing on socialization theories, including the Socialization Theory and Social Learning Theory, this research seeks to contribute to understanding how adolescents form consumption intentions in response to varying social influences. The findings of this study could provide valuable insights into how people form their consumption norms and the implications for designing responsible marketing and educational interventions (Weitzman et al., 2003).

## II. LITERATURE REVIEW

### 2.1 Theory

#### 2.1.1 Socialization theory

Socialization theory is useful for understanding factors that can influence children's and youth's knowledge, attitudes, and behaviors. Socialization theory provides a useful framework to conceptualize the collective processes by which young people acquire consumption styles, skills, knowledge, and orientations that are relevant to their performance as consumers in the marketplace. Research has demonstrated that parents play a primary role in modeling consumption behavior, guiding financial decision-making, and transmitting attitudes toward brands and purchasing. Peers and media also contribute significantly, especially during adolescence, as they shape preferences and norms through shared experiences and exposure to marketing content (Moschis & Churchill, 1978). More recent studies have extended the theory to include digital and social media as critical agents, emphasizing their role in shaping contemporary consumer identities (John, 1999). This theoretical framework provides a foundation for understanding how consumer habits and attitudes evolve, particularly in the context of social and technological changes.

#### 2.2.2 Social learning theory

Social Learning Theory, developed by (Albert Bandura et al., 1977), highlights the role of observational learning in behavior acquisition. According to the theory, individuals learn not only through direct experiences but also by observing and imitating others. Key processes involved include attention, retention, reproduction, and motivation. In consumer behavior, Social Learning Theory underscores how individuals internalize consumption patterns by watching others, particularly those who serve as role models, such as family members, peers, celebrities, and influencers. The rise of social media has amplified this dynamic, as platforms facilitate easy access to a wide range of role models, often showcasing aspirational lifestyles and consumption choices (Chen G. M., 2018). Moreover, Bandura's concept of vicarious reinforcement explains how observing positive or negative outcomes of others' consumption behaviors influences one's decision-making. This theory is instrumental in understanding the diffusion of trends, the impact of advertising, and the development of brand loyalties through social observation.

### 2.2. Intention to consume non-alcoholic beer

An intention to purchase is a person's choice to buy a good or service from the same company or brand (Hellier et al., 2003; **Linh, 2023**). According to the results of studies conducted in the UK and the Netherlands, people prefer low- and non-alcoholic goods because they taste good and to replace alcoholic beverages when it would be improper to use a stronger product (for example, after driving) (de Wit et al., 2021). Increased availability of low- and no-alcohol drinks indicates that the industry is responding to consumer demand, which may be connected to the general trend of decreased alcohol consumption in Western nations (Manthey et al., 2019).

### 2.3. Socialization agents

#### 2.3.1. Social Media

Social media refers to the online platforms and tools that people use to share opinions and experiences, including photos, videos, music, insights, and perceptions (Sin et al., 2012; Linh, 2023). Brands and merchants can use social media as a tool to interact with and sway their customers. With an average of 5.54 social media accounts, over 70% of Internet users are active social media users as of July 2015 (McClure & Seock, 2020). People may use social media for a variety of purposes, such as amusement, networking opportunities, or pointless seeking. The convenience of connecting and the freedom to choose who to connect with, when to connect, and what to share are the main reasons for social media's consistent growth (McClure & Seock, 2020). Besides, study of Tran & Thanh (2017) in Vietnam found that social media had a beneficial effect on customer purchasing intentions. Interacting with social media marketing increases customer engagement and consideration for purchases. Similarly, the usage of social media has considerably

influenced customer intentions (Linh, 2023).

Peer, influencer, or community endorsements have a major impact on validation and trust, which in turn increases customers' willingness to interact with and use goods and services (McClure & Seock, 2020). Social media platforms enhance these components by providing targeted advertising, customized interactions, and real-time feedback, resulting in individualized customer experiences. Deeper consumer connections are fostered via relatable narrative and influencer partnerships, which enhance audiences' trust, loyalty, and long-term relationships with businesses (Chung & Muk, 2017).

Besides that in Asian countries, Thai millennials believe that non-alcoholic beer is a healthier and more socially acceptable option for parties; yet, the market is hindered by factors such as low brand awareness and high prices (Leewatnakit, 2019). While platforms in Indonesia also improve brand recognition and image by serving as a mediator between customer attitudes and purchase decisions (Kharismatyawati & Janfry Sihite, 2023). Social media not only makes non-alcoholic beer a popular option but also encourages deeper engagement through influencer relationships, community involvement, and storytelling strategies (Kharismatyawati & Janfry Sihite, 2023; McClure & Seock, 2020). Thus, we developed the following hypothesis:

H1: Social media has a direct positive impact on the intention to consume non-alcoholic beer.

#### 2.3.2. Parental influence

Parents are the key suppliers of early educational experiences for children, giving them important life skills and values from a young age (Asih, 2020; Hasni, 2021). Positive interactions and supervision are crucial for forming a child's maturity and social ideals (Więcławska, 2018). Children see their parents as role models. Thus, parents have an important role in setting consumption intentions, particularly for young people's beverage intake, by influencing their views and actions through a variety of processes (Gottlieb & Baker, 1986; Manuel Sancho et al., 2011; Matjila, 2017). Young people frequently model their alcohol-drinking behavior after their parents (Gottlieb & Baker, 1986; Manuel Sancho et al., 2011; Matjila, 2017). This suggests that parents serve as role models for their children (Fleary et al., 2013). When parents practice good eating habits, their children are more likely to follow as well, resulting in healthier food and drink choices for their children. Another study found that children's eating habits are highly connected to their parents' beliefs, actions, and habits (Keleş Ertürk, 2019). This shows that if parents promote good eating and drinking habits, their children are more likely to follow.

Furthermore, parental guidance on alcohol use has a considerable impact on young people's intentions to drink alcohol and take substitutes (Matjila, 2017). This involves establishing regulations for alcohol usage and addressing the consequences of consuming alcohol. (Matjila, 2017) emphasizes that when parents create clear rules and restrictions for alcohol use, it can lower both intake and frequency of alcohol use among youth. Setting boundaries with children can reduce their desire to consume alcohol (Matjila, 2017; Østergaard et al., 2018), supporting better beverage consumption habits among young people.

According to (Gottlieb & Baker, 1986), young people's opinions about the effectiveness of behavior change in lowering health risks are negatively associated with their alcohol usage. This suggests that effective guidance for parents on health problems might reduce alcohol use intentions while increasing the possibility of purchasing healthier alternatives, such as non-alcoholic beer. Some researchers have indicated that non-alcoholic beer is a safer choice and has greater health advantages than alcoholic beer (Bagchi et al., 2001; Sohrabvandi et al., 2010). Thus, the hypothesis is proposed:

H2: Parents have a direct positive effect on the intention to consume non-alcoholic beer.

### 2.4. The meditating factor

#### 2.4.1. Health literacy

Health literacy is defined as the ability of individuals to obtain, process, and understand basic health information and services necessary for making appropriate health decisions (Hye-Jin Paek et al., 2011; Nielsen-Bohlman & Lynn, 2004). It encompasses more than just reading skills; it includes advanced cognitive and social skills that empower individuals to find, critique, and process health information confidently (Zarcadoolas et al., 2006).

The health socialization model suggests that health literacy can be influenced by various socialization agents, including interpersonal relationships and media, which play significant roles in how adolescents acquire health-related information (Nutbeam, 2000).

### 2.4.2. The relationship between health literacy and socialization agents

#### Social media influence

Social media serves as a significant health socialization agent, influencing adolescents' understanding of health information. Frequent exposure to health information through media can enhance overall health literacy (Bush et al., 1999; Moschis & Churchill, 1978b). Hye-Jin Paek et al. (2011) indicated that adolescents increasingly turn to the Internet as a primary source of health information, which can positively impact their health literacy levels. Similarly, the exponential growth of the Internet has made it an optimal channel for disseminating health information, contributing to adolescents' ability to access and understand health-related content (Bernhardt & Cameron, 2003; Brodie et al., 2003). Social media environments can foster autonomy and decision-making skills, which are crucial for young people to reflect on their health knowledge and intentions. Overall, social media plays a crucial role in shaping health literacy by providing diverse and accessible health information to adolescents, thereby influencing their health behaviors and decisions (Dudley et al., 2018).

H3: Social media has a direct positive effect on health literacy.

H4: Health literacy positively moderates the impact of social media on the intention to drink non-alcoholic beer.

#### *Parental influence*

Past socialization literature has noted the roles of family and peers in the socialization process. Many peer researchers indicate that parents play a crucial role in health literacy by frequently communicating health information to their children (Lee et al., 2007; Moschis & Churchill, 1978). The more often adolescents hear about health topics from their parents, the higher their health literacy levels tend to be (Moschis & Churchill, 1978). Easy access to parents for health-related inquiries is positively associated with health literacy. Hence, adolescents who can readily approach their parents for health information are likely to have a better understanding and knowledge of health issues, hence, they can choose to consume things that are good for health.

Moreover, family members, especially parents, serve as role models for adolescents. If parents engage in alcohol use, they may inadvertently normalize these behaviors, which can affect adolescents' perceptions and understanding of substance use risks. Given that, if parents engage in non-alcohol use, they can imitate and come to more non-alcohol beer.

H5: Parents have a directly positive impact on health literacy.

H6: Health literacy positively moderates the impact of parents on the intention to drink non-alcoholic beer.

### 2.4.3 The relationship between health literacy and intention to drink non-alcoholic beer

Health literacy significantly influences alcohol use behaviors among young people. Youth with higher health literacy are better equipped to understand health messages related to alcohol. This understanding can shape their perceptions and expectations about alcohol consumption, leading to more informed decisions regarding its use (Chisolm et al., 2014). In contrast, it may imply that with higher health literacy, young people will focus on healthier things, especially non-alcoholic beer. Specifically, the positive impact of non-alcohol expectancies on actual drinking behaviors is stronger in teens with higher health literacy. This suggests that those who can comprehend health information are more likely to align their behaviors with their expectancies (Andrew F. Hayes, 2022).

H7: Health literacy has a positive impact on the intention to drink non-alcoholic beer.

## III. METHODOLOGY

### 3.1. Sampling and data collection

The research team used a survey to evaluate the influence of socialization agents on intentions to consume non-alcoholic beer in Vietnam. The survey sample consisted of people aged 18 to 25, selected through a random sampling method.

The study was conducted in Vietnam between December 1, 2024, and December 14, 2024. A total of 603 valid answers were gathered, with responses from 30.7% male participants and 69.3% responses from female participants. This showed that in Vietnam, women are more interested in non-alcoholic beer than men. This can be explained by the fact that women tend to be interested in healthier drinks such as non-alcoholic beer.

The questionnaire used a five-point Likert scale. The intention to consume non-alcoholic beer was measured using five items on a five-point Likert scale modified from Armitage & Conner (2001). In addition, the investigation included the functions of socialization agents such as parents and social media. Parents' impact was examined using measures of parental guidance, parental restrictions on alcoholic beer, and the frequency of non-alcoholic beer use, which were rated using a five-point Likert scale. The last component of the questionnaire included demographic information such as age, and gender.

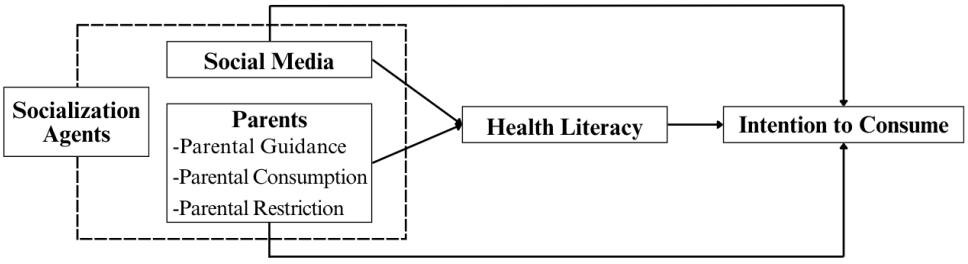



**Figure 1. Conceptual model**

### 3.2. Scales

We created the scales and their components by focusing on previous research and modifying the substance of statements or questions to the study's setting and the distinct sociological characteristics of each place. The scales were particularly developed to guarantee clarity and stability.

A five-point Likert scale (1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, and 5 - Strongly Agree) was used to assess respondents' levels of agreement with each statement, assuring measurement reliability. To assess the intention to consume non-alcoholic beer, Armitage & Conner (2001) items were modified slightly. Four questions modified from Chinn & McCarthy (2013) study were used to assess health literacy. A three-item scale from the research by Emini & Zeqiri (2021) was used to evaluate the effect of social media. Parental influence and its three main components: parental guidance (PG - 4 items), parental consumption (PC - 3 items), and parental restrictions (PR - 5 items) —were measured using items adapted from the studies of Yee et al. (2021); Koning et al. (2021); Birch et al., (2001).

### 3.3 Common method bias

To examine common method bias from systematic bias, The final 39-item measurement model's maximum variance contribution rate was 30.159%, which is less than the 50% cutoff point suggested by Podsakoff et al., (2003). Consequently, the results indicated that CMB was not an issue in this model.

## IV. RESULT AND DISCUSSION

Using empirical data from questionnaires, structural equation modeling (SEM) is a useful method for predicting the pathways of a multivariable model with latent components. (Hair et al., 2020). Partial least structural equation modeling (PLS-SEM) was chosen for this study's model parameter estimation because of the formative and high-order structures present in the SEM (Zhuang et al., 2023). The SmartPLS 4.0 software was used for this purpose.

### 4.1. First-order measurement model

First-order reflective constructs, including INT, HL, SMM, PG, PC, and PR, were evaluated for discriminant validity, convergent validity, internal consistency reliability, and indicator reliability (Sharma et al., 2023). Besides PG4, outer loadings of all indicators (0.746–0.885) exceeded the 0.7 cutoff point (Basco et al., 2022). This result

suggests that the indication reliability is adequate. Even though PG4's outer loading was 0.685, it might be acceptable because Cronbach's alpha (α) and composite reliability (CR) values were good. (Cheah et al., 2023; Christmann & Van Aelst, 2006; Davis et al., 2006), indicating that the internal consistency dependability of the first-order reflective measurement model was suitable (Zhuang et al., 2023). Additionally, the AVE was used in this study to assess convergent validity, and the results ranged from 0.593 to 0.764, all of which were above the suggested threshold of 0.5 (Idiana et al., 2022). Additionally, the Fornell-Lacker and HeterotraitMonotrait ratios (HTMT) criteria were used to evaluate discriminant validity. All HTMT ratios are below 0.9, as shown in Table 1, and italicized values highlight the highest correlation between each construct and itself within each column, confirming the model's discriminant validity (Zhuang et al., 2023).

**4.2 Higher-order measurement model**

All first-order construct indicators were reused for the second-order construct in the repeated indicator approach of the higher-order reflective-reflective assessment model for parents (PC, PG, and PR). This method was used to improve path coefficient accuracy and parameter estimation in the higher-order structure (Zhuang et al., 2023). First, every VIF value shows that there are no multicollinearity problems with this model. Then, by carefully examining the variability in the sample data, non-parametric resampling bootstrapping is used to evaluate estimated path coefficients (β) (Guenther et al., 2023). Each dimension's path coefficients were statistically significant, according to Table 2, with values far above the suggested cutoff point of 0.5 for higher-order model path coefficients (Hair et al., 2020). With PG ($\beta = 0.759$, $p < 0.001$) playing the most important role in shaping parents, PC ($\beta = 0.713$, $p < 0.001$), and PR ($\beta = 0.563$, $p < 0.001$) following closely behind, the β values also indicated variation in the effects of the three dimensions.

In conclusion, the results of every measurement model show that the suggested models and the data suit each other well. Strong validity and reliability are shown by each measurement model, opening the door for a comprehensive structural model evaluation.

**Table 1. Reliability, construct validity, and HTMT discriminant validity.**

| Constructs | Heterotrait-Monotrait ration (HTMT) criterion | | | | | |
|---|---|---|---|---|---|---|
| | **HL** | **INT** | **PC** | **PG** | **PR** | **SM** |
| HL | | | | | | |
| INT | 0.559 | | | | | |
| PC | 0.240 | 0.329 | 0.841 | | | |
| PG | 0.298 | 0.449 | 0.931 | 0.512 | | |
| PR | 0.367 | 0.453 | 0.939 | 0.355 | 0.389 | |
| SM | 0.546 | 0.655 | 0.545 | 0.205 | 0.361 | 0.595 |

*Notes: N = 603.*

*Source(s): Author's elaborations based on the research data*

The parameters of the structural models, which describe the link between constructs, can be evaluated when the measurement models have been completed. A bootstrapping technique was used to evaluate the PLS-SEM's statistical significance (Hair et al., 2020). The path coefficients' impact magnitude matched the matching f2 values. None of the constructs' Q2 values were less than 0, as shown in Table 1, confirming the path model's predictive relevance. Figure 2 showed that the final model had significant explanatory power, explaining 39.8% of the variance for INT. According to Table 3, there were no collinearity issues because all constructs had VIF values less than 3.

**Table 2. Assessment of second-order reflective measurement model**

| Higher-order constructs and first-order construct | | β | S.D. | *T*-value | *p*-value | $f^2$ | VIF |
|---|---|---|---|---|---|---|---|
| Parents | → Parent Consumption | $0.715^{***}$ | 0.020 | 17.438 | 0.000 | 1.049 | 1.000 |
| | → Parent Guidance | $0.759^{***}$ | 0.021 | 20.525 | 0.000 | 1.357 | 1.000 |
| | → Parent Restriction | $0.563^{***}$ | 0.030 | 18.766 | 0.000 | 1.448 | 1.000 |

***Note(s):*** *N =603. *p < 0.05. **p < 0.01. ***p < 0.001*

*Source(s): Author's elaborations based on the research data*

The findings showed that SM (β = 0.342, p < 0.001), PA (β = 0.209, p < 0.001), and HL (β = 0.261, p < 0.001) all had a direct beneficial impact on INT, while SM (β = 0.393, p < 0.001) and PA (β = 0.132, p < 0.001) had a favorable impact on HL. The information backed up H1, H2, H3, H5, and H7. The results of our study are consistent with and bolster the body of current literature, especially when it comes to highlighting the critical impact that PA and SM have on INT (Gottlieb & Baker, 1986; Manuel Sancho et al., 2011; Sin et al., 2012). Additionally, it demonstrates the more general conceptual knowledge that people who possess healthy literacy are more likely to make positive decisions, feel supported by their environment, and intend to drink non-alcoholic beer. The favorable relationships between SM, PA, HL, and INT that have been found support the larger body of research and highlight the crucial influence that socialization and health literacy have on consumers' decisions to buy non-alcoholic beer (Dudley et al., 2018; Lee et al., 2007; Moschis, 1985). It also implies that people who possess health literacy are more likely to take the initiative to use alcohol-related solutions to make wise drink choices. The socialization theory framework's strength in comprehending the socialization determinants of INT is further supported by the validity of these correlations in our study.

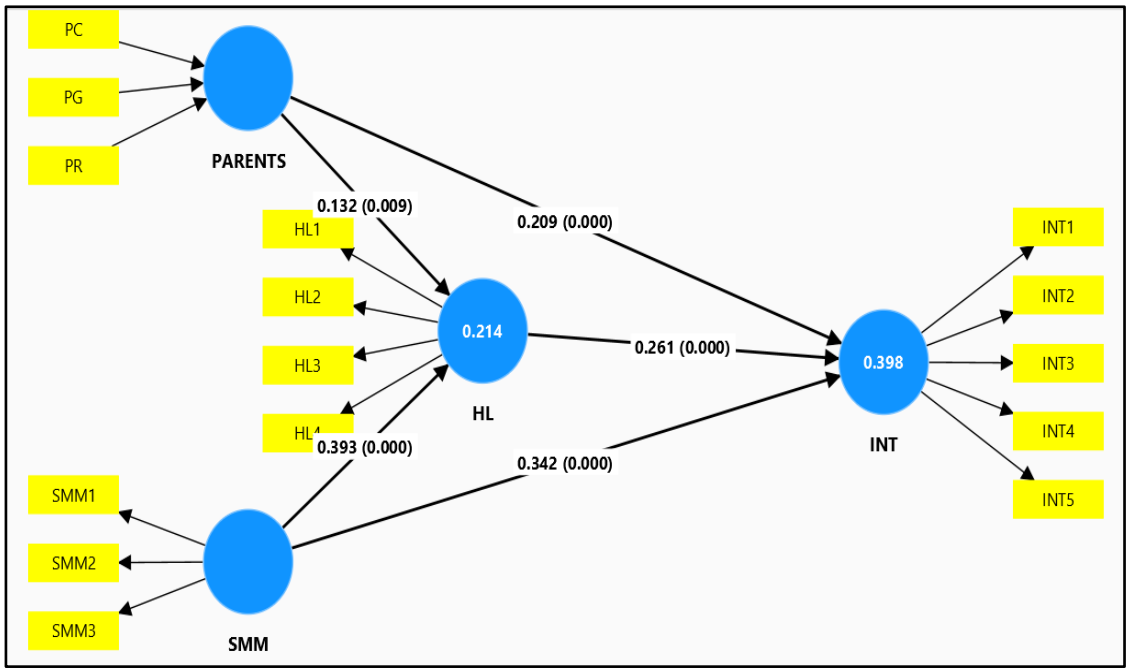



**Figure 2. Second-order structural model**

*Source: Results from SMART-PLS4*

Therefore, the findings of our study provide compelling evidence for the little-known hypothesis that an individual's purchase intention positively influences their entrepreneurial mindset and cognitive processes. This factor has not yet gotten as much attention in the literature, although being conceptually recognized. Our research provides empirical evidence for this notion by shedding light on the transforming potential of socialization agents such as parents and social media on the consumer's attitude, which was derived from PA, SM, and HL to their DEI. This research is a major advancement because it thoroughly investigates and provides empirical evidence for this theory.

**Table 3. Hypotheses testing results**

| Hypotheses | β | S.D. | *T*-value | *p*-value | $f^2$ | VIF | Supported [Yes/No] |
|---|---|---|---|---|---|---|---|
| H1. SM → INT | 0.342*** | 0.041 | 8.279 | 0.000 | 0.139 | 1.394 | Yes |
| H2. PA → INT | 0.209*** | 0.042 | 4.923 | 0.000 | 0.064 | 1.219 | Yes |
| H3. SM → HL | 0.393*** | 0.046 | 8.577 | 0.000 | 0.164 | 1.197 | Yes |
| H5. PA → HL | 0.132*** | 0.050 | 2.614 | 0.009 | 0.022 | 1.197 | Yes |
| H7. HL → INT | 0.261*** | 0.044 | 5.887 | 0.000 | 0.089 | 1.394 | Yes |

**Note(s):** N= 603. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$;

*Source(s): Author's elaborations based on the research data*

H6 and H4 were supported since Table 4 showed that HL positively moderated the effect of PA and SM on INT (β = 0.034, p < 0.05; β = 0.103, p < 0.001). The positive moderating effect of HL on the relationship between PA, SM, and INT suggests that people who believe parents and social media may offer knowledge to improve their health literacy to deal with alcohol-related problems. This highlights how crucial it is to identify and utilize social media and parental roles in the health journey with the health knowledge domain (Andrew F. Hayes, 2022; Dudley et al., 2018). The finding indicates that individuals who possess awareness from parents and positive content on social media may strategically deploy this health literacy to nurture and augment their non-alcoholic purchase intention.

**Table 4. Indirect effects**

| Hypotheses | β | S.D. | *T*-value | *p*-value | Supported [Yes/No] |
|---|---|---|---|---|---|
| H4. SM → HL→ INT | 0.103*** | 0.021 | 4.988 | 0.000 | Yes |
| H6. PA → HL→ INT | 0.034* | 0.015 | 2.341 | 0.019 | Yes |
| **Note(s):** N= 603. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$; | | | | | |

***Source(s):*** *Author's elaborations based on the research data*

## V. CONCLUSION

The results indicated that social media has a stronger influence than parents in shaping young people's purchase intention. Based on the cognitive process of non-alcoholic beer, our study contributes to both theoretical and practical implications by applying health literacy to explore how socialization agents affect individuals' non-alcoholic beer purchase intention.

### 5.1 Theoretical contributions

This study adds a number of noteworthy pieces to the body of knowledge already available on non-alcoholic topics. First, this study extends health literacy in a complex and situation-specific way. Our research adds to the flexibility and usefulness of health literacy in explaining non-alcoholic beer consumption intentions. Second, our study explores the complex relationship between parents and social media, including how parental use, supervision, and limitation shape cognitive factors (health literacy) and, ultimately, intention. By providing empirical evidence of the impact of socialization agents on health-related cognition and intention, this makes a significant contribution to the body of current work. This study extends the theoretical framework by investigating the mediating effects of health literacy on the intent to consume non-alcoholic beer, the relationship between parents, and social media. This exploration expands the theoretical framework to incorporate the contemporary influence of health literacy in shaping individuals' intentions to drink non-alcoholic beer.

### 5.2 Practical implementation

The findings of our study yield several practical implications that can guide policymakers, educators, and consumers in fostering a conducive environment for non-alcoholic beer.

*First*, identifying specific parental influences, such as parental guidance, consumption, and restriction, not only highlights their significance but also necessitates a paradigm shift in educational approaches. For instance, in the context of parental guidance and parental restriction, the educational process could incorporate practical exercises that teach children to analyze and interpret information critically and make informed decisions based on the negative consequences of alcohol. Parental consumption could be a sample for children to learn, if the parent is likely to pick up healthy food, children can imitate and do the same thing. By giving more awareness, they become adept at consuming non-alcoholic things, thus contributing to addressing the issues about bad health-related alcohol in the world. This holistic approach to education ensures that individuals are well-prepared academically and possess the mindset to be healthier in real life.

*Second*, the distinction between socialization channels is blurred when obtaining health information. Recent advancements in social networks and online social media have the potential to bridge the gap between mass-mediated and interpersonal health information sources by fostering new kinds of connections and acting as a stand-in for interpersonal health information sources. Furthermore, in line with the two-step flow of information theory, our

mediation experiments indicate that interpersonal agents have a stronger mediating effect on media agents and health literacy than the other way around.

Thirdly, firms can build a multi-channel communication strategy to increase and widely reach people about non-alcoholic beer. At the same time, research to diversify flavors, provide transparent product information and cooperate with health and transportation organizations, clearly commit to accompanying services and policies to build long-term trust with consumers.

**5.3 Limitations and directions for further research**

Even though our study offers insightful information about the intention to purchase non-alcoholic beer, it is important to recognize several limits that present chances for further investigation. Firstly, our study's cross-sectional design makes it difficult to establish causal links. A more thorough understanding of how shifts in socialization agents across time affect purchasing intentions may be possible with future longitudinal research. Secondly, our study concentrated on a particular setting - Vietnam. Future studies could examine the applicability of our model in various scenarios, taking into account cultural differences and economic disparities, although it is important to exercise caution when extrapolating our findings to different cultural and economic contexts. Finally, other socialization agents including siblings, peers, and schools have not been mentioned in our study.

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# SEO IN E-COMMERCE USING KEYWORDS OR META TAGS IDENTICAL OR SIMILAR TO TEXTUAL ELEMENTS OF OTHER PARTIES' TRADEMARKS FROM A LEGAL PERSPECTIVE

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**ABSTRACT**

E-commerce is rapidly growing worldwide. This activity takes place in an online environment within cyberspace, which makes it susceptible to situations involving the abuse of intellectual property rights. One common issue is the use of the textual elements of another party's trademarks as keywords or meta tags to describe or advertise products or services, thereby attracting users searching for those trademarks. This paper analyzes issues related to the use of the textual elements of other parties' trademarks as keywords or meta tags in e-commerce, evaluates the current legal framework, and provides recommendations for improving the law.

*Keywords:* "keyword", "e-commerce", "online advertisement", "meta tag", "trademark".

## I. INTRODUCTION

Along with the rapid advancement of science and technology, e-commerce is experiencing remarkable growth on a global scale (Shahriari et al., 2015). In Vietnam, this activity is also expanding rapidly, contributing the highest proportion to the country's digital economy development strategy (Tran, 2024).

In e-commerce activities, the amount of information about goods and services is vast, and search engine optimization (SEO) techniques are the primary tools for buyers to search for goods and services, while sellers use this tool to make information about their products or services visible to users (Zulkarnain, 2023). Buyers use search engines on e-commerce websites and enter keywords they are looking for, then the website displays goods and services whose descriptions or advertisements contain information that matches or is close to the searched keywords. On sellers' side, in order for their goods and services to be displayed to buyers, the descriptions or advertisements must contain keywords or meta tags that match or closely resemble the searched keywords.

A trademark may include textual elements. This gives rise to the situation where sellers in the e-commerce environment intentionally use keywords or meta tags that match or are similar to the textual elements of another party's trademark to describe or advertise their goods and services to attract buyers to their stores then buy their products or services. This behavior affects the legitimate rights of trademark holders, as without this behavior, buyers would see information about goods or services of trademark holders, not the infringing sellers. In practice, trademark infringement on e-commerce platforms in Vietnam is increasing rapidly (Nguyen, 2024). Therefore, it is necessary to implement measures to prevent actions that harm the rights of trademark holders, including the use of keywords or meta tags that are identical or similar to textual elements of another's trademark to describe or advertise their goods or services.

Based on this reality, this paper analyzes issues related to the use of textual elements of other parties' trademarks as keywords or meta tags in descriptions and advisements in e-commerce, evaluates current legal regulations, and offers recommendations for improving the law.

## II. METHOD

The research methodology employed in this paper is secondary analysis, which involves examining and interpreting existing legal materials. The study considers the law as a structured system of rules and norms established within applicable legislation. To achieve this, the research adopts a library research approach, focusing on the systematic review of secondary materials, including statutory laws, judicial decisions, legal commentaries, and scholarly articles.

The selection of legal documents and secondary sources follows specific criteria. First, priority is given to legally

binding instruments, such as national legislation, and authoritative court rulings. Second, academic and doctrinal sources are chosen based on their relevance, credibility, and contribution to legal discourse. Third, the research incorporates comparative legal perspectives, where applicable, to provide a broader contextual understanding.

The analysis is conducted using a qualitative legal research framework, emphasizing content analysis and doctrinal interpretation. Content analysis is used to identify key legal principles and interpretations within statutory provisions and case law. Doctrinal interpretation involves critically examining legal texts in light of established jurisprudence and scholarly opinions, ensuring a comprehensive and systematic approach to the research problem.

Through this methodological framework, the study aims to provide a structured and well-substantiated legal analysis based on authoritative and relevant sources.

## III. RESULT AND DISCUSSION

### 3.1. Keywords and meta tags for SEO in e-commerce

In online activities, to attract user traffic to websites, SEO techniques are used, with keywords and meta tags being key factors to make websites appear as a result of a search activity (Farahmand et al., 2011). E-commerce activities also take place on the Internet, so this technique is applied in e-commerce as well. As a result, for many e-commerce sellers, utilizing SEO techniques is crucial to increase customer attraction (Shashank et al., 2017).

E-commerce sellers can apply keywords and meta tags on websites they build themselves and on websites built by others, including platforms where many sellers and buyers gather, called e-commerce marketplaces (Wang, 2021). In this way, sellers can attract customers both passively and actively.

The passive approach is carried out when sellers add keywords and meta tags into the title or description of the goods or services. When buyers search, this information will be displayed, thereby attracting traffic to sellers' store.

The active approach involves sellers purchasing advertising services on websites based on keywords. When advertising in this way, sellers' goods and services will be actively displayed to buyers according to relevant criteria or when buyers perform a search (Yang & Li, 2023). This is an effective way to attract buyers in e-commerce, especially on platforms with a large number of sellers and buyers.

In this activity, legal issues arise when a seller uses keywords or meta tags that are identical or similar to the textual elements of other parties' trademarks in order to attract buyers to their stores through SEO.

Thus, in e-commerce, using SEO techniques with keywords and meta tags is an important activity to attract buyers. Legal issues will arise if sellers use keywords or meta tags that are identical or similar to the trademarks of other parties.

### 3.2. Legal regulations about the use of keywords or meta tags identical or similar to textual elements of other parties' trademarks in e-commerce

According to the principles of intellectual property law, the holder of a trademark is the exclusive owner of that trademark. Organizations or individuals can only use another person's trademark in accordance with legal regulations. A trademark can be or include texts in any words, name (Smith & Parr, 2005, p. 38). Vietnamese law also stipulates that trademarks can be visible in the form of letters or words (Law on Intellectual Property, 2005/2022, Art. 72). Therefore, the use of keywords or meta tags identical or similar to the textual elements of another person's trademark must be authorized by the holder, except in cases where exceptions are stipulated by law.

Pham (2016) argues that if a meta tag contains another person's trademark with the intention of redirecting traffic or deceiving customers to lead them to a different website, it should be examined for potential infringement or unfair competition regarding the trademark. This author references legal regulations and court rulings from some European and U.S. jurisdictions, which hold that when meta tags containing another party's trademark cause confusion and are intended for profit, they harm the trademark owner. Some instances of fair use, such as descriptive references, may be acceptable under the laws of specific countries.

In the legal perspective of some countries, using keywords from another party's trademark for advertising or SEO in e-commerce is also considered trademark infringement. A notable case is Interflora v. Marks & Spencer. Interflora, an international flower delivery network, sued Marks & Spencer (M&S) for using the keyword "Interflora" in Google AdWords advertising. The Court of Justice of the European Union (CJEU) ruled that M&S's use of this keyword could

mislead consumers about the origin of the services, thereby infringing Interflora's trademark rights (Interflora v. Marks & Spencer, 2013).

A similar perspective exists in U.S. law, as seen in Rescuecom Corp. v. Google Inc. Rescuecom, a computer services company, sued Google for allowing competitors to use the "Rescuecom" trademark as a keyword in its AdWords advertising program. The U.S. Court of Appeals ruled that Google's sale of trademarked keywords could constitute commercial use, paving the way for trademark infringement lawsuits related to online advertising (Atkinson, K., 2009).

In Vietnamese law, the use of identical or similar signs that could cause confusion about the origin of goods or services is considered an infringement of trademark rights (IP Law, 2005/2022, Art. 126). Regarding the act of a seller using keywords or meta tags identical or similar to the textual elements of another's trademark in e-commerce, several potential scenarios arise as outlined below.

Scenario 1: Sellers use meta tags identical or similar to textual elements of other parties' trademarks in titles or descriptions of goods or services

This act is essentially an abuse of others' trademarks to attract buyers to their goods or services through SEO tools, when, in fact, these buyers should be directed to information about the trademark holders' goods or services. However, this behavior, done by adding letters after the hash (#), does not constitute a trademark infringement because it does not cause confusion about the origin of goods or services, nor is it considered unfair competition under Article 130 of IP Law, 2005/2022. Although this act may harm trademark holders, it is not an infringement or unfair competition, so there is currently no legal basis to prohibit it under Vietnamese law.

Scenario 2: Sellers use keywords identical or similar to textual elements of other parties' trademarks in titles or descriptions of goods or services

According to the law, if this usage is applied to goods or services that are not identical, similar, or not related to the goods or services registered with trademarks, it does not constitute a trademark infringement. However, in practice, such use is primarily aimed at directing buyers to purchase similar goods or services from sellers, so these cases are typically considered trademark infringements and are prohibited. An exception may apply under the fair use doctrine (Leval, 1990), but such use should not cause confusion or harm to the trademark rights holder. In most cases in e-commerce, these requirements are not met. Therefore, the use of keywords identical or similar to other parties' trademarks in titles or descriptions of goods or services in e-commerce violates intellectual property law.

Scenario 3: Sellers purchase advertising services on e-commerce websites based on keywords identical or similar to textual elements of other parties' trademarks

The use of tools to promote products, goods, or services to the public constitutes advertising (Law on Advertising, 2012, Art. 2). Advertising goods bearing a protected trademark is one form of trademark use (IP Law, 2005/2022, Art. 124). Vietnamese law prohibits advertising activities that violate intellectual property laws (Law on Advertising, 2012, Art. 8). Therefore, purchasing advertising services on e-commerce platforms based on keywords identical or similar to other parties' trademarks is considered a use of the trademarks. If sellers purchase advertising services using keywords identical or similar to other parties' trademarks without permission from holders, it is an act of trademark infringement.

In practical e-commerce operations, sellers may combine these above activities related to the use of keywords or meta tags identical or similar to the textual elements of a trademark.

In conclusion, according to legal regulations, the act of using SEO techniques in e-commerce with keywords or meta tags identical or similar to the textual elements of other parties' trademarks is often a legal violation. However, in some specific situations, the law has not yet provided clear regulations, which could potentially affect the legitimate rights and interests of trademark holders.

3.3. Some proposals for improving legislation and practical application

In current e-commerce activities, the use of keywords and meta tags plays an important role in attracting user traffic (Kwon et al., 2008). The situation in Vietnam is no exception. However, the issue of using keywords and meta tags that are identical or similar to the text portion of another party's trademark still exists (Le, 2024).

To protect the legitimate rights of trademark holders, it is necessary to add provisions prohibiting such activities.

For the use of meta tags identical or similar to textual elements of other parties' trademarks in titles or descriptions of goods or services, it is necessary to classify it as an act of trademark infringement under intellectual property law and to establish responsibilities of website providers to prevent it under e-commerce law.

For paid ads or descriptions containing keywords identical or similar to the textual elements of another party's trademark, it is necessary to supplement regulations on the responsibilities of website providers to prevent such practices under e-commerce law. Specifically, an item should be added to Clause 4, Article 4 of Decree No. 52/2013/ND-CP to define this as a prohibited act. Additionally, specific sanctions for violations should be prescribed.

The three key scenarios above can be summarized in the table below when the seller uses text that is identical or similar to parts of other's trademarks:

| Scenario | Legal Basis | Current Challenges | Proposed Solutions |
|---|---|---|---|
| Meta tags | Not yet regulated in intellectual property law or e-commerce law. | Not a trademark infringement nor an unfair competition. Sellers can do. | Supplementing it as an act of trademark infringement under intellectual property law and establishing the responsibilities of website providers to prevent it under e-commerce law. |
| Keywords | IP Law, 2005/2022; Decree No. 52/2013/ND-CP | Trademark infringement (except fair use cases or applied to goods or services that are not identical, similar, or not related to the goods or services registered with the trademark). In fact, this behavior is still happening in e-commerce. | Supplementing regulations on the responsibilities of website providers to prevent it under e-commerce law. |
| Paid Ads | Law on Advertising, 2012; IP Law, 2005/2022; Decree No. 52/2013/ND-CP | Trademark infringement. But it is happening every day in ecommerce. | Supplementing regulations on the responsibilities of website providers to prevent it under e-commerce law. |

Regarding the responsibility of e-commerce platform providers, Decree No. 52/2013/ND-CP currently only requires them to cooperate with intellectual property rights holders to review and remove goods and services that infringe intellectual property rights. There are no provisions requiring platforms to create tools for rights holders to protect themselves, as stated in Article 198 of the Intellectual Property Law 2005, amended in 2022, in preventing and terminating intellectual property rights infringement. Therefore, it is suggested to add this provision to Article 36 of Decree No. 52/2013/ND-CP so that trademark holders can prevent and terminate others' use of textual elements in their trademarks for SEO on platforms.

In practice, for e-commerce platforms, in addition to websites built by domestic entities in Vietnam, there are websites built by foreign entities located outside of Vietnam's territory, providing cross-border services into Vietnam. These foreign platforms must comply with the regulations regarding handling violations where sellers use meta tags identical or similar to the text portion of other parties' trademarks in titles or descriptions of goods and services, if the platform is considered to be operating in Vietnam. This is the case when the platform has a Vietnamese domain, displays content in Vietnamese, or has more than 100,000 transactions from Vietnam in a year (Article 67a of Decree No. 52/2013/ND-CP as amended by Decree 85/2021/ND-CP). However, requiring foreign platforms to comply with Vietnamese law is quite difficult if they are not sufficiently concerned. Therefore, Vietnam needs to strengthen international cooperation in e-commerce to ensure that foreign platforms comply with Vietnamese legal regulations.

On the other hand, when Vietnamese individuals or organizations sell on foreign e-commerce platforms, they must advertise through a registered advertising service provider that is legally operating in Vietnam (Article 13 of Decree No.

181/2013/ND-CP). However, for small businesses or individual sellers, they may bypass this procedure and directly register to buy ads on the website and make payments easily through online payment methods, which complicates the monitoring of advertising activities that use keywords similar or identical to the text portion of other parties' trademarks on foreign e-commerce platforms. To address this issue, it is necessary to simplify registration procedures and promote the application of these procedures as well as implement management measures for foreign platforms.

In conclusion, to ensure the legal rights and interests of trademark holders in e-commerce platforms, as well as to maintain order in the e-commerce sector, it is essential to supplement and refine the legal provisions and monitor compliance with the law in practice, particularly regarding SEO techniques related to keywords or meta tags that involve text portions of trademarks.

## IV. CONCLUSION

Displaying goods or services and then proceeding with transactions is an essential part of e-commerce. Keywords and meta tags are elements used in SEO techniques. From this practice, there has been a situation where sellers use keywords or meta tags that are identical or similar to other parties' trademarks in order to attract buyers to their stores.

The use of keywords or meta tags that are identical or similar to other parties' trademarks in SEO techniques for e-commerce sales is an act of trademark abuse aimed at gaining unlawful profit. Vietnamese law has regulations in place to prohibit such acts. However, there are still shortcomings in these regulations, which need to be supplemented for legal refinement, as well as requiring proper monitoring of compliance in practice.

Improving legal regulations related to the use of SEO techniques in e-commerce, specifically concerning keywords or meta tags that are related to the text portion of a trademark, will help protect the legal rights and interests of trademark holders and maintain order in e-commerce activities in general.

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# DETERMINANTS OF KNOWLEDGE SHARING IN VIRTUAL STUDENT COMMUNITIES

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**ABSTRACT**

The purpose of this study is to identify the factors that influence the knowledge sharing behavior of university students in virtual communities in Hanoi. On the basis of the Social Exchange Theory and the Social Cognitive Theory, the study proposes a research model exploring the impact of both contextual and individual factors. Employing a quantitative approach, the study collects data through an online survey combined with a qualitative approach (10 in-depth interviews) with university students from various institutions in Hanoi. With responses from 367 students, the findings reveal that knowledge-sharing behavior is influenced by the norm of reciprocity, interpersonal trust, self-efficacy, perceived compatibility, enjoyment of helping, and perceived relative advantage. The study therefore gives recommendations that may enhance students' behavior of sharing and acquiring knowledge in virtual student communities.

*Keywords:* "contextual factors", "individual factors", "knowledge sharing", "virtual communities"

## I. INTRODUCTION

In the digital era, 4.0 technologies and social networks have transformed the way people communicate and acquire knowledge. A report by We Are Social and Hootsuite (2023) indicates that over 72 million people in Vietnam use social media as a primary tool for connection, learning, and information exchange. Especially in the years of COVID-19, online work and study is required. This trend has not only helped people to carry on education and work during the tough period but also new opportunities for communication and cooperation. In this case, Facebook, Zalo, Microsoft Teams, and Google Classroom are the platforms that create the flexible space for learning and working and become the growing intermediaries for people and organizations to systematically depend on online platforms for communicating, sharing, and supporting each other. This has over some time led to the formation of particular online groups and communities of practice where individuals share common interests in specific fields or topics. They serve as interactive community platforms where members engage in knowledge exchange through computer-mediated communication, facilitating the sharing of information and experiences (Chen and Hung, 2010).

Virtual communities provide a lot of information such as lectures, specialized data and experts, and create discussion and idea-sharing platforms. In the business context, virtual communities are not only knowledge repositories but also a firm's key assets in terms of networking of experts, generating ideas, and building brands. Such communities have been used by different organizations to carry out market research, feedback from customers, and product enhancement. For example, organizations use Microsoft Teams and Trell to manage communication and knowledge sharing among teams in the organization. The educational application of virtual communities has been found to be of vital importance in the improvement of education quality; thereby introducing a shift in the way people gain knowledge. Some online student groups, including "NEU News Corner"; "NEU Student Information Group"; "ĐHBKHN Learning Support". In general, these communities are not only learning environments but also places that keep people connected with each other, with a similar purpose, to contributing to the exploration and maximization of knowledge potential. Since 2020, the rise of hybrid communities, blending online and offline interactions, has further reshaped how individuals engage and share knowledge. These developments underline the need to revisit and incorporate updated frameworks to better capture the modern dynamics of community building and knowledge sharing.

Internationally, knowledge sharing behavior in virtual communities has become a widely researched topic since the late 1990s. Studies in this field primarily focus on identifying factors influencing knowledge sharing behavior - a broad,

multidimensional area requiring in-depth elaboration. Knowledge sharing behavior in communities is defined as the act of transferring knowledge, information and experience between individuals, groups or organizations. It can be done by sharing articles, commenting, discussing or giving feedback on the web and social networks. Many of the present studies are located in East Asia and Europe, often in the context of enterprises (Zaqout and Abbas, 2012; Ong et al., 2011). Previous studies on knowledge sharing behavior have covered the following aspects: including influencing factors, the relationship between sharing behavior and work performance, and examining sharing behavior from the perspectives of knowledge collection and contribution. These studies also emphasize that different contexts produce different research results (Chih-Jou Chen and Shiu-Wan Hung, 2010).

In the context of Southeast Asia, especially Vietnam, studies on knowledge sharing behavior are still limited and have not been investigated extensively. The current studies in Vietnam are confined to direct academic settings and are aimed at university students and teachers. The study by Nguyen et al. (2024) at Ho Chi Minh City University of Natural Resources and Environment emphasizes that self-efficacy, teamwork, technology, and encouragement are the key drivers of students' knowledge-sharing behavior. Similarly, Bui Thi Thanh (2024) identified that for Vietnamese faculty members, rewards, organizational culture, and trust significantly influence knowledge-sharing behavior. However, these studies have not endeavored to develop a model grounded on two major elements: individual and contextual, but rather examine factors such as trust, teamwork, or intrinsic motivation affecting knowledge sharing behavior.

Due to differences in approaches and contexts of studies on the same topic thus, research in Vietnam, specifically with university students, is crucial to develop this line of research. University students are young people as the future generation, being the main driving force in the intellectual community as the core workforce in the organization and at the national level. This group is unique since its members require a lot of professional growth, and often share information through the Internet. Knowledge sharing behavior helps in the learning process and also contributes towards a positive learning environment, as the student community demonstrates social responsibility and collaboration.

A number of prior researches have established the theoretical framework for knowledge sharing behavior, investigating through personal and contextual characteristics. Chih-Jou Chen and Shiu-Wan Hung (2010) have focused trust, self-efficacy and perceived benefits with regard to reciprocity and flexibility. Likewise, Hsin Hsin Chang and Shuang-Shii Chuang (2011) emphasize on social capital such as social interaction, trust and language. However, these studies have not clearly and comprehensively classified factors into individual and contextual groups. Also, considering the context, the majority of the current research is based on business contexts (Mahajan et al., 2024; Gharib et al., 2017), brand communities (Jiang et al., 2021; Zhang et al., 2019) or professional communities (Frost et al., 2014; Hung et al., 2015; Keary, 2012) and the knowledge sharing behaviors of students in virtual communities, especially in Southeast Asia, is a research area that still has to be investigated. To move this area forward, the research will administer a survey to students who engaged in knowledge sharing within the virtual communities to gather information on their experience, perceived benefits and barriers. Furthermore, the team will examine the elements from two major groups, individual and contextual factors, to define how they influence the knowledge sharing behavior. On this basis, the study will provide recommendations that will enhance a better online learning environment.

## II. LITERATURE REVIEW

### 2.1. Conceptual Foundation

Davenport and Prusak (1998) define knowledge as the information acquired through learning or which has been accumulated in the course of working. The current knowledge-based economy considers knowledge as an essential valuable resource (Chang et al., 2015). Knowledge sharing behavior is defined as the act of sharing knowledge and learning between two or more people, or between two or more organizations. Hindah Mustika et al (2022) defined knowledge sharing for several reasons such as knowledge acquisition, knowledge reuse, and knowledge creation. The four essential attributes of this behavior include (1) personal and intrinsic nature, (2) deliberate purposefulness, (3) operation within regulatory frameworks and (4) collective knowledge ownership. Studies indicate that knowledge sharing behavior stands as a critical step for creating valuable resources which enhance service delivery quality (Mafabi et al., 2017) and arises from a need to share knowledge (Bai et al., 2019; Lin et al., 2018; Mirkovski et al., 2018; Sallam & Algammash, 2016). Previous studies have identified two main groups of factors influencing knowledge sharing

behavior: Individual factors and social context factors (Chih-Jou Chen and Shiu-Wan Hung, 2010). However, the way these factors are categorized and the names given to similar variables make it rather hard to evaluate their contributions. Moreover, current models cannot be easily adapted to fit the different types of communities; hence there is a need for an adaptive and integrated model.

Knowledge sharing behavior is assumed to have theoretical underpinnings in social theories, notably in social exchange theory and social cognitive theory. Social Cognitive Theory was developed by Bandura in 1986, this theory posits that people's behavior is influenced by the behavior, the environment and the person. This means that the cognition and the context play a role in the behavior of an individual. This hypothesis is based on the three-way reciprocal interaction of 'individual factors', 'contextual factors', and 'behavioral factors'. Social Cognitive Theory is often seen as a ''widespread theoretical model'', which comprises other theories that focus on behavior of an individual as subcategories of its many facets (Mobashar Rehman, 2019).

Social Exchange Theory was respectively introduced by George Homans in 1961, Peter Blau in 1964 and Richard Emerson in 1962 and 1972a & 1972b, which is one of the theories that explain social interaction and social structure. The core of this theory is the norm of reciprocity, which suggests that individuals are more likely to share knowledge if they perceive a balance between what they contribute and what they gain in return. Social Exchange Theory has been used in many studies to explain that knowledge sharing does have a great influence in enhancing the long-term relationships of the members. Past scholars have focused on a ratio of the perceived benefits and the costs (D. Gefen & M. Keil, 1998; W.L. Shiau & M.M. Luo, 2012; Liu & Hung, 2010). Thus, in this study, this framework is applied to understand the determinants of knowledge sharing behavior in virtual communities.

### 2.2. Research model

Building on the foundational theories of Social Exchange Theory and Social Capital Theory, Chih-Jou Chen and Shiu-Wan Hung (2010) developed a model encompassing two groups of variables: individual and contextual factors. The model focuses on understanding knowledge-sharing behaviors in professional virtual communities (PVCs) which function as online platforms to unite professionals with shared interests who need efficient collaboration and knowledge exchange. In the contextual factors group, there are two main variables: Norm of Reciprocity (Ming-Ji James Lin et al., 2009; P. Pai and H. Tsai, 2015) and Interpersonal Trust (Chao-Min Chiu et al., 2006; Hsin Hsin Chang and Shuang-Shii Chuang, 2011; Hoseini et al., 2019) - are examined as key drivers of cooperative behavior within online communities, grounded in Social Exchange Theory. In the individual factors group, there are four variables: Perceived relative advantage (Lin and Hsiu-Fen, 2006; Manli Wu et al., 2016), perceived compatibility (Hsiu-Fen, 2006; Lin, 2009; Ray, 2014), and self-efficacy (Elham Aliakbar, 2013; Kee-Young Kwahk and Do-Hyung Park, 2016). These factors are particularly relevant in online student communities, where intrinsic motivation, alignment with personal values, and confidence in one's abilities significantly drive participation and engagement in knowledge-sharing activities.

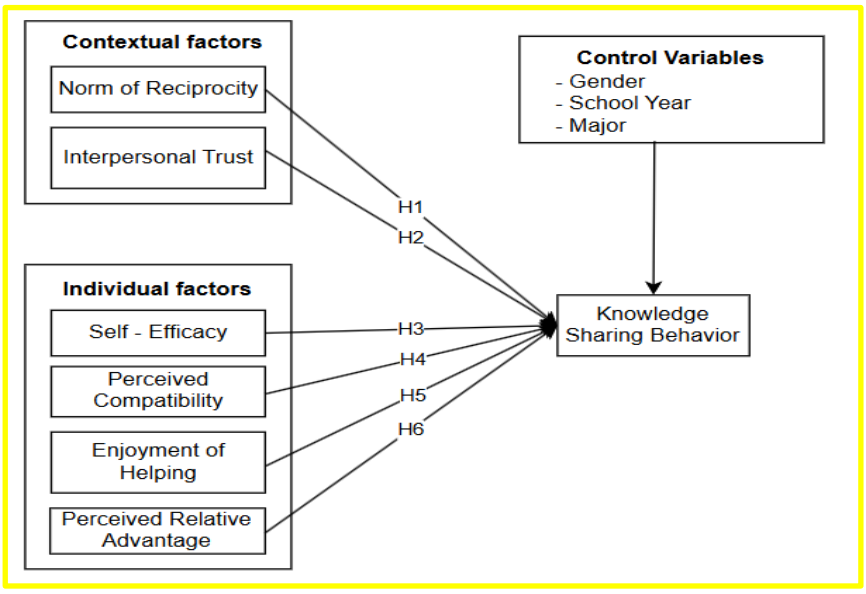



**Figure 2: Proposed Conceptual Model**

In addition to the commonly observed variables mentioned above, Kee-Young Kwahk and Do-Hyung Park (2016) incorporated the variable: Enjoyment of Helping, which represents a new perspective on understanding knowledge-sharing behavior within online communities. This factor reflects the intrinsic motivation individuals feel when assisting others, which often enhances their sense of fulfillment and satisfaction. Therefore, this variable is added to provide a more comprehensive understanding of the dynamics within online knowledge-sharing environments. Moreover, control variables, including gender, academic year, and major, are also incorporated into the research to investigate differences across student groups and clarify the impact of personal and academic characteristics on information sharing within the learning environment.

Based on theoretical foundations, the context, and the operational framework of online student communities, which differ from previous studies, the measurement scales have been inherited and adjusted as follows: Norm of Reciprocity (3 items), Interpersonal Trust (3 items) were adopted from the study by Ming-Ji James Lin *et al.* (2009), Self-efficacy (4 items), Perceived Compability (4 items), Enjoyment of Helping (3 items), Perceived Relative Advantage (3 items), and Knowledge Sharing Behavior (4 items) inherited from Kee-Young Kwahk and Do-Hyung Park (2016). All the scales were measured on a five-point Likert scale with labels: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

**2.2.1. Norm of Reciprocity**

Norm of reciprocity is a basic social exchange mechanism that demands the recipient return the same value as the amount of resources received (Chen & Hung, 2010; Wu et al., 2006). This norm goes beyond the repayment and includes how people should respond to acts of benevolence or aggression. This norm fosters knowledge sharing and continuous cooperation in organizations (Kwahk & Park, 2016). Knowledge sharing behavior in virtual communities is influenced by the norm of reciprocity where members expect to receive the same in the future (Chen & Hung, 2010). In the same regard, Wasko and Faraj (2005) argue that this norm is vital in sustaining cooperation and support among the members. Individuals who consider knowledge as their personal property will be motivated to share their knowledge with others for tangible and intangible returns. In such exchanges, reciprocity creates a perceived fairness that motivates knowledge-exchange behavior (Chang & Chuang 2011; Chiu et al. 2006). Based on this foundation, the following hypothesis is proposed:

H1: Norm of Reciprocity positively influences knowledge sharing behavior within members of virtual student communities.

**2.2.2. Interpersonal Trust**

Interpersonal trust within the virtual communities is the degree to which members trust the knowledge sharers' goodwill, benevolence, competence, and reliability. This factor cuts across the interactions of the people in the community and has a very significant role in the sharing of knowledge and collaboration among the people (Chen et al., 2009; Lin et al., 2007). Especially in professional virtual communities (PVCs), trust is an essential antecedent of knowledge exchange relationships that foster a sharing climate and improve participation (Hung & Cheng, 2013). Chiu et al (2006) note that trust includes the values and norms that are followed in the group so as to encourage sharing. According to Lee and Choi (2007) people's readiness to engage actively rises in proportion to the degree of trust. Not only does trust continue cooperation but also it assists in expanding exchange relationships within virtual communities (Chiu et al., 2006; Lin et al., 2002). On the other hand, a lack of trust is a form of knowledge sharing impediment (Lee & Choi, 2003). When trust is enhanced, members are more active in sharing according to Chiu et al., (2006) & Chang & Chuang, (2011). Chen and Hung (2010) however point out that the level of impact of this factor depends on the situation and the members' commitment. Based on these arguments, the following hypothesis is proposed:

H2: Interpersonal trust positively influences knowledge sharing behavior within members of virtual student communities.

**2.2.3. Self - Efficacy**

In this case, self-efficacy is defined as an individual's perceived capacity to arrange and implement activities to yield the intended results (Jashapara & Tai, 2006). In the case of knowledge sharing it is defined as the extent to which an individual believes in his/her ability to offer relevant and valuable knowledge to others (Kankanhalli et al., 2005).

Self-efficacy is known to cause more enthusiasm and a proactive approach to knowledge sharing activities in the virtual community (Bock & Kim, 2002; Elham Aliakbar, 2013; Rohman et al, 2020). Many authors have stressed the role of self-efficacy in knowledge sharing behavior. According to Bock and Kim (2002), people who are self-confident are likely to contribute knowledge to the community in a positive and active way. Kee-Young Kwahk and Do-Hyung Park (2016) also add that self-efficacy not only motivates people to contribute but also to gain more knowledge, which makes the virtual community more proactive and useful. On the other hand, low self-efficacy is characterized by low participation in knowledge sharing activities as well as low involvement in the community, and therefore hampers the efficiency of the community. Based on these findings, the research team proposes the following hypothesis:

H3: Self-efficacy *positively influences knowledge sharing behavior within members of virtual student communities.*

**2.2.4. Perceived Compatibility**

Perceived compatibility is the degree to which knowledge sharing corresponds to an individual's organizational culture, personal requirements, and the needs of the community to which the person belongs (Moore, 1991). In virtual communities, compatibility is also shown in the extent to which knowledge sharing activities fit the working environments and personal life patterns of the participants (Hung & Cheng, 2013; Lin et al., 2009; Karahanna et al., 2006). Earlier research postulated that when people find a high level of fit between the knowledge sharing and their personal values, they are willing to share knowledge in virtual communities (Hsiu-Fen, 2006; Lin, 2009; Ray, 2014). Likewise, Lin (2009) found that community members' participation is higher when they consider knowledge sharing as aligned to their values and expectations. However, Chen & Hung (2010) in a survey of 2 virtual communities in Taiwan reported a lower correlation between adaptability and knowledge sharing behavior. Based on these findings, the research team proposes the following hypothesis:

H4: Perceived compatibility positively influences knowledge sharing behavior within members of virtual student communities.

**2.2.5. Enjoyment of Helping**

The enjoyment of helping is defined as the pleasure in sharing their knowledge to help others without the expectation of receiving rewards in the future (Moghavvemi et al., 2017). This intrinsic reward promotes member participation and increases the incidence of members' volunteering. Studies also show that this feeling elicits a positive impact on the knowledge sharing behaviour and improves the community involvement and delicateness of its members (Davenport & Prusak, 1998; Kankanhalli et al., 2005). Tai-Kuei Yu et al. (2010) also stress that the pleasure derived from helping is one of the major factors that should be used to encourage knowledge sharing. Similar research (Hoseini et al., 2019; Tang et al., 2016) has concluded that enjoyment in helping others has a positive effect on knowledge sharing. Based on this, the research team proposes the following hypothesis:

H5: The enjoyment of helping positively influences knowledge sharing behavior within members of virtual student communities.

**2.2.6. Perceived Relative Advantage**

Perceived relative advantage is the knowledge contributor's cognition of likely advantages and benefits that knowledge sharing behavior will produce and return (Chih-Jou Chen and Shiu-Wan Hung, 2010). This is one of the main factors that foster knowledge sharing. Past research has established that perceived relative advantage is a key determinant of knowledge sharing behavior. Lin (2009) stresses that the members contribute to obtaining value like the increase of their knowledge, getting support, developing friendships, or confirming their own abilities. Another reason is that while the benefits are clear, people will participate actively, but a lack of understanding of such benefits leads to decreased interaction with the community (Teunissen, 2009; Ray, 2014). Based on these prior studies, the research team hypothesizes:

H6: Perceived relative advantage has a positive effect on knowledge sharing behavior within members of virtual student communities.

**2.3. Research method**

This research design utilizes both qualitative with in-depth interviews and quantitative with cross-sectional online

questionnaire research techniques. Initially, in-depth interviews were conducted with 10 students from different universities to assess the relevance and clarity of the measurement variables. The team then adjusted t Ờm he measurement scale based on context derived from the interviews and conducted an online survey with 150 students from active communities in ten leading universities in Vietnam. The measurement scales showed a Cronbach's Alpha coefficient of ≥ 0.75, thereby indicating good internal consistency.

The research team resumed the online survey from March 2024 to May 2024 and received 389 responses from students currently engaging in virtual communities in Hanoi. The surveyed communities are mainly located in Hanoi, a city that accommodates numerous large universities and has a highly active exchange of academic information. These students are from prestigious universities and are participating in academic organizations and knowledge exchange processes. To achieve representativeness, the team targeted students in the fields of economics, technology, education, and the social sciences. Subsequently, 22 responses from students who did not report sharing knowledge were removed. Therefore, 367 valid responses were employed in the sample analysis to obtain a representation of the target group.

## III. RESULT AND DISCUSSION

In this study, we tested the reliability of the variables using Cronbach's Alpha coefficient. The results showed that all variables met the testing standards and all variables had values > 0.75.

**Table 1. Exploratory factor analysis for scales serving as independent variables**

| Observation variable | Factors | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| NLBT1 | 0.866 | | | | | |
| NLBT4 | 0.863 | | | | | |
| NLBT3 | 0.841 | | | | | |
| NLBT2 | 0.8 | | | | | |
| KNTU4 | | 0.846 | | | | |
| KNTU2 | | 0.815 | | | | |
| KNTU1 | | 0.804 | | | | |
| KNTU3 | | 0.775 | | | | |
| LI3 | | | 0.896 | | | |
| LI2 | | | 0.878 | | | |
| LI1 | | | 0.861 | | | |
| STT1 | | | | 0.894 | | |
| STT2 | | | | 0.868 | | |
| STT3 | | | | 0.824 | | |
| NV1 | | | | | 0.89 | |
| NV2 | | | | | 0.849 | |
| NV3 | | | | | 0.829 | |
| QTTH3 | | | | | | 0.9 |
| QTTH1 | | | | | | 0.852 |
| QTTH2 | | | | | | 0.749 |

| | |
|---|---|
| **KMO** | 0.798 |
| **sig of Bartlett's Test** | 0.000 |
| **Eigenvalue** | 1.047 |
| **Total extracted variance** | 73.879 |

The results of EFA also reveal that the Kaiser Meyer Olkin (KMO) value is 0.798. A high KMO value shows that the observed variables are quite suitable for factoring, since the observed variables have relatively high intercorrelations. The first 20 observed variables in 6 measurement scales were loaded into 6 factors at Eigenvalue of 1.047. This result validates that all six factors are valid in measuring the research constructs. Further, the total amount of variance, which is explained by the extracted 6 factors, is 73.879%. The observed variables within the same factor were accurately grouped, with high convergent validity (the variables within a factor are highly related) and discriminant validity (the variables in one factor are less related to those in another factor). Therefore, the research model is structurally confirmed, and ready for quantitative analysis to hypothesis testing and understanding of research relations.

**Table 2. Exploratory factor analysis for the scale serving as the dependent variable**

| Observation variable | Value |
|---|---|
| HVCS1 | 0.858 |
| HVCS2 | 0.836 |
| HVCS4 | 0.826 |
| HVCS3 | 0.824 |
| **KMO** | 0.824 |
| **sig of Bartlett's Test** | 0.000 |
| **Eigenvalue** | 2.796 |
| **Total extracted variance** | 69.904 |

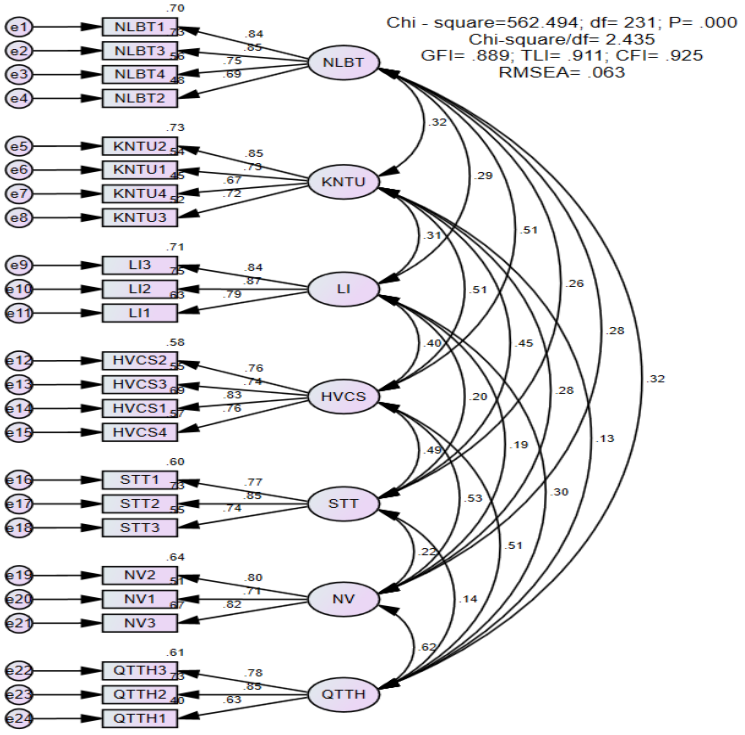


**Figure 2: Results of CFA model analysis**

EFA results of the dependent variable scale show KMO value is 0.824 which is greater than 0.6, so the survey data is suitable for factor analysis. The Bartlett's Test of Sphericity resulted to a sig of 0.000 which is less than 0.05. Further, the exploratory factor analysis shows that all the observed variables related to the dependent variable have a factor loading of more than 0.5. This shows that the observed variables are highly related to the knowledge sharing behavior factor that they represent, and also confirms that these variables capture the aspects of this factor.

In preparation for SEM, CFA was done to assess the fit of the measurement scales and to assess the actual structures of the scales in this study. By using CFA analysis, the measurement model was found to fit well with the survey data. The CMIN/DF value was 2.435 which is less than 5 and GFI, CFI and TLI were 0.889, 0.911 and 0.925 respectively, RMSEA was 0.063 which also supported the overall model fit. The survey data were measured with a high degree of accuracy and thus the convergent and discriminant validity was established, which forms the basis for SEM analysis.

**Table 3. Results of reliability, convergent and discriminant analysis**

| | CR | AVE | MSV | NLBT | KNTU | LI | HVCS | STT | NV | QTTH |
|---|---|---|---|---|---|---|---|---|---|---|
| **NLBT** | 0.865 | 0.617 | 0.262 | 0.785 | | | | | | |
| **KNTU** | 0.835 | 0.561 | 0.259 | 0.32 | 0.749 | | | | | |
| **LI** | 0.872 | 0.695 | 0.159 | 0.286 | 0.310 | 0.834 | | | | |
| **HVCS** | 0.856 | 0.598 | 0.285 | 0.512 | 0.509 | 0.399 | 0.774 | | | |
| **STT** | 0.834 | 0.626 | 0.240 | 0.256 | 0.447 | 0.201 | 0.490 | 0.791 | | |
| **NV** | 0.821 | 0.606 | 0.391 | 0.283 | 0.283 | 0.195 | 0.534 | 0.223 | 0.778 | |
| **QTTH** | 0.804 | 0.581 | 0.391 | 0.318 | 0.127 | 0.297 | 0.508 | 0.142 | 0.625 | 0.762 |

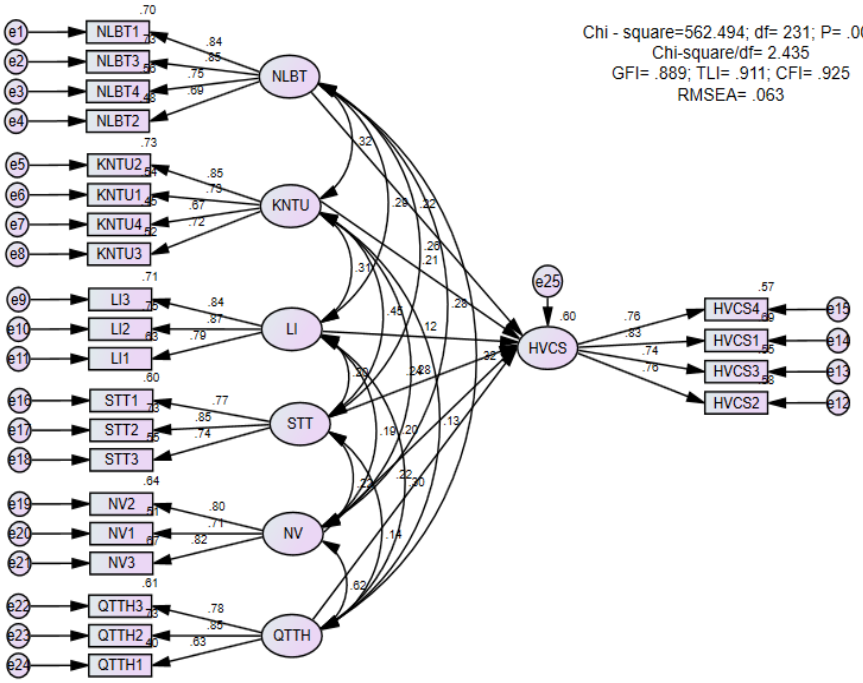



**Figure 3. Results of linear structural model analysis**

In order to assess the reliability of the factors in the proposed model, the Composite Reliability (CR) coefficient was used. The analysis results show that the CR values of all factors are greater than 0.7, which proves that the factors in the model have high reliability and can be used to measure the research constructs with good accuracy and stability. With regard to the convergent validity, the findings reveal that the AVE of all factors is more than 0.5. This means that

each of the factors accounts for more than 50% of the variability of the observed variables, which confirms that the factors have good convergent validity and represent the theoretical constructs adequately. For discriminant validity, The MSV of all factors is less than the AVE of each factor. This affirms our conclusion that the factors in the model possess adequate discriminant validity, and there is no significant crossover of the factors, and each of them is easily distinguishable from the others.

As seen from the result of the SEM analysis, the degrees of freedom are 231 and CMIN/DF ratio is 2.435 which is less than 5. Also, the significance value or sig is 0.000 < 0.05 which proves that the model is a good fit for the collected data. In addition, the indices GFI = 0.91, TLI = 0.97, and CFI = 0.95 are greater than 0.8, and the RMSEA = 0.063 which is less than 0.08, which also proves the fact that the proposed model has a good fit. Therefore, the validity of the structural equation model is assumed and is used for further research analysis.

**Table 4. Impact coefficient between factors in SEM model**

| The impact | | | Estimate | S.E. | C.R. | P |
|---|---|---|---|---|---|---|
| HVCS | <--- | NLBT | 0.179 | 0.041 | 4.363 | 0.000 |
| HVCS | <--- | KNTU | 0.166 | 0.046 | 3.650 | 0.000 |
| HVCS | <--- | LI | 0.113 | 0.048 | 2.365 | 0.018 |
| HVCS | <--- | STT | 0.188 | 0.043 | 4.434 | 0.000 |
| HVCS | <--- | NV | 0.201 | 0.068 | 2.936 | 0.003 |
| HVCS | <--- | QTTH | 0.216 | 0.069 | 3.143 | 0.002 |

The results of the SEM model show that all the effects are significant at 5 percent level of significance since all the p-values are less than 0.05. Thus, it is possible to state that hypothesis H1 in relation to the Norm of Reciprocity with regard to the studied indicators is confirmed. This finding indicates that when students are knowledge sharers, they want others to share with them as well. This result is different from the study by Chih-Jou Chen and Shiu-Wan Hung (2010), maybe due to the fact that Vietnamese culture is compatible with the spirit of solidarity and cooperation. The students in such communities are likely to exhibit such similar characteristics, needs and behaviors. In addition, the positive impact of the Norm of Reciprocity on the sharing behavior validates the studies conducted by Blau (1964), Chen & Hung (2010) and Wasko & Faraj (2005).

Regarding hypothesis H2: It is clearly stated that Interpersonal Trust has a positive effect on knowledge sharing behavior, the SEM results are 0.000 (p-value <0.05) and the effect coefficient is positive 0.188. Hence, hypothesis H2 is also supported. This indicates that trust leads to a sense of security among the members in as much as they wish to share their information, ideas or experiences with others without being laughed at, criticized or exploited. This result is supported by Chen et al. (2009), Lin et al. (2007), Hung and Cheng (2013) and other researchers who have emphasized trust in knowledge sharing behavior. For hypothesis H3 about self-efficacy, p = 0.000, and the effect coefficient is positive 0.179, we can accept H3. This hypothesis is well supported in the literature like Constant et al., (1994), Bock & Kim (2002) and Kankanhalli et al., (2005). When people are confident of their ability and have a lot of information in a certain area they are assured to give out information.

The SEM results of hypothesis H4: "Perceived Compatibility has a positive effect on knowledge sharing behavior" are 0.166 (positive effect coefficient) and 0.000 (p-value less than 0.05), which supports H4. Since tools, learning methods and communication approaches in online environments are dynamic, the more flexible students are able to accept and get acquainted with the changes, the more willing they will be to share knowledge in order to help others to embrace change. In the same regard, Hung and Cheng (2013), Lin et al. (2009), and Karahanna et al. (2006) share the same feelings.

Regarding hypothesis H5 which states that Enjoyment of Helping in sharing has a positive impact on knowledge sharing behavior, we find that the p-value is 0.003 <0.05 and the effect coefficient is positive 0.201. Thus, H5 is accepted. This finding supports the conclusions of Davenport and Prusak (1998), Kankanhalli et al. (2005), Wasko and

Faraj (2005), and Tai-Kuei Yu et al. (2010). These studies insist that people who derive pleasure from sharing knowledge with the intention of assisting others are likely to share knowledge, and therefore, emphasize "enjoyment of helping" as an important aspect of knowledge sharing behavior.

Hypothesis H6 "Perceived Relative Advantage has a positive effect on knowledge sharing behavior" the SEM results reveal a p-value of 0.018 and a positive effect coefficient of 0.113. Therefore, H6 is accepted. The above hypothesis is well supported by Lin (2009), Teunissen (2009) and Ray (2014) who posited that people are willing to devote time and effort in sharing knowledge in the same community if they see that they are benefiting from the same community.

With the aim of testing the mean difference of knowledge sharing behavior according to students' personal characteristics, the Independent Sample T-Test and One-way ANOVA tools are used. The analysis results of the qualitative variable Gender show that the sig of the F test is 0.629 > 0.05, so there is no difference in variance between the two gender groups. The T-test results with sig = 0.975 > 0.05 show that there is no mean difference in sharing behavior between the two groups of Male and Female.

**Table 5. Independent samples test**

| Independent Samples Test | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Levene's Test for Equality of Variances | | T-test for Equality of Means | | | | | | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| HVCS | Equal variances assumed | .234 | .629 | .031 | 365 | .975 | .00250 | .07965 | -.15413 | .15913 |
| | Equal variances not assumed | | | .032 | 361.705 | .975 | .00250 | .07904 | -.15294 | .15794 |

With the qualitative variable consisting of 3 values, School year, in the Levene test, sig reaches a value of 0.378 > 0.05, so the ANOVA test is used to continue the review. The ANOVA test results show that sig = 0.301 > 0.05. Thus, no difference in knowledge sharing behavior is found between the groups of first-year, second-year, third-year and fourth-year students. The results of the Levene test analysis for the Major variable show that the sig value is 0.401 > 0.05, which is sufficient to use the ANOVA test. Accordingly, the sig of the ANOVA test is 0.574. This means that regardless of the major the students are studying: Economics, Engineering or Arts, there is no difference in knowledge sharing behavior between groups.

## IV. CONCLUSION

### 4.1. Implications of the study

Previous studies have shown that virtual communities' activities are vital in managing strategic knowledge-sharing practices among their members. This research finds that individual factors (such as perceived relative advantage, self-efficacy, enjoyment of helping, and perceived compatibility) and contextual factors (such as norms of reciprocity and interpersonal trust) play a critical role in encouraging knowledge-sharing behavior.

Building on this, the study theoretically develops a research model that integrates both individual and contextual factors to explore the determinants of knowledge-sharing behavior. In addition to clarifying how these factors influence knowledge sharing, this approach extends theoretical frameworks on knowledge-sharing behavior.

From a practical perspective, the research findings suggest that online community managers or organizations can implement policies and activities to foster trust, enhance knowledge-sharing practices, and strengthen members' sense of attachment. Trust among members plays a crucial role in promoting knowledge sharing, knowledge utilization, and community loyalty. Managers can encourage trust by appointing reputable student moderators who act as coordinators and create a safe environment for members. Additionally, establishing clear community guidelines that emphasize

mutual respect and support can help build a trustworthy atmosphere.

Organizing knowledge-sharing activities, such as the "Knowledge Exchange – Value Connection" program, where members share lessons, experiences, or materials and receive feedback as well as networking opportunities, can further reinforce the norm of reciprocity and enhance member engagement. Managers should ensure that every contribution, no matter how small, is acknowledged and positively reinforced. Simple expressions of gratitude like "Thank you for sharing this useful post!" can increase members' enjoyment of sharing.

At the same time, managers can provide tangible rewards such as study vouchers, free materials, or opportunities to participate in in-depth workshops for active contributors, highlighting the benefits of knowledge sharing. Furthermore, offering diverse sharing formats, such as videos, articles, livestreams, or infographics which allows students to choose the medium they feel most comfortable with, thereby improving their adaptability to knowledge-sharing activities.

For faculty members, creating a trustworthy and supportive environment through clear engagement guidelines, active moderation, and student moderators can enhance knowledge-sharing behavior. Faculty can encourage collaboration by designing interactive activities, recognizing student contributions, and leveraging diverse content formats such as videos, discussion threads, and live Q&A sessions. Additionally, ensuring accessibility and flexibility in participation will help students adapt more easily, fostering a dynamic and sustainable online learning environment.

### 4.2. Limitations and avenues for further research

This study has brought many important theoretical implications, helping to clarify the factors affecting students' knowledge sharing behavior in virtual communities, and at the same time offering practical recommendations on how to enhance the efficiency of virtual communities.

However, this study has its limitations. First, this study is limited to universities in Hanoi, so the generalizability of the findings may be limited to other regions and international contexts. Second, the study ignores technological factors, such as platform design, support features, or the use of digital tools. Underexplored within the scope of this research are these elements, which are important to encourage knowledge sharing behavior. Third, the study does not compare different online student communities. This limitation restricts the ability to identify distinctive properties or factors that distinguish the knowledge sharing behavior of different groups of students with different backgrounds or contextual influences.

To overcome the limitations mentioned above, future research could include universities from different regions of Vietnam in order to increase the coverage and cultural variability of the data collected. In addition, it is still important to examine the effects of the technology in more depth, for example, the attributes linked to the platform and the relations between students in order to discover the approaches to increase the effectiveness of the virtual communities. It will also be useful in the process of achieving the goal of making new advancements in the field as varied geographical, cultural, and technological contexts will be integrated. However, it will be more effective to compare different online student communities in different contexts or sites to find out influential factors and provide more useful suggestions.

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# FACILITATING GREEN CONSUMPTION INTENTION THROUGH MINIMALISM & ITS DETERMINANTS: A THEORETICAL MODEL PROPOSAL

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**ABSTRACT**

In response to global environmental challenges driven by overconsumption and resource depletion, green consumption has emerged as a crucial strategy for sustainability. Green consumption, characterized by reducing waste, lowering carbon emissions, and choosing eco-friendly products, emphasizes responsible consumption patterns to minimize environmental harm. Alongside this, minimalism - a lifestyle centered on reducing material possessions and prioritizing quality over quantity closely aligns with green consumption principles. This paper proposes a conceptual model that integrates three key factors influencing minimalism - environmental concerns, financial considerations, and social influence as well as explores how minimalism can foster green consumption, particularly focusing on Gen Z in Vietnam. The study applies the Theory of Reasoned Action (TRA) to analyze the relationship between psychological factors and consumer behavior. This model highlights the impact of elements such as attitude (environmental and financial concerns) and subjective norms (social influence) and examines how these factors influence green consumption behavior. By synthesizing insights from international research and the socio-economic dynamics of Vietnam, this model underscores how adopting minimalist practices can reduce overconsumption, promote environmental awareness, and encourage sustainable product choices among Vietnam's young consumers. The proposed framework aims to provide actionable strategies for advancing green consumption and achieving Sustainable Development Goal (SDG 12), with a focus on fostering sustainable practices in the rapidly developing Vietnamese market.

*Keywords:* “environmental concerns”, “financial concerns”, “green consumption”, “minimalism”

## I. INTRODUCTION

### 1.1. Background of the study

The global shift towards sustainable development has intensified the focus on green consumption (Nguyen & Tran, 2025). Consumers are becoming more conscious of the ecological impact of their purchasing decisions and, as a result, are seeking products and services that reduce harm to the environment. This transition is not only a response to environmental challenges but also a reflection of changing societal values. Simultaneously, minimalism has gained prominence as a contemporary lifestyle choice, emphasizing reduced material possessions and a focus on intrinsic values (Kang et al., 2021). Notably, Generation Z, those born in the late 1990s to early 2010s, stands out for its heightened environmental consciousness (Tran et al., 2022). Members of this generation often demonstrate a clear preference for eco-friendly products and place significant emphasis on ethical and sustainable practices in their purchasing decisions. According to Andruszkiewicz et al. (2023), Gen Z has a higher sensitivity to environmental degradation, reflecting a growing preference for green consumption behaviors. Similarly, studies in Vietnam and Australia confirm that Gen Z integrates sustainability into their purchasing decisions, such as preferring green cosmetics and alternative proteins, driven by personal values and pro-environmental beliefs (Hieu et al., 2021). These findings underscore Gen Z's role in advancing green consumption through minimalism, emphasizing their potential to influence sustainable market trends globally.

Green consumption intention (GCI) reflects consumers’ willingness to prioritize eco-friendly products in their purchases (Zaremohzzabieh, 2021; Nguyen & Tran, 2025). Studies on GCI mainly focus on developed nations like Korea (Han, 2015) and Taiwan (Rahimah, 2018). Previous studies have highlighted factors such as perceived value, green trust, and social influence (Zhuang et al., 2021; Sharma et al., 2022). However, barriers like high prices and mistrust in green products remain (Tian et al., 2022). In Vietnam, GCI is increasingly relevant due to growing

environmental challenges alongside economic development. Key drivers include attitudes, trust, and eco-labeling, while pricing and availability pose challenges (Nguyen et al., 2019; Duong et al., 2022). Social media also enhances environmental awareness (Nguyen et al., 2024). Collectively, these findings provide valuable insights for policymakers and businesses to develop strategies that encourage sustainable consumption, address price barriers, and leverage digital tools to foster greater environmental responsibility among Vietnamese consumers.

Over the past few years, minimalism has become a global movement, initially rising to prominence in Asian countries. This lifestyle encourages reducing material possessions and focusing on intrinsic values. Wilson and Bellezza (2021) define minimalism through three dimensions: limited possessions, sparse aesthetics, and mindful curation, aligning it with environmental sustainability and well-being. Minimalism emerged globally as a counter-response to materialism and overconsumption, major contributors to environmental degradation (Kang et al., 2021; Druică et al., 2023). Increasing awareness of mental health and sustainability has driven more people to adopt minimalism (Kang et al., 2021; Druică et al., 2023; Hashim et al., 2023). Most studies focus on global trends or the psychological benefits of minimalism, such as well-being (Matte, 2021) and happiness (Jain et al., 2023). In Vietnam, however, minimalism remains a new concept with limited research (Nguyen et al., 2023), with very few studies exploring it as a subject of academic investigation (Chung, 2023; Nguyen & Tran, 2025). Research on minimalism's impact on consumer behavior and sustainable consumption in Vietnam is scarce, creating opportunities for further exploration. Its growing adoption, especially among younger generations, reflects cultural and economic shifts toward simplicity and sustainability. Minimalism's principles can help tackle overconsumption, waste management, and environmental challenges, warranting deeper academic and practical study.

The relationship between minimalism and GCI is similarly underexplored, particularly in emerging markets like Vietnam. Globally, minimalism fosters mindful, eco-friendly consumption by reducing waste and prioritizing essential purchases (Wilson & Bellezza, 2021; Kang et al., 2021). Despite these synergies, empirical evidence linking minimalism to GCI remains limited. In Vietnam, where minimalism and GCI are nascent, studies like Chung (2023) explore minimalism's growing appeal, while Nguyen (2023) identifies barriers to green consumption, such as cost sensitivity, skepticism toward eco-labels, and limited product availability. This gap is especially relevant for Generation Z, a key demographic influencing consumption trends. This is especially pertinent for Generation Z, who, despite their environmental awareness, face materialistic pressures, highlighting an opportunity to advance sustainable practices.

Addressing this gap, this study introduces a conceptual framework to investigate the factors of minimalism and ít impact on GCI in Vietnam, with a particular focus on Gen Z consumers. By addressing the unique consumption behaviors and attitudes of this demographic, the research seeks to contribute to both theoretical advancements and practical applications in sustainable consumption. Given the growing urgency of promoting sustainable practices amid global environmental challenges, the findings could offer actionable solutions for businesses and policymakers to encourage green consumption in Vietnam's dynamic and influential Gen Z market.

### 1.2. Research Questions and Objectives

To fill this gap, the research aims to investigate green consumption intention through minimalism and its determinants. There are several main objectives of the research:

– RO1: To examine the relationship between minimalist lifestyles and green consumption intention among Gen Z.

– RO2: To ascertain the interactions of environmental concerns, financial concerns, and social influence impacting minimalism among Gen Z.

– RO3: To analyze the correlation between environmental concerns and green consumption intention among Gen Z.

– Three key questions will be addressed to achieve the stated objectives:

– RQ1: How does the adoption of minimalism correlate with Gen Z's green consumption intention?

– RQ2: How are the main factors influencing minimalism among Gen Z?

– RQ3: Is there a significant relationship between environmental concerns and Gen Z green consumption intention?

## II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### 2.1. Conceptual Foundation

**Minimalism**

The concept of minimalism is defined as a lifestyle that embodies the importance of reducing consumption and curating possessions to only those that are essential (Martin-Woodhead, 2022). This approach encourages intentional living by restricting material excess and maintaining a focus on simplicity. According to Matte et al. (2021), minimalism encourages individuals to reassess their core priorities, shifting focus from material possessions to meaningful relationships and fulfilling activities that add depth and purpose to life, reflecting a conscious effort to prioritize simplicity and intentionality over materialism. Minimalism, as researched by (Kang et al, 2021), emerged as a prominent lifestyle in Asian countries, with Japan being a notable example. While minimalism has garnered global attention, yet its interpretation and adoption can differ significantly across cultural contexts. Notably, in collectivist cultures, the concept of minimalism remains underexplored within academic research (Druică et al, 2023). This gap is particularly important to address, given that minimalism not only encourages a simplified lifestyle but also aligns with environmental sustainability by promoting mindful consumption patterns.

**Green Consumption Intention**

Green Consumption Intention (GCI) refers to consumers' willingness to purchase environmentally friendly products, influenced by personal values, beliefs, and external factors (Choi & Johnson, 2019), which serves as a key predictor of sustainable consumption behavior (Prentice et al., 2019). It reflects consumers' drive to seek out products from brands committed to sustainable manufacturing, despite external environmental influences (Nur et al., 2021). Eco-conscious purchasing involves choosing products that reduce environmental harm, are recyclable, and contribute to sustainability efforts (Djaelani et al., 2020). Although GCI has been widely examined in developed markets such as South Korea and Taiwan (Lee, 2017), research remains limited in emerging economies (Amin & Tarun, 2021). Understanding how economic and cultural contexts influence GCI is essential for businesses and policymakers aiming to promote sustainability. Encouraging green consumption requires addressing not only individual motivation but also systemic factors shaping consumer choices. By fostering environmental awareness and improving access to sustainable products, GCI can drive meaningful changes in consumer behavior, ensuring that sustainability becomes a fundamental consideration in purchasing decisions.

**Theory of Reasoned Action (TRA)**

The Theory of Reasoned Action (TRA), developed by Fishbein and later refined with Ajzen in 1975, explains the relationship between attitudes, behavioral intentions, and human actions. According to TRA, individual behavior is primarily driven by behavioral intentions, which are influenced by two critical factors: Attitude and Subjective Norm. Attitude reflects an individual's positive or negative evaluation of a behavior based on their beliefs about its outcomes, while Subjective Norm refers to perceived social pressure from influential figures, such as family, friends, or society, regarding whether to engage in a behavior. Together, these components make behavioral intention the strongest predictor of action. TRA has been widely applied across fields such as consumer behavior, voting patterns, and sustainable practices due to its simplicity and adaptability (Ajzen & Fishbein, 1980).

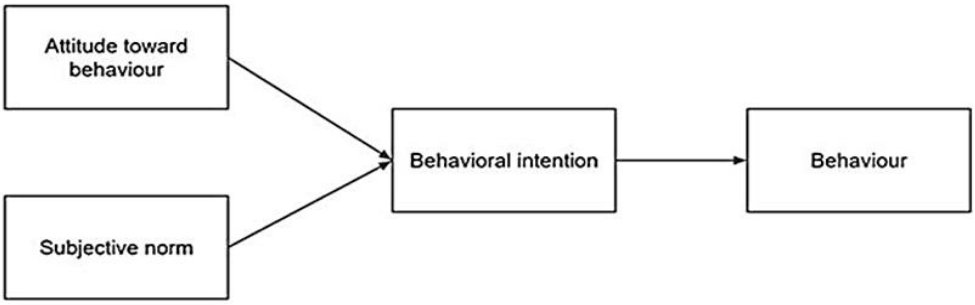



**Fig. 0.1 Theory of Reasoned Action - TRA Model**

*(Source: Pham et al., 2021)*

Minimalism is often examined through its dimensions (Kang, 2021; Wilson & Bellezza, 2021), but research on its adoption remains limited. This study applies TRA to explore how Environmental Concerns and Financial Concerns (as

components of Attitude) and Social Influence (as Subjective Norms) shape minimalist lifestyles and influence green consumption intention. Environmental Concerns are central to minimalism's sustainability focus, as those aware of ecological issues adopt minimalism to reduce consumption and waste (Jain et al., 2023; Nguyen et al., 2025). Financial Concerns also play a key role, as minimalism emphasizes expense simplification, prioritizing quality over quantity, and value-driven consumption (Meissner, 2019; Martin-Woodhead, 2021). Social Influence reinforces eco-conscious behaviors, as societal norms encourage sustainable lifestyles (Jain et al., 2023; Druică et al., 2023). Jain et al. (2023) previously examined Environmental Concerns and Social Influence together as key drivers of minimalist consumer behavior. While Financial Concerns and Minimalism have not been explicitly linked in prior studies, discussions suggest economic motivations significantly foster minimalist lifestyles, helping individuals regain autonomy amid financial insecurity and consumerist pressures (Martin-Woodhead, 2021).

Environmental Concerns, Financial Concerns, and Social Influence are interrelated yet distinct in shaping behavior. Environmental and Financial Concerns reinforce each other, as cost-saving sustainable practices boost environmental commitment. Social norms further strengthen Environmental Concerns by promoting sustainability, while Financial Concerns align with Social Influence when communities value frugality. Together, these factors complement and amplify each other while independently shaping minimalism.

This study applies the Theory of Reasoned Action (TRA) to examine how Attitude and Subjective Norms shape environmentally conscious behaviors. It investigates how Environmental and Financial Concerns (as Attitude components) and Social Influence (as a Subjective Norm) impact minimalist lifestyle adoption and green consumption. TRA offers a strong framework for understanding how consumer perceptions and social expectations drive sustainable choices. By applying this perspective, the research aims to uncover the psychological mechanisms linking attitudes, social influences, and eco-friendly behaviors.

### 2.2. Hypothesis Development

#### 2.2.1. Environmental concerns and Green consumption intention

Environmental concern has frequently been conceptualized as a broad-based attitude (Bamberg, 2003) which manifests through context-specific situations. The significance of environmental concerns (EC) is increasingly recognized in the context of sustainable consumption. EC encompasses an individual's thoughts, beliefs, perceptions, and actions related to environmental issues. It demonstrates a person's deep awareness of environmental challenges and their willingness to engage in addressing these problems (Liu et al., 2020). Environmental concerns are closely tied to emotional responses, knowledge, and readiness to adapt behavior.

Sung (2016) identified various types of anti-consumption, including the trend of anti-consumption driven by attitudes and behaviors linked to environmental concerns. People with eco-friendly concerns tend to exhibit more deliberate consumption habits, aligning their actions with minimalist lifestyles (Kuanr et al., 2020). For individuals adopting environmentally conscious lifestyles, minimalism provides a framework to align their practices with personal values and beliefs. It serves as an alternative approach to achieving environmental sustainability, prioritizing reduced consumption over material ownership. This study explores how environmental concerns act as a critical motivator for voluntary simplicity in consumer behavior. Building on prior research in sustainable consumption and minimalism, the study positions environmental concerns as a core element of voluntary anti-consumption, reflecting individuals' thoughts, beliefs, perceptions, and behaviors toward environmental issues in their consumption choices (Sung, 2016).

Based on the above arguments, the article proposes the first hypothesis as follows.

***H1: Environmental concerns positively influence the adoption of minimalist lifestyles.***

Environmental concern is frequently recognized as a critical predictor of environmentally conscious behavior, directly driving the intention to engage in green consumption. It is extensively employed as a foundational construct to elucidate pro-environmental actions, sustainable practices, and related behavioral outcomes (White & Simpson, 2013; Bamberg, 2003; Pagiaslis & Krontalis, 2014). Studies conducted by Tam & Chan (2017) underscore the role of environmental concern as a pivotal determinant positively influencing consumers' intentions to purchase eco-friendly products. According to Ramayah et al. (2010), heightened awareness and attention to environmental issues significantly facilitate the adoption of sustainable consumption practices. Furthermore, they posited that external factors exert

minimal direct influence on green consuming behavior; instead, it is the intrinsic concern for environmental preservation that compels consumers to take action. Supporting this perspective, the empirical findings of Paul et al. (2016) and Schmuck et al. (2018) identified a robust and positive association between environmental concern and the intention to engage in green consumption. On this basis, it is reasonable to postulate that individuals inclined toward purchasing green products must exhibit a heightened awareness and consciousness regarding environmental sustainability (Chi, 2021).

Hence, the following hypothesis is suggested.

***H5: Environmental concerns significantly influence the intention toward Green consumption intention***

**2.2.2. Financial concerns**

Fear is an unpleasant feeling that arises when individuals perceive a threat to their values or resources. Financial concerns, specifically, emerge when individuals are unable to meet their financial needs or assess their financial situation as inadequate (Friedman, 1991). These concerns are often accompanied by fear and anxiety, which, while distressing, can trigger adaptive responses such as improving financial management or seeking new income sources. Furthermore, Van Raaij (1991) posited that individuals' economic behavior is influenced by their subjective perception of financial stability, shaping their decision-making processes in times of financial stress. Building on these insights, this study hypothesizes that financial concerns act as a driver for the adoption of minimalist lifestyles. When individuals face financial uncertainty, they may re-evaluate their consumption patterns, prioritizing essential needs over materialistic desires. Minimalism, which emphasizes reducing material possessions and adopting intentional consumption, naturally aligns with this shift. While existing studies primarily focus on the outcomes of minimalism - such as significant financial advantages (Martin-Woodhead, 2021), improved financial well-being (Malik & Ishaq, 2023; Minter, 2023) or reduced psychological distress (Cappetto, 2020) - limited research has examined how financial concerns might serve as a catalyst for embracing minimalism.

Thus, the following hypothesis is derived.

***H2: Financial concerns has a direct positive effect on minimalism***

**2.2.3. Social influence**

Consumption is an inevitable aspect of human life, as it sustains our basic needs and supports our well-being. Social influence has emerged as a pivotal factor in understanding various societal outcomes, including education, income, and labor (Liebman et al., 2004), unemployment Topa (2001), relationships (Marmaros & Sacerdote, 2006) and etc. In addition, an increasing number of studies have been delving into its impact on customer choices.

Social influence explains the impact of our society on individuals's purchasing decisions. In some previous studies, social influence is considered as subjective norm (Wang, 2014). While social influence enhances recycling activities (Park & Ha, 2012) and drives the willingness to buy sustainable and environmentally-friendly products (Moons & De Pelsmacker, 2012); Wang (2014) proved that the social factors affect green consumption intention. On the other hand, minimalism emphasizes personal development by encouraging individuals to focus on meaningful experiences and personal values that promote environmental sustainability (Kropfeld et al., 2018) by recycling, and reducing waste. According to Nguyen and Tran (2025), this study presents the impact of minimalism on green consumption intention via pro-environmental behavior. Hence, this study aims to investigate the relationship between social influence and green consumption intention, with a focus on the mediating role of minimalism, to gain deeper insights into their relationship.

Thus, the following hypothesis is derived.

***H3: Social influence has a direct positive effect on minimalism***

**2.2.4. Minimalism and Green consumption intention**

Minimalism has gained significant influence, particularly in Japan (Dumnova, 2023). Martin (2017) describes his transition from consumerism to simplicity in Goodbye, Things: The New Japanese Minimalism. Sasaki differentiates his approach from Marie Kondo's, whose method focuses on organization rather than reducing possessions (Martin, 2017). Minimalism emphasizes eliminating excess, fostering contentment with fewer belongings, and making deliberate

purchasing choices. Green consumption intention refers to the motivation to purchase eco-friendly products that provide environmental or social benefits. Every purchase impacts health, ecosystems, and society throughout its lifecycle, contributing to a product's sustainability footprint. Green consumption has been widely examined due to its significance in mitigating environmental challenges and promoting responsible consumer choices.

Previous studies have extensively examined the link between minimalism and sustainable consumption, highlighting its role in reducing environmental impact. Research shows that materialism drives environmentally harmful behaviors (Kilbourne & Pickett, 2008), whereas minimalism fosters pro-environmental actions and ethical consumption (Lloyd & Pennington, 2020). Lloyd and Pennington (2020) found that minimalists often realign their values, opting for ethical and eco-friendly products. Similarly, Hüttel et al. (2020) emphasize resource conservation through reduced consumption, reinforcing minimalism's contribution to sustainability.

While existing research explores the broader link between minimalism and sustainability, this study focuses specifically on green consumption behavior. Although studies on minimalism's impact on green consumption intention remain limited, key research has examined its connection to eco-conscious purchasing. Beuria et al. (2024) found that minimalism, subjective norms, attitudes, and perceived behavioral control significantly influence the intention to buy eco-friendly fashion, supporting the Theory of Planned Behavior (TPB) among educated Gen Y and Z consumers in India. Chuming Qiu (2023) also confirms minimalism's role in shaping green consumption through TPB. Recently, Nguyen and Tran (2025) explored how minimalism affects green consumption intention via pro-environmental behavior. This study investigates how minimalism as a lifestyle directly influences green consumption intention and strengthens their relationship.

Hence, the following hypothesis is derived.

***H4: Minimalism has a direct positive effect on Green consumption intention***

### 2.3. Research model

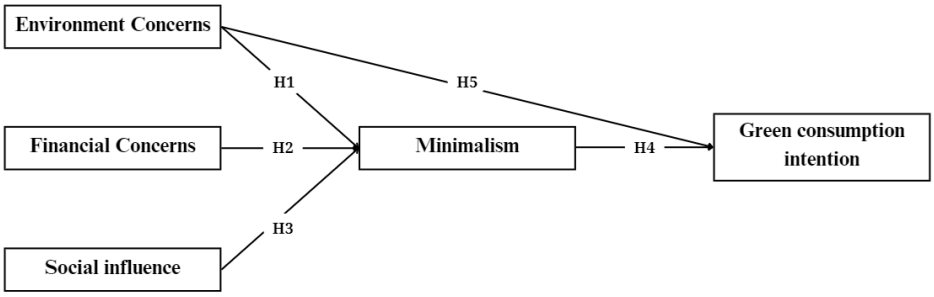



**Fig. 0.2 Proposed Conceptual Model**

## III. CONCLUSION

### 3.1 Research Findings

Green consumption has become an essential strategy in pursuing sustainability, emphasizing the responsible use of resources and adopting environmentally friendly practices. By minimizing and prioritizing products and services, green consumption intention is critical for fostering sustainable development. In addition, minimalism emphasizes the reduction of material possessions and the prioritization of quality over quantity. Accordingly, by encouraging mindful purchasing decisions and sustainable life, minimalism promotes a more intentional approach to green consumption. The relationship between minimalism and sustainable consumption has been proved in previous studies, but few studies investigate the impact of minimalism on green consumption intention. Besides, generation Z - young people currently represents a demographic with significant influence in the realm of consumer behavior. Their participation in shopping activities reflects a tendency to follow materialistic pursuits, driven by emerging trends and societal expectations. This study introduces a conceptual framework that synthesizes three main explaining variables of minimalism: environmental concerns, financial concerns, and social influence; it also examines the potential of minimalism to promote green consumption intention, with the survey for Gen Z in Vietnam.

### 3.2 Limitations and Future Research Directions

As a result, this research suggests several directions for future research. The proposed theoretical model explores the relationship between minimalism and green consumption intention (GCI) among Gen Z in Vietnam. However, several limitations should be acknowledged, which offer opportunities for future quantitative research. As a theoretical model, this study lacks empirical validation. Future studies should employ quantitative methods such as structural equation modeling (SEM) to test the proposed relationships using survey data. A larger sample size representative of Gen Z consumers in Vietnam would enhance the generalizability of findings. The research should employ validated measurement scales for key constructs, such as the Minimalist Lifestyle Scale (Wilson & Bellezza, 2021), the Green Purchase Intention Scale (Dima, 2013), Environmental Concern Measures (Paul et al., 2016), Financial Concern Measures (Wilson et al., 2020), Social Influence (Druică et al., 2023). A stratified random sampling approach targeting Gen Z consumers across different regions in Vietnam will enhance data generalizability. Besides, the study focuses on three determinants: Environmental concerns, financial concerns, and social influence; while other potential factors remain unexplored offering new directions for further investigation. Additionally, this research does not consider longitudinal changes in consumer behavior, meaning that future studies could benefit from tracking shifts over time to better understand the causality and evolution of minimalist and green consumption tendencies. Moreover, cultural and economic contexts may significantly moderate these relationships, suggesting the need for comparative studies across different countries or socio-economic groups to enhance the model's applicability. Addressing these limitations through rigorous empirical research will provide a stronger foundation for understanding the role of minimalism in fostering sustainable consumption behaviors.

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# EXPLORING THE LINKAGE BETWEEN CUSTOMER PERSONALITY TRAITS AND E-CUSTOMER CITIZENSHIP BEHAVIOUR IN MOBILE COMMERCE APPLICATIONS

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**ABSTRACT**

The popularity of mobile devices facilitates the increasing adoption of mobile commerce applications, creating new opportunities for businesses to co-create with customers, particularly Gen Z. To better understand the individual-level factors driving customer behaviour, it is crucial to study the impact of personality traits, specifically the Big Five personality model, on e-Customer Citizenship Behaviour (e-CCB) in mobile commerce applications. This paper investigates the relationship between the Big Five personality model including extraversion, conscientiousness, neuroticism, agreeableness, openness, and e-CCB among Gen Z consumers in Vietnam. Drawing on peer-reviewed research, the study explores how these personality traits influence behaviours in mobile commerce. The findings highlight the significant role of extraversion, conscientiousness, and neuroticism in promoting e-CCB, while agreeableness and openness show no correlation. This paper also provides insights into how personality traits shape customer behaviour and offers recommendations for marketers to develop strategies for promoting e-CCB, especially with Gen Z customers in mobile commerce applications.

*Keywords*: "Customer citizenship behaviour", "E-customer citizenship behaviour", "e-CCB", "mobile commerce applications", "personality traits"

## I. INTRODUCTION

### 1.1 Background of the study

Mobile commerce, defined as transactions of monetary value conducted via mobile networks using handheld devices, has become a significant driver of global retail activity (Ngai & Gunasekaran, 2007). In 2024, mobile commerce accounted for 57 percent of e-commerce revenue, with this figure then projected to increase to 63 percent by 2028, highlighting the growing reliance on mobile platforms for online shopping (Statista, 2024a). Additionally, global mobile commerce revenue was estimated at 2.07 trillion USD in 2024, projected at 3.35 trillion USD by 2028, representing nearly 80 percent of retail website visits and 66 percent of worldwide orders (Statista, 2024a). In Vietnam, this growth is particularly pronounced, with mobile commerce revenue reaching 3.18 billion USD in 2021 and expected to rise to 8.67 billion USD by 2026 (Statista, 2024b). This trend demonstrates the importance of mobile commerce globally and locally, encouraging retail businesses to refine their marketing strategies for mobile platforms to maximise profitability.

In today's highly competitive retail environment, particularly within the online retail sector, e-CCB has emerged as a critical focus for businesses. This shift stems from the evolving nature of customer interactions, which are increasingly mediated by virtual interfaces rather than traditional face-to-face engagement with service personnel (Meuter et al., 2000). Moreover, previous research has emphasised the pivotal role of customer citizenship behaviour (CCB) in the success and sustainability of e-retail businesses, given the substantial economic and social benefits these behaviours yield (Chevalier & Mayzlin, 2006; Garma & Bove, 2011; Rosenbaum & Massiah, 2007). From an economic perspective, past research demonstrated that CCB contributes to enhanced customer satisfaction and loyalty, both of which are essential for long-term business success (Assiouras et al., 2019). Additionally, customers who engage in proactive behaviours such as recommending a brand or assisting other consumers significantly influence the financial outcomes of firms. These activities foster increased loyalty and customer lifetime value, as economic exchanges between customers and firms are sustained through mutually beneficial relationships, ultimately leading to improved customer retention rates (Mandl & Hogreve, 2020; Segarra-Moliner & Moliner-Tena, 2022). In terms of social benefits,

positive relationship between CCB and individuals' perceived contributions to the welfare of others, which, in turn, enhances overall happiness (Hsieh et al., 2018). This highlights the broader societal value of such behaviours, extending beyond the immediate economic implications. Taking all that into consideration, it is evident that the diverse economic and social benefits associated with e-CCB underscore the importance of examining its antecedents. By identifying effective strategies to promote and enhance these behaviours, retail businesses can not only achieve higher profitability but also contribute to broader societal well-being.

Personality traits are a particularly important factor in shaping e-CCB within the context of mobile commerce (Mishra & Vaithianathan, 2015; Pagani & Mirabello, 2011). Despite this, research on the role of personality traits in influencing e-CCB remains limited. This calls for further examination of how consumer personality traits affect e-CCB, aligning with numerous researchers' recommendations to explore personality traits as antecedents of e-CCB (Assiouras et al., 2019; Men et al., 2024; Tung et al., 2017). In this context, it is recommended to adopt the Big Five personality model, a framework encompassing conscientiousness, extraversion, agreeableness, neuroticism, and openness to experience (Mitrega et al., 2022). As highlighted in organisational literature, this model is considered a significant predictor of voluntary behaviours in customer domains (Choi & Hwang, 2019).

This study aims to address these research gaps by exploring the relationship between personality traits and e-CCB, examining how e-CCB impacts mobile commerce, and providing insights to optimise customer engagement and business outcomes in mobile commerce applications.

### 1.2. Research questions and objectives

This study aims to investigate the influence of customer personalities on e-CCB within the context of mobile commerce applications, thereby making suggestions for promoting e-CCB. Specific objectives are as follows:

- RO1: To gain an overview of the theoretical foundations of e-CCB and the Big Five Personality Model
- RO2: To examine the linkage between particular personality traits on e-CCB, given the context of mobile commerce applications
- RO3: To suggest for applications providers to promote e-CCB among young Vietnamese consumers
- To accomplish these objectives, this study will address the following research questions:
- RQ1: What are key theories regarding e-CCB and the Big Five Personality Model
- RQ2: What is the linkage between customer personalities and e-CCB in the context of mobile commerce applications?
- RQ3: What can be done to promote e-CCB among young Vietnamese consumers?

## II. MATERIAL AND METHOD

### 2.1. Hypotheses Development

#### 2.1.1. E-Customer Citizenship Behaviour

CCB refers to "voluntary and discretionary behaviours that are not required for the successful production and/or delivery of the service but that, in the aggregate, help the service organization overall" (Groth, 2005). E-CCB, which is the adaptation of CCB in an internet service environment, includes activities such as sharing comments, recommendations, and information aimed at fostering long-term service improvements (A. Anaza & Zhao, 2013). It also involves offering useful guidance, positive feedback, links, or pertinent details to assist other customers (Salem & Alanadoly, 2024; Türkdemir et al., 2023). E-shoppers exhibiting positive extra-role behaviours like e-CCB are deemed good online citizens, as their actions enhance service quality for e-retailers. Given that online services often require customers to participate in the delivery process, their readiness to exceed expected roles by supporting both the business and other e-shoppers reflects their commitment to the e-retailer's success (Anaza, 2014). E-CCB contributes to fostering customer loyalty, encouraging positive e-word-of-mouth, and promoting business sustainability. It also helps organisations gain a competitive edge, strengthen customer connections, and enhance the brand image by offering personalised products (Assiouras et al., 2019; Gong & Park, 2023; Li & Wei, 2021). For the mobile commerce apps context, e-CCB is reflected in actions such as providing constructive feedback, expressing appreciation for quality service, offering assistance to other customers, addressing others' service-related difficulties, and guiding them in proper service usage (Ahn et al., 2019). These behaviors are used as the scale for the research of e-CCB.

### 2.1.2. The Big Five Personality Model

Individuals display relatively consistent responses to environmental stimuli, reflecting their underlying personality traits (Kassarjian, 1971). Existing research highlights a significant relationship between personality traits and behaviours associated with mobile commerce applications (Mishra & Vaithianathan, 2015; Pagani et al., 2011). This study employs the Big Five Personality model to examine customer's individual characteristics. The model is widely recognised as a highly replicable and robust framework for understanding personality structure (Angelini, 2023; Costa Jr & McCrae, 1992; Digman, 1990). The Big Five model outlines five key dimensions of personality: extraversion, agreeableness, conscientiousness, neuroticism, and openness (Costa & McCrae, 1999).

**Extraversion**

Extraverted individuals are energetic, sociable, and outgoing (Costa & McCrae, 1992), often sharing experiences online to satisfy their social communication needs (Bowden-Green et al., 2021). Studies reveal a positive relationship between extraversion and organisational citizenship behaviour, which extends to CCB in mobile app contexts (Gong & Yi, 2021; Mitrega et al., 2022). Thus, the following hypothesis is derived:

H1: Extraversion is positively related to shoppers' e-CCB.

**Agreeableness**

Agreeable individuals value trust, kindness, and cooperation, often prioritising social harmony over their own needs (DeYoung et al., 2002). They are more likely to participate in supportive activities, such as sharing online reviews (Adamopoulos et al., 2018). It then further suggested that agreeableness is linked to knowledge-sharing behaviours, as agreeable individuals are typically more helpful, generous, and collaborative (Barrick & Mount, 1991; Matzler et al., 2011). Therefore, the following hypothesis is proposed:

H2: Agreeableness is positively related to shoppers' e-CCB.

**Conscientiousness**

Conscientious individuals display traits such as diligence, responsibility, and organisation (McCrae & Costa Jr, 1997). They are inclined to assist others and share information online, demonstrating strong customer-focused behaviours (Adamopoulos et al., 2018). Similarly, past research found that conscientiousness is positively associated with individuals' intentions to share knowledge, as they typically fulfil their responsibilities and are more willing to contribute to the success of a community through knowledge sharing (Wang & Yang, 2007). Hence, the following hypothesis is suggested:

H3: Conscientiousness is positively related to shoppers' e-CCB.

**Neuroticism**

Neuroticism is characterised by traits such as anxiety, fearfulness, and insecurity (Barrick & Mount, 1991). Neurotic individuals often seek social recognition through online engagement, improving their mood and CCB (Yang et al., 2023). Research also indicates a positive link between neuroticism and online review activity (Picazo-Vela et al., 2010). Thus, the following hypothesis is derived:

H4: Neuroticism is positively related to shoppers' e-CCB.

**Openness**

Open individuals are curious, creative, and open to new ideas and technologies (McCrae & Costa Jr, 1997). They often engage with online platforms to share information, demonstrating strong customer-oriented behaviours (Marshall et al., 2015). Previous research has also shown that openness is positively associated with knowledge-sharing intentions (Cabrera et al., 2006). As a result, the following hypothesis is put forward:

H5: Openness is positively related to shoppers' e-CCB.

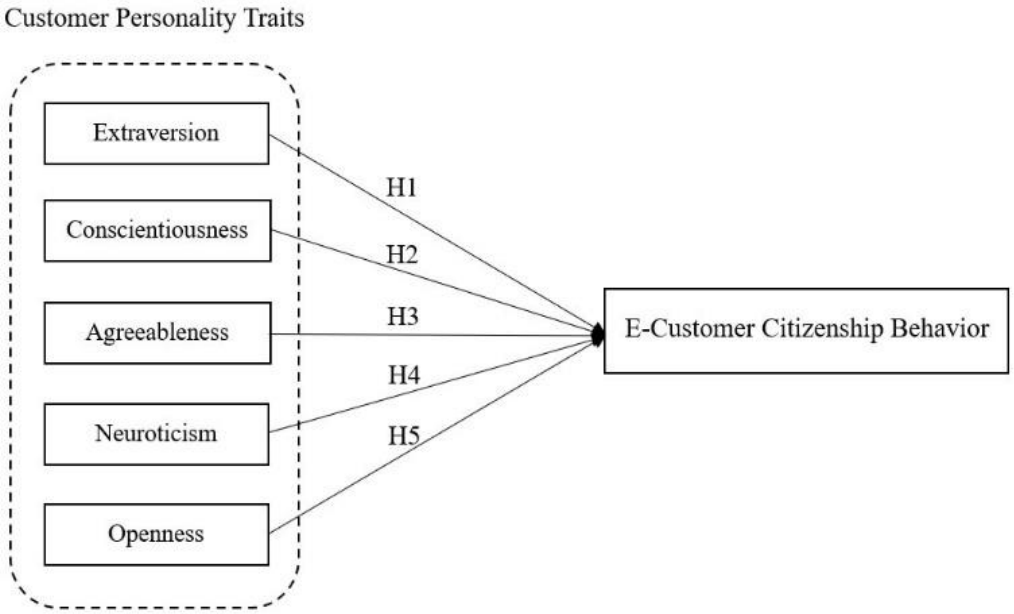



**Figure 1. Conceptual model**

### 2.2. Research method

The study was carried out using a quantitative approach and a self-administered survey utilized a convenience sampling method. Its purpose is to test the proposed hypotheses (Figure 1) about the relationship between the personality traits from The Big Five personality model and e-CCB. From September to November 2024, an online questionnaire was distributed to Gen Z consumers through social media platforms.

The questionnaire consisted of 3 parts. The first section aimed to understand participants' behaviour in mobile commerce applications. The next part includes questions about five independent variables, such as extraversion, conscientiousness, agreeableness, neuroticism, and openness to experience, and the dependent variable, which is e-CCB was constructed based on past studies (Ahn et al., 2019; Yoo & Gretzel, 2011). All statements used a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The last part is about demographics, including questions about respondents' age, gender, educational level, income level, and area of residence. These were measured using a nominal scale to analyze the representativeness of the study sample.

Out of 513 responses, 43 were excluded due to missing data or outliers, leaving 470 valid participants. Of these, 70.9% were female, and 29.1% were male, with age distribution as follows: 4% aged 12–18, 86.8% aged 19–22, and 9.1% aged 23–27. The majority of respondents were university students (87.7%) residing in metropolitan areas, including Ha Noi (56.6%) and Ho Chi Minh City (36.6%). Regarding mobile commerce usage, 62.3% had used such applications for over three years, 31.1% for one to three years, and 6.2% for less than one year. Monthly online shopping expenditures varied, with 50.2% spending between 500,000 and 2 million VND, 36% spending below 500,000 VND, and 13.8% spending above 2 million VND.

The results were then coded and analyzed using SPSS 26 and AMOS 24, following a two-step recommended by (Anderson & Gerbing, 1988). The first step involved confirmatory factor analysis (CFA) to validate the measurement model, while the second tested the structural equation model (SEM).

## III. RESULT AND DISCUSSION

### 3.1. Results

#### 3.1.1. Reliability analysis

First, this study used Cronbach’s alpha (Coefficient alpha) as a criterion of reliability. Table 1 illustrated that Cronbach’s alphas ranged from 0.838 to 0.869, while the Corrected Item-Total Correlation varied between 0.558 and 0.753. Thus, all scales are considered reliable and appropriate for further analysis.

**Table 1. Reliability analysis**

| Variables | | Cronbach's alpha values | Corrected Item-Total Correlation | Number of deleted items |
|---|---|---|---|---|
| **Extraversion** | EXT | 0.869 | 0.665-0.728 | 0/5 |
| **Conscientiousness** | CONS | 0.838 | 0.589-0.714 | 0/5 |
| **Agreeableness** | AGR | 0.838 | 0.613-0.687 | 0/5 |
| **Neuroticism** | NEUR | 0.845 | 0.618-0.683 | 0/5 |
| **Openness** | OPE | 0.854 | 0.558-0.753 | 0/5 |
| **E-CCB** | ECCB | 0.869 | 0.620-0.751 | 0/5 |

***Note:*** *Corrected Item-Total Correlations are demonstrated in the lowest and highest values*

### 3.1.2. Measurement model assessment

Before hypotheses testing, confirmation factor analysis (CFA) was adopted to evaluate overall model fitness. Results revealed that the measurement model exhibits a high degree of accuracy in predicting the studied phenomena, with all indices meeting satisfactory criteria, as shown in Table 2.

**Table 2. Assessment of model fitness**

| Index | Analysis value | Conclusion |
|---|---|---|
| CMIN/DF | 2.353 | Good fit (≤ 3) |
| GFI | 0.875 | Acceptable (> 0.8) |
| CFI | 0.922 | Good fit (≥ 0.9) |
| TLI | 0.913 | Good fit (≥ 0.9) |
| RMSEA | 0.054 | Good fit (≤ 0.06) |

As part of the measurement model, discriminant validity and convergent validity were then examined. The item OPE3 from the OPE construct was removed due to unsatisfactory composite reliability (CR). All average variance extracted (AVE) values were above 0.5 and exceeded the squared correlations between constructs, demonstrating adequate convergent and discriminant validity for each scale. The results are detailed in Table 3.

**Table 3. Model Validity Measures**

| | CR | AVE | MSV | MaxR(H) | EXT | CONS | AGR | NEUR | OPE | ECCB |
|---|---|---|---|---|---|---|---|---|---|---|
| EXT | 0.870 | 0.573 | 0.204 | 0.872 | 0.757 | | | | | |
| CONS | 0.839 | 0.512 | 0.249 | 0.846 | 0.451*** | 0.715 | | | | |
| AGR | 0.838 | 0.510 | 0.285 | 0.841 | 0.346*** | 0.499*** | 0.714 | | | |
| NEUR | 0.847 | 0.526 | 0.207 | 0.853 | 0.124* | 0.290*** | 0.455*** | 0.725 | | |
| OPE | 0.807 | 0.512 | 0.285 | 0.811 | 0.259*** | 0.465*** | 0.534*** | 0.424*** | 0.715 | |
| ECCB | 0.866 | 0.568 | 0.218 | 0.889 | 0.394*** | 0.467*** | 0.447*** | 0.422*** | 0.340*** | 0.754 |

***Note(s):*** *CR: composite reliability; AVE: average variance extracted; MSV: maximum shared variance*
*EXT: extraversion; AGR: agreeableness; NEUR: neuroticism; CONS: conscientiousness; OPE: openness; ECCB: e-customer citizenship behavior; ***p < 0.001*

### 3.1.3. Structural model assessment

Once the measurement model for reliability and validity had been tested, SEM analysis was performed to test the hypotheses. H1, H2, H3, H4 were all accepted, with the following findings: $p < 0.05$; H1: $\beta = 0.213$; H2: $\beta = 0.237$; H3: $\beta = 0.135$; H4: $\beta = 0.279$. Conversely, H5 was not supported due to exceeding p-value ($p = 0.812$). The impact of personality traits on e-CCB follows a hierarchy, with neuroticism, conscientiousness, extraversion, and agreeableness exerting the most to least influence, respectively.

Findings indicated that all personality traits, except openness, play a crucial role in enhancing e-CCB ($p < 0.05$; H1: $\beta = 0.213$; H2: $\beta = 0.237$; H3: $\beta = 0.135$; H4: $\beta = 0.279$). This means individuals with high neuroticism, conscientiousness, extraversion, and agreeableness tend to perform extra-role behaviour. Motivated by a desire to socialise, extroverted individuals would likely assist other customers willingly and enthusiastically. According to

Buckingham and Corkeron (2020) and Mammadov (2022), conscientiousness stands out as a strong predictor of performance, as this personality type is associated with diligence and a sense of responsibility. As such, individuals who possess this trait are more likely to make meaningful contributions that enhance the overall success of the service. Regarding H3, it is understandable that agreeableness is positively linked with e-CCB performance since this trait is typically characterised by friendliness, helpfulness, sociability, and empathy (Cuperman & Ickes, 2009). In particular, agreeable users tend to be sympathetic, readily sharing their knowledge and skills with fellow shoppers who have difficulties using mobile commerce applications for online shopping, including searching for products and utilising app features. With a strong sense of collaboration, they would also help the platforms enhance user experience by submitting feedback based on their perspectives. Notably, neurotic customers, albeit characterised by anxiety, fear, and emotional instability, are likely to perform voluntary behaviours, which can be attributed to their need for recognition as a way to alleviate emotional challenges (Yang et al., 2023).

By contrast, there is no correlation between openness and e-CCB (H5: p = 0.812), which indicates the reluctance of highly open customers to engage in e-CCB. Drawn to novelty seeking and personal exploration, individuals with a high scores on openness may prioritise discovering new things, such as app features, over investing in supporting others. Hence, they would engage neither in contributing ideas to the applications nor in offering other users guidance on how to use the app correctly, as these activities may not resonate with their interests.

**Table 4. Results of hypotheses testing**

| Hypotheses | | Path estimate | P-Value | Conclusion |
|---|---|---|---|---|
| H1 | ECCB ← EXT | 0.213 | *** | Supported |
| H2 | ECCB ← CONS | 0.237 | *** | Supported |
| H3 | ECCB ← AGR | 0.135 | 0.037 | Supported |
| H4 | ECCB ← NEUR | 0.279 | *** | Supported |
| H5 | ECCB ← OPE | -0.015 | 0.812 | Not supported |

***Note(s):*** *ECCB: e-CCB; EXT: extraversion; CONS: conscientiousness; AGR: agreeableness; NEUR: neuroticism; OPE: openness; ***p < 0.001; path estimates are standardised*

### 3.2. Discussion

#### 3.2.1. Discussion on the linkage between personality traits and e-CCB within mobile commerce applications

This study addresses a critical research gap by exploring the mechanisms through which customer personality traits influence e-CCB within the context of mobile commerce applications (Choi & Hwang, 2019; Men et al., 2024; Mitrega et al., 2022). The findings confirm a significant relationship between customer personality traits and e-CCB, indicating that a deeper understanding of these traits can enhance the effectiveness of strategies aimed at promoting e-CCB. This emphasises the importance of considering the nuanced effects of customer personality traits for mobile commerce applications.

The results demonstrate that four of the Big Five personality model, including neuroticism, extraversion, conscientiousness, and agreeableness, are particularly influential in encouraging e-CCB in the mobile commerce apps context. Customers who exhibit high levels of these traits are more likely to provide feedback on their experiences with mobile commerce applications and assist other customers in resolving issues. These results underscore the importance for managers to design mobile commerce experiences that cater to these specific personality traits, thereby enhancing levels of e-CCB.

Notably, the study also reveals that only openness does not affect e-CCB within this context. This finding indicates that this personality trait does not influence customers' citizenship behaviours in mobile commerce environments. The absence of impact from this trait may be attributed to the unique characteristics of digital platforms or their inherently transactional nature. This insight provides an opportunity for retail businesses to allocate resources more strategically by prioritising personality traits with a stronger influence on e-CCB, thereby enhancing the outcomes of their efforts and minimising costs associated with fostering these behaviours.

#### 3.2.2. Recommendations

First, by leveraging insights into neuroticism, extraversion, conscientiousness, and agreeableness businesses can craft personalised experiences that resonate with each customer segment. A fundamental step in this process is the categorisation of customers, which can be achieved by utilising Big Data and Digital Footprints. Analysing user interaction patterns, such as social sharing frequency, feedback activities, and purchase behaviours, enables the identification of personality-driven preferences. Machine learning algorithms can further refine this process by detecting behavioural cues linked to specific traits.

Second, neurotic individuals are prone to anxiety, stress, and negative anticipation. To support these customers, mobile commerce platforms should create an environment that minimises stress and instils a sense of security. Providing real-time customer support, such as a chatbot or live agent, can help alleviate concerns about purchases or service issues. For these customers, transparent and detailed product information (e.g., shipping timelines, return policies, or product guarantees) can mitigate doubts and fears. To incentivise their feedback, platforms can appeal to their fear of negative outcomes by crafting messages that emphasise the importance of their input in preventing future issues and enhancing the overall experience. These messages should highlight the role of customer feedback in improving service quality and ensuring more positive outcomes, thereby appealing to their concerns about avoiding negative experiences. Platforms could also implement simple and low-effort feedback mechanisms, such as single-tap ratings or emoji-based surveys, to reduce decision fatigue.

Third, customers with extraverted traits exhibit behaviours such as initiating conversations, feeling comfortable in social settings, and seeking attention. Mobile commerce applications can harness these tendencies by creating opportunities for interaction and social engagement. A dedicated "community hub" within the app, where users can discuss products or share reviews can cater to their sociable nature. Additionally, to capitalise on their ease of making connections, platforms could implement a referral program that rewards users for bringing in friends. These rewards could include discounts, exclusive access to new products, or virtual badges that are personalised and linked to the Digital Footprints, which help encourage extraverts to promote the platform actively. For those who enjoy being the centre of attention, creating user-generated content competitions, such as “Top contributor”, “Best product review” or “Creative use of the product”, can provide an avenue to showcase their talents and gain recognition.

Fourth, conscientious customers are detail-oriented, disciplined, and highly organised. To align with their methodical nature, mobile commerce platforms should prioritise functionality that enhances planning and precision. Features like advanced filtering and sorting options for products, detailed product descriptions, and side-by-side comparisons allow conscientious users to make informed decisions. Customisable shopping lists or goal-setting tools can help them track their purchases and adhere to their plans. For instance, if a user regularly buys a specific item, the platform can suggest recurring purchase reminders or subscription options, ensuring convenience and consistency. Platforms can also provide comprehensive tracking of order status, detailed return policies, and responsive customer support. Offering “progressive feedback mechanisms”, where users receive updates on how their specific feedback, not only rating from 1 to 5, improves the service, can further instil confidence and encourage participation.

Fifth, customers with agreeableness personalities usually show their helpfulness and collaborativeness. There should be an information system developed to enable customers to assist one another, thereby reducing reliance on traditional support centre. This system would make agreeable customers help others by sharing their personal experiences or the issues which they are familiar with. In return, customers who assist could receive tangible benefits or incentives, thereby fostering a collaborative and supportive community environment on the platform. Furthermore, it is recommended that the platform implement or maintain a feature that enables users to rate the usefulness of customers’ reviews. This functionality has been successfully employed by platforms such as Google Maps, which allows users to assess the quality of reviews for places they have visited and to accrue corresponding contribution points. Although similar features are present on platforms like Shopee, there is currently no notification regarding the number of 'helpful review' votes received. Addressing this shortfall could further incentivise user engagement, which in turn allows them to be more active in e-CCB.

## IV. CONCLUSION

The study's findings on the impact of the Big Five personality model on e-CCB make meaningful theoretical contributions by advancing dynamic capabilities theory and addressing a research gap in examining the relationship between the Big Five personality model and e-CCB and understanding CCB in mobile commerce environments (Choi & Hwang, 2019; Men et al., 2024; Mitrega et al., 2022). In terms of which individual personality traits drive CCBs in mobile commerce settings, the study found positive effects of extraversion, conscientiousness, agreeableness, and neuroticism on e-CCB. In contrast, the lack of an impact from openness challenges their applicability to e-CCB, suggesting the need to reassess traditional frameworks for mobile commerce applications. By implementing the findings, the study also offers insights into how mobile commerce applications can deploy customer personality traits to enhance the performance of e-CCB, which, in turn, contributes to improving their outcomes.

Despite the significance of the study's insights into customer citizenship behaviour in the context of mobile commerce applications, several limitations require further investigation. First, the reliance on a convenience sample through surveys limits the generalisability of the findings. Future research could incorporate varied methods, such as interviews, participant observations, or focus groups, to achieve a more in-depth understanding of CCB. Comparing results across these methods could also strengthen the validity of the findings. Second, the emphasis on the Big Five personality model as a primary determinant of e-CCB highlights the need to reconsider traditional personality models. Investigating alternative frameworks may provide more robust explanations for customer behaviour in the context of mobile commerce. Third, the findings' applicability to other generational groups, such as Gen X or Millennials is limited by the study's focus on Gen Z. Future research should explore differences across generations to better understand how various age groups engage with mobile commerce, enabling more effective and tailored marketing strategies. Addressing these limitations would advance both theoretical understanding and practical applications in CCB research, particularly in mobile commerce.

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# THE EFFECTS OF ECO-FRIENDLY PACKAGING ON PURCHASE INTENTION OF ORGANIC FOOD: THE MEDIATIONS OF PERCEIVED VALUE AND TRUST OF VIETNAMESE CUSTOMERS

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**ABSTRACT**

Organic food has become a regular choice in shopping list of Vietnamese consumers who concern about their health and environment. Meanwhile, sustainable packaging solutions has risen in popularity in the market, but businesses still face challenges in attracting customer attention through packaging. Therefore, this study aims to investigate the effects of eco-friendly packaging on purchase intention of organic food as well as to explore the meditation of perceived values and customer trust in the relationship between eco-friendly packaging and purchase intention. Data is collected from the three most prominent cities in Vietnam with 385 millennial respondents. The data is tested against the research model using structural equation modeling with SMART-PLS 4.1. The results provide valuable findings for businesses to proceed eco-friendly packaging strategies, especially packaging design to enhance customer perceived values and trust, then boost their purchase intention of organic food. The study also has some limitations in terms of survey scale and conditions that future research may focus on to get more representative results. This study is one of first few research about the effects of eco-friendly packaging on purchase intention of Vietnamese consumers. Furthermore, it contributes to the extension of TPB and SOR, which has not been focused on much in earlier studies about consumer behaviros in the context of organic food.

*Key words:* "S-O-R", "Theory of planned behavior", "Organic food", "Eco-friendly packaging", "Perceived value", "Trust"

## I. INTRODUCTION

Packaging materials are one of the major causes of pollution from household consumption (Gupta & Prusty, 2023). With the rise of environmental concerns, eco-friendly packaging is considered by manufacturing firms in doing business to retain consumer purchasing intention (Wong et al., 2019). In Vietnam, food packaging is an indispensable part of the food industry, not only because of its function of protecting and preserving food, but also because it is a factor that creates attraction and brand recognition for products. According to the Vietnam Ministry of Industry and Trade, food packaging currently accounts for 30-50% of the packaging industry, clearly demonstrating the symbiotic relationship between the two fields: packaging and food (*Giants Lead Green Packaging Future*, 2023). In order to minimize negative impacts on the environment and create benefits for consumers, the trend of sustainable food packaging is becoming more and more popular in the food and beverage industry (Thanh An, 2024). However, packaging is one of the challenges for organic food businesses, especially individual one and small households when packaging is not attractive enough for customers to recognize the brand and understand the product (Dang, 2024).

In recent years, environmental and health concerns have made consumers more interested in organic food. Vietnamese consumers are no exception as this is increasingly evident in their daily food choices. They are more interested in nutritious foods and changing their cooking methods for a healthier life (Burrage, 2023). Therefore, organic food is gradually becoming popular and highly appreciated by Vietnamese consumers. In addition, the recent rise of information related to food safety and food poisoning has also made consumers increasingly concerned about their food choices (Ho & Van Vo, 2023), and organic food is one of the good options for consumers.

The trend of consuming organic food is increasing around the world in general and in Vietnam in particular. Despite of being considered to be small and fragmented, the Vietnam organic food market has great potential for development as it witnesses significant growth in recent years. Euromonitor's report shows that the market size reached 100 million USD in 2023, an increase of 20% compared to 2020. This growth is demonstrated by the increasing number

of organic products appearing in large supermarket chains such as Co.opmart, Winmart, Lottermart and MM Mega Market (Thi Ha, 2024).

To date, there have been many studies investigating consumers' purchase intention and behavior towards organic foods in general (Ayyub et al., 2021; Liu et al., 2021; Santos et al., 2021) and foods in eco-friendly packaging (Santos et al., 2021; Cammarelle et al., 2021). Most of them focus on factors that drive purchase intentions such as attitudes, subjective norms, and behavioral control, but have not expanded to external environmental factors such as packaging. Understanding the role of packaging in consumer behavior towards organic foods is important for businesses in this industry to pay attention to. For the above reasons, the main research question of this study is "The effects of eco-friendly packaging on purchase intention of organic foods: the mediations of perceived value and trust of Vietnamese customers." This study will contribute to the theory in the field of sustainable consumption in Vietnam on the influence of perceived valuew and trust on the intention to buy organic food in eco-friendly packaging. Furthermore, the research results also provide important information to help marketers who are planning to redesign packaging to better understand the relationship between perceived values, trust and puchase intention of organic food.

The following sections will present the background theory, research concepts and hypothesis development, research methodology, results, discussion and conclusion.

## II. MATERIAL AND METHODOLOGY

### 2.1. Theory background

#### Theory of Planned Behavior (TPB) and Stimulus-Organism-Response (SOR)

This study applied two fundamental theories, the Theory of Planned Behavior (TPB) and the Stimulus-Organism-Response (SOR) model, to explain the intention to purchase organic food under the influence of eco-friendly packaging.

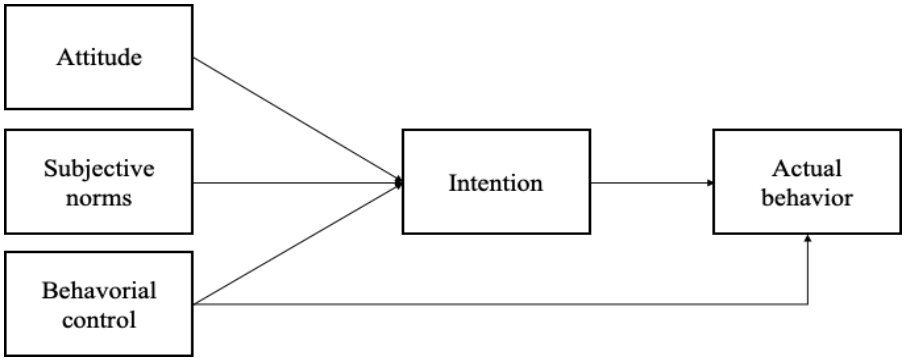



**Fig 1 - TPB model**

*Source: Ajzen (1991)*

TPB is widely applied in research on organic food purchasing behavior. According to a survey conducted by Huo et al. (2024), in 51 completed studies on consumer behavior related to organic food published in the period 2008-2022, TPB is the most applied theory, accounting for more than 50%. This was also confirmed by Le & Le (2021) in a similar study on an overview of 86 topics. In other words, consumers' consumption of organic food is mainly examined under the TPB model, which explains the effects of attitude, subjective norms and behavioral control. In the context of the Vietnam market, topics applying TPB to study consumers' purchase intention and behavior of organic food have also been carried out by many authors in recent years such as Phan et al. (2023); Tran (2024).

However, the model's suitability varies when applied to empirical verification with consumers across countries where surveys were conducted. Are there other factors besides attitudes, subjective norms and behavioral control that affect the intention to buy organic food? The above studies only focused on internal factors of the subject such as awareness and knowledge, but did not exploit the stimulating factors from the external environment, typically represented by packaging - the touch point between customers and brands. Packaging attributes can influence customers' personal feelings, thereby affecting their purchase intention and behavior. In addition, the TPB model has not explained where behavioral control originates from. This has been supplemented by some authors in studies on organic food consumption intention and behavior such as perceived values (Yadav & Pathak, 2017), customer trust

(Nuttavuthisit & Thøgersen, 2017). Thereby, the variables of perceived values and trust have been proven to have an impact on the intention to buy organic food.

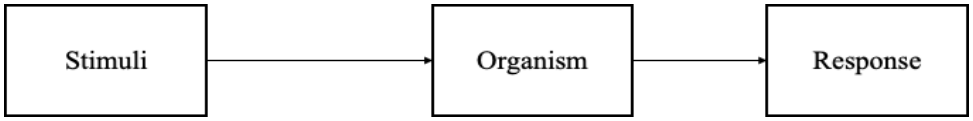



**Fig 2 - SOR model**

*Source: Mehrabian & Russell (1974)*

SOR is a widely used model in marketing research topics. The main content of this theory is to expand the understanding of how environmental stimuli (S) affect consumers' cognition (O), thereby activating additional emotions that create consumer responses (Rivas et al., 2022). According to the SOR framework, an individual will form a conscious or unconscious psychological response process created by the stimulation of external environmental factors and then motivate people to perform appropriate behavioral responses. Many scholars have also applied SOR to explain organic food purchase intention and behavior (Sultan, Wong, & Azam, 2021; Liu et al., 2021; Talwar et al., 2021). Previous studies have investigated the relationship between antecedents (stimuli) and postconditions (consumer responses) in organic food purchase behavior. In which, the authors also analyzed consumer perceptions or beliefs as a processing process in each individual before deciding to consume organic food. A typical study is by Liu et al. (2021) applying the SOR theoretical framework to study the influence of similarity effects including information anxiety, uncertainty, and sustainable consumption attitudes (S) on perceived value (O) and organic food purchase behavior (R). Similarly, the study by Cao et al. (2023) investigated the impact of of safety concerns (S) to perceived values (O) and organic food purchase behavior (R). Meanwhile, Khalid (2021) applied SOR to investigate the mediating role of trust in the relationship between corporate image and organic food purchase intention.

On the other hand, the SOR model is widely used to examine the input factors, the subject's processing, and the output results. SOR has appeared in many studies on consumer intentions and behaviors. For example, studies on the impact of marketing channels on perceived values and intention to purchase organic food (Sultan et al., 2021); the impact of social media interactions on perceived values and repeated fashion purchase behavior (Hewei & Youngsook, 2022); factors affecting advertising avoidance behavior of Youtube users in Can Tho city (Huynh et al., 2022). The SOR model is also the basis for many studies on the impact of packaging on purchase intention. For example, recently, there is a study by Pan et al. (2021) analyzing the impact of green packaging (S) on perceived values, perceived risk (O) and green satisfaction, green purchase intention (R).

The combination of SOR and TPB provides a solid research model on the impact of packaging on consumer purchase intention (Naszariah et al., 2024). Therefore, the author proposes to combine the TPB and SOR models in this research to better understand:

– The relationship between eco-friendly packaging and organic food purchase intention.

– The mediations of perceived value and trust in the relationship between eco-friendly packaging and organic food purchase intention.

**Eco-friendly packaging**

Kotler and Keller (2009) considered packaging is all activities related to the design and production of containers to help preserve, display and consume products on the market. According to Jahre and Hatteland (2004), packaging is the technology and art of creating a method to facilitate transportation, storage and business. The elements of packaging are also studied and discussed from very diverse perspectives of many author. Retti and Brewer (2000); Silayoi and Speece (2004) believe that packaging has two main groups of elements: visual and information elements. In which, visual elements include shape, size, graphics, color while product information and packaging technology belong to the group of information elements (Silayoi & Speece, 2004). Partially agreeing with the visual attributes, Underwood (2003) added structural factors such as shape, size, and material. Meanwhile, Kotler and Keller (2009) identified six packaging factors, including size, shape, material, color, font, and brand. In general, packaging in the above studies was measured by two main groups of factors: visual and information (Salem, 2018). Some criteria that sustainable packaging needs to meet are: being accessible and usable for all; utilizing recycled and renewable materials; designed for reuse, recycling

or composting; and applying clean production technology (Sustainable Packaging Coalition, 2024).

As consumers become increasingly concerned about the environment and food safety, their trust in plastic packaging is decreasing (Morashti et al., 2022). For consumers, green packaging is a solution to protect the environment (Hapsari & Widodo, 2023). According to Nguyen et al. (2020), Vietnamese consumers' perceptions of eco-friendly packaging can be classified into three main dimensions: packaging materials, packaging manufacturing techniques, and market appeal of the packaging. In summary, a consumer-defined eco-friendly packaging for food must be visually appealing while meeting their expectations regarding the materials and manufacturing processes of the packaging.

Within this framework, this study suggests three attributes of eco-friendly packaging according to consumers' perception, that are design, information and materials.

### 2.2 Hypothesis development

#### Eco-packaging and Perceive values (O)

Kotler and Armstrong (2018) believed that perceived values were ratio between the total cost that customers pay and the total benefits they receive. According to Sweeney and Soutar (2001), perceived values were measured by four dimensions and divided into two groups: utilitarian (functional value; economic value) and hedonic (social value; emotional value). This statement was aligned with Mackay (1999), that attraction of products or services came from both rational and emotional factors. Thus, perceived values in this study context is the overall subjective assessment of consumers about the benefits of organic food compared to price, along with the emotions that consuming food in eco-friendly packaging brought to them.

Generally, organic food consumers' perceived values were positively influenced by the attributes of the packaging (Lian & Mansori, 2016). According to Popovic et al. (2019), eco-friendly packaging had positive impact on perceived values of consumers and made them feel that the food having higher quality and better taste. The color combination on the packaging had been verified to have a significant affect to customers' perceived food taste (Kauppinen-Räisänen & Luomala, 2010). Meanwhile, graphics on packaging (Steenis et al., 2017), labels and certification (Lian & Mansori, 2016) were also verified to have influence on consumers' evaluation of eco-friendly packaging.

Consumers tended to positively evaluate brands that came with environment friendly packaging solutions. To them, eco-friendly packaging was an ethical and responsible choice. Consumers were more likely to support products that align with their own environmental standards, which increases their purchase intention (Imran et al., 2024). Hence, this study proposed three first hypotheses as below.

**H1:** The eco-friendly packaging design of organic food positively influence Perceived values.

**H2:** The eco-friendly packaging information of organic food positively influence Perceived values.

**H3:** The eco-friendly packaging material of organic food positively influence Perceived values.

#### Eco-packaging and Customer trust (O)

Customer trust had attracted many scholars to study its concept, especially in the field of marketing. Trust was defined as the level of trust that one party has for the other party in an exchanging relationship (Nguyen et al., 2013). In the food industry, trust makes customers believe that the food is in good condition and safe to consume (Skripnuk et al., 2021; Wu et al., 2021).

Many factors have been examined to influence trust, including packaging attributes. Specifically, packaging design elements like color (Tanus et al., 2023) and materials (Azad & Hamdavipour, 2012) have a significant impact on customer trust. Packaging not only attracts customers because of its appearance, but the information provided on the packaging also plays an important part of promoting customer trust (Wu et al., 2021). Sustainability certification labels, an element of eco-friendly packaging, are only effective in stimulating purchase decisions when and only when customers trust them (Thøgersen et al., 2017). Therefore, Teng and Wang (2015) suggested that the reputable certification labels and related information such as production, processing, and packaging of organic products are important factors enhance trust. Thereby, the following research hypotheses are proposed.

**H4:** The eco-friendly packaging design of organic food positively influence Customer trust.

**H5:** The eco-friendly packaging information of organic food positively influence Customer trust.

**H6:** The eco-friendly packaging material of organic food positively influence Customer trust.

**Purchase intention (R)**

Sustainable packaging solutions enhance consumers' awareness and concerns about environment, lead to positive evaluation on brand and increase purchase intetion (Imran et al., 2024). The significant impact of packaging design on awareness about eco-friendly packaging and intention to buy food in that has been studied by many authors (Popovic et al., 2019). Consumers admitted that packaging appeal positively influence their purchase intention (Lindh et al., 2016). Besides, recyclable and reusable materials are factors that increase their tendency to choose products in eco-friendly packaging (Rundh, 2005).

Consumers had bigger intention to purhase products in eco-friendly packaging if they were available in the market (Garcia & Campos, 2022). Eco-friendly packaging, measured by attributes like color, image, size, information and materials, has positive impact on purchase intention. That influence becomes stronger through the mediations of customers' awareness (Esvandiari et al., 2023). Thus, this study advances the following hypotheses.

**H7:** The eco-friendly packaging design of organic food positively influence Purchase intention.

**H8:** The eco-friendly packaging information of organic food positively influence Purchase intention.

**H9:** The eco-friendly packaging material of organic food positively influence Purchase intention.

**Mediator variable: Perceived values**

Perceived values have been proven to have influence on purchase intention and behaviors in the context of sustainable consumption (De Toni & Larentis, 2017; Curvelo et al., 2019; Chi et al., 2021; Liu et al., 2021; Hapsari & Widodo, 2023). In terms of green consumption, perceived values have positive and significant impact on green purchase intention, as the consumers who have knowledge and concerns about the environment, will attain products that cause no harm to the environment (Hapsari & Widodo, 2023). Likewise, positive affect of perceived values to purchase intention and behaviors of organic food was tested by De Toni and Larentis (2017); Curvelo et al. (2019); Liu et al. (2021).

Furthermore, perceived values are also proven to have mediating roles in the relationship between green packaging and green purchase intention. This shows that consumers, who have awareness about the environment, have interest in eco-friendly packaging as they can be recycled while reducing biodegradable waste (Hapsari & Widodo, 2023). On the other hand, perceived values also enhance the relationship between organic labels, nutrition information and purchase intention of organic food (Shawky Ebrahim, 2023).

Hence, this study proposes the hypotheses as below.

**H10**: Perceived values positively influence purchase intention of organic food.

**H11a**: Perceived values is the mediator in the relationship between the eco-friendly packaging design of organic food and purchase intention.

**H11b**: Perceived values is the mediator in the relationship between the eco-friendly packaging information of organic food and purchase intention.

**H11c**: Perceived values is the mediator in the relationship between the eco-friendly packaging materials of organic food and purchase intention.

**Mediator variable: Customer trust**

There are many studies proving the relationship between trust and purchase intention in various contexts (Prakash et al., 2023). Customer trust does not only have a positive and significant impact on buying decision, but also mediating role in the relationship between brand image and buying decision (Retnowati, 2021). Moreover, trust is considered as a essential construct in studies on food consumption behaviors in general (Teng & Wang, 2015) and organic food consumption in particular (Fernqvist & Ekelund, 2014; Nguyen, Park, & Choi, 2021). Trust is an important factor to consider when conduct studies on organic food consumption as consumers cannot verify whether the food is organic or not, even after they consumed it (Janssen & Hamm, 2012).

Base on above, this study proposes the following hypotheses.

**H12:** Customer trust positively influence purchase intention of organic food.

**H13a:** Customer trust is the mediator in the relationship between the eco-friendly packaging design of organic food and purchase intention.

**H13b:** Customer trust is the mediator in the relationship between the eco-friendly packaging information of organic food and purchase intention.

**H13c:** Customer trust is the mediator in the relationship between the eco-friendly packaging material of organic food and purchase intention.

### 2.3. Research model

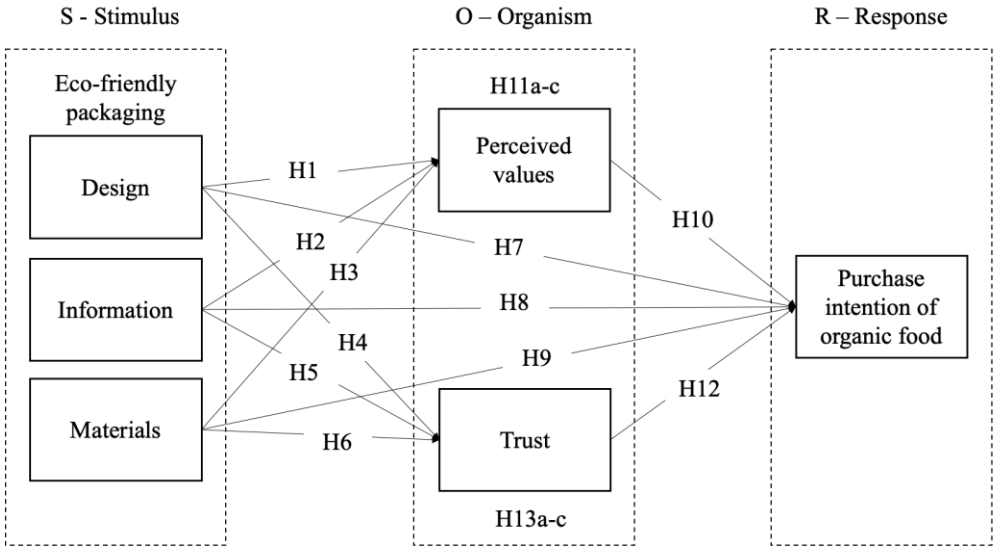



**Fig 3 - Proposed Conceptual Model**

## III. RESULT AND DISCUSSION

### 3.1 Descriptive

The final sample comprised 385 respondents who said to have intention to buy organic food at the present time or in the near future. Among that, nearly 35% were from Ho Chi Minh City, 34% Hanoi, 31% Da Nang and less than 1% from other provinces of Vietnam. Considering gender, 57% were women and 43% men. In term of age, 36% of the sample were from 18 to 24 years old, following by 25% were between 25 and 29, 25% were from 30 to 39, 11% were from 40 to 49 and less than 4% were from 50.

### 3.2. Measurement model assessment

**Internal consistency reliability**

Cronbach's Alpha and Composite Reliability (CR) tests were used for the reliability assessment of the variables. According to Hair et al. (2019), these indexes range from 0 to 1, the closer to 1 the higher the reliability. 0.6-0.7 is an acceptable level and 0.7-0.9 is optimal. If these indexes > 0.95, there is a possibility of duplication of observed variables. At the same time, the authors also pointed out that Cronbach's Alpha assesses low reliability, contrary to the CR index. Therefore, the actual reliability of the variables should be within the range of these two indexes. The results in Table 1 show that the reliability of the scales is guaranteed when the above conditions are satisfied.

**Table 1. Variables reliability testing results**

| | Cronbach's Alpha | Composite Reliability | AVE |
|---|---|---|---|
| **MAT** | 0.746 | 0.855 | 0.663 |
| **PV** | 0.886 | 0.909 | 0.556 |
| **CT** | 0.784 | 0.860 | 0.607 |
| **DES** | 0.915 | 0.929 | 0.567 |
| **INF** | 0.840 | 0.887 | 0.611 |

| | | | |
|---|---|---|---|
| **PI** | 0.809 | 0.875 | 0.636 |

**Convergent Validity**

The level to which a latent variable is explained by the variation of observed items is expressed through the average variance extracted index (AVE). If the AVE value is 0.5 or higher, the scale has convergent validity (Hair et al., 2019). In other words, the latent variables are explained by at least 50% of the variation of their observed items. The AVE values of the latent variables (Table 1) ranges from 0.556 (perceived values) to 0.663 (packaging materials); meeting the condition. Additionally, in order to know the degree of association between observed variables and the corresponding latent variable, the Outer loading factor needs to be considered. This index of the observed variables in the article is all greater than 0.7. Therefore, according to Hair et al. (2019), the scales in this study are reliable.

**Discriminant validity**

Discriminant validity indicates whether a construct overlaps with other constructs in the research framework. In order to evaluate discriminant validity, Fornell & Larcker analysis which was introduced by Fornell & Larcker (1981) and the Heterotrait-Monotrait (HTMT) correlation index proposed by Henseler et al. (2015) were used. According to Fornell & Larcker (1981), two factors do not overlap when the correlation coefficient between them is not greater than their two square roots of the AVE. Table 2 shows that all correlation coefficients of all pairs of factors are less than their two square roots of the AVE. Regarding the HTMT index, Henseler et al. (2015) assumed that the discriminant validity of a factor is violated when the HTMT index is from 0.9 or higher, and if it is below 0.85, the discriminant validity is well guaranteed. The analysis results in Table 3 show that all HTMT values are less than 0.85. Therefore, the discrimination of the variables in the model is guaranteed.

**Table 2. Fornell Larker**

| | MAT | PV | CT | DES | INF | PI |
|---|---|---|---|---|---|---|
| MAT | **0.814** | | | | | |
| PV | 0.478 | **0.746** | | | | |
| CT | 0.497 | 0.255 | **0.779** | | | |
| DES | 0.425 | 0.523 | 0.469 | **0.753** | | |
| INF | 0.439 | 0.495 | 0.455 | 0.394 | **0.782** | |
| PI | 0.556 | 0.520 | 0.512 | 0.521 | 0.549 | **0.798** |

**Table 3. HTMT**

| | MAT | PV | CT | DES | INF | PI |
|---|---|---|---|---|---|---|
| MAT | | | | | | |
| PV | 0.585 | | | | | |
| CT | 0.644 | 0.299 | | | | |
| DES | 0.513 | 0.577 | 0.550 | | | |
| INF | 0.554 | 0.575 | 0.556 | 0.447 | | |
| PI | 0.714 | 0.612 | 0.632 | 0.603 | 0.662 | |

**3.3. Structural model assessment**

The coefficiant of determination is often used in structual model assesment. In which, the $R^2$ and adjusted $R^2$ values indicate the level of explanation of the independent constructs on a dependent one. The dependent variable is well explained when $R^2$ reaches 0.75; on average if $R^2$ is 0.5 and weak if $R^2$ is 0.25, but this is not accurate for all study contexts and research fields (Hair et al., 2019). In particular, the $R^2$ value at 0.2 is considered high in consumer behavior research (Hair et al., 2017). The results of analysis show that the adjusted $R^2$ value of purchase intention is 0.505. Thus, the independent variables including packaging design, information, materials; perceived values and trust explain 50.5% of the variation in purchase intention. Similarly, packaging attributes explained 40.4% of the variation in perceived values and 36.2% in customer trust. Overall, dependent variables in the research framework are explained well by independent variables.

**Table 4. R2 and adjusted R2 values**

| | R Square | R Square Adjusted |
|---|---|---|
| PV | 0.409 | 0.404 |
| CT | 0.367 | 0.362 |
| PI | 0.511 | 0.505 |

Since R2 only reflects the level of explanation of the independent variables on the dependent variables withing the survey sample, we need to consider the Q2 index proposed by Geisser (1974) and Stone (1974) to evaluate the out-of-sample predictive ability of the model. The Q2 value should be greater than 0 and if all the component models have Q2 > 0, the overall research model is also of good quality. If Q2 < 0.25, the model has low predictive accuracy, < 0.5 is average and > 0.5 is high (Hair et al., 2019). The table below shows that the component models of the dependent variables perceived values and customer trust as well as the model of the dependent variable purchase intention has average predictive accuracy. In general, the overall research model is significant.

**Table 5. Q2 values**

| | $Q^2$ predict |
|---|---|
| PV | 0,394 |
| CT | 0,349 |
| PI | 0,469 |

The $f^2$ effect size is often considered along with the adjusted $R^2$ to evaluate the level of explanation of the independent variables to the dependent variable in the model. This evaluation is to consider whether the independent variable has an explanatory role for the dependent variable or not and if so, the level of explanation is strong or weak. The f2 value of 0.02 - 0.15 - 0.35 represents the small, medium and large prediction level of the independent variables on the dependent variable (Cohen, 1988). Normally, people often use the $f^2$ index to consider selecting variables with a high level of explanation in the research model to focus on improving these factors. According to the results in Table 6, it can be seen that purchase intention is slightly affected by packaging design, information and materials along with perceived values and customer trust. Perceived values and Trust are also slightly affected by all 3 packaging attributes.

**Table 6. f2 values**

| | **MAT** | **PV** | **CT** | **DES** | **INF** | **PI** |
|---|---|---|---|---|---|---|
| **MAT** | | 0.061 | 0.096 | | | 0.058 |
| **PV** | | | | | | 0.035 |
| **CT** | | | 0.080 | | | 0.041 |
| **DES** | | 0.135 | 0.062 | | | 0.034 |
| **INF** | | 0.094 | | | | 0.062 |
| **PI** | | | | | | |

Collinearity occurs when independent variables are not truly separate from each other, leading to a decrease in the reliability and accuracy of the research model. Therefore, it is necessary to determine the collinearity among independent variables through the VIF (variance inflation factor) values. According to Hair et al. (2019), the model does not experience collinearity when the VIF is lower than 3. The result shows that the independent construct in this study have satisfied the condition, so the collinearity issues do not exist.

### 3.4. Hypothesis testing result

The nonparametric bootstrap analysis with a sample size of 500 was conducted. The analysis results (Table 7) show that all 17 initially proposed hypotheses were accepted because they met the condition of p-values < 0.05. Particularly, the purchase intention of organic food in eco-friendly packaging is directly influenced by the packaging design (0.167; $p < 0.05$), information (0.220, $p < 0.05$) and materials (0.215; $p < 0.05$), along with perceived values (0.175; $p < 0.05$) and customer trust (0.182; $p < 0.05$). Regarding indirect relationships between packaging attributes and purchase intention, the mediating role of perceived values and customer trusts has also been clarified. The hypotheses testing

results are shown in Table 7.

**Table 7. Direct, indirect and total effects**

| H | Relationship | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values | Supported |
|---|---|---|---|---|---|---|---|
| | | | **Path Coefficients** | | | | |
| H1 | DES → PV | 0.322 | 0.322 | 0.060 | 5.389 | 0.000 | Yes |
| H2 | INF → PV | 0.270 | 0.273 | 0.049 | 5.482 | 0.000 | Yes |
| H3 | MAT → PV | 0.223 | 0.222 | 0.048 | 4.631 | 0.000 | Yes |
| H4 | DES → CT | 0.257 | 0.258 | 0.055 | 4.669 | 0.000 | Yes |
| H5 | INF → CT | 0.228 | 0.228 | 0.047 | 4.881 | 0.000 | Yes |
| H6 | MAT → CT | 0.287 | 0.290 | 0.052 | 5.507 | 0.000 | Yes |
| H7 | DES → PI | 0.167 | 0.167 | 0.049 | 3.365 | 0.001 | Yes |
| H8 | INF → PI | 0.220 | 0.219 | 0.047 | 4.627 | 0.000 | Yes |
| H9 | MAT → PI | 0.215 | 0.215 | 0.047 | 4.539 | 0.000 | Yes |
| H10 | PV → PI | 0.175 | 0.175 | 0.050 | 3.468 | 0.000 | Yes |
| H12 | CT → PI | 0.182 | 0.184 | 0.047 | 3.902 | 0.000 | Yes |
| | | | **Indirect Effects** | | | | |
| H11a | DES →PV→PI | 0.056 | 0.056 | 0.020 | 2.785 | 0.005 | Yes |
| H11b | INF→PV→PI | 0.047 | 0.048 | 0.016 | 2.927 | 0.003 | Yes |
| H11c | MAT→PV→PI | 0.039 | 0.038 | 0.013 | 2.925 | 0.003 | Yes |
| H13a | DES →CT→PI | 0.047 | 0.048 | 0.017 | 2.809 | 0.005 | Yes |
| H13b | INF→CT→PI | 0.042 | 0.042 | 0.014 | 2.903 | 0.004 | Yes |
| H13c | MAT→CT→PI | 0.052 | 0.053 | 0.016 | 3.197 | 0.001 | Yes |
| | | | **Total Effects** | | | | |
| | DES → PI | 0.103 | 0.104 | 0.025 | 4.193 | 0.000 | Yes |
| | INF → PI | 0.089 | 0.090 | 0.022 | 4.107 | 0.000 | Yes |
| | MAT → PI | 0.091 | 0.092 | 0.021 | 4.303 | 0.000 | Yes |

Note. N=385; *p<.05.

## IV. CONCLUSION

The analysis results provided some findings about the affect of eco-friendly packaging attributes, including: design (DES), information (INF), materials (MAT) on perceived values (PV), customer trust (CT) and the purchase intention of organic food (PI) of Vietnamese consumers. Below are some discussions and comparisons with the results of earlier studies.

### Eco-friendly packaging and perceived values

All three attributes of eco-friendly packaging, including design (DES), information (INF) and materials (MAT), have positive influences on perceived values (PV). Their path coefficients are 0.322 - 0.270 - 0.223, respectively. In other words, if DES, INF, MAT changed by 1 unit, PV would change in the same direction with a corresponding level of 0.322 - 0.270 - 0.223 units. This result indicated that perceived values is most strongly impacted by packaging design, following by information and materials. The influence of packaging design on perceived values has been verified through a number of earlier studies, including Magnier and Schoormans (2015), Steenis et al. (2017) on perceived quality of organic food in the packaging; Nordin and Selke (2010) on perceived social and environmental values. This study also reaffirms that well-designed packaging boosts customer perceived value in many aspects. According to Janssen and Hamm (2012), Lian and Mansori (2016), relevant and clear information such as organic certification, transparency about ingredients and environmental impact play an important role in shaping customers'

perception of values. This is also reflected in the analysis results above when the data shows that packaging information has a positive influence on perceived values (patch coefficients = 0.270). When information about the product and the sustainability of the packaging are clearly conveyed on the product, customers' perceptions of product quality as well as their own social value are also promoted. The results also poins out that packaging made from environment friendly materials has a direct impact on perceived values of organic food (patch coefficients = 0.223). Similar observations were also found in the study by Magnier et al. (2016). Generally, packaging sustainability positively impacts consumers' perceived value of product quality.

**Eco-friendly packaging and customer trust**

The analysis results show that all three eco-friendly packaging attributes have an impact on customer trust. This is similar to the findings of Azad and Hamdavipour (2012); Thøgersen et al. (2017); Wu et al. (2021); Tanus et al. (2023). In particular, when packaging design (DES), information (INF) and materials (MAT) changes by 1 unit, customer trust (CT) will go up by 0.257 - 0.228 - 0.287 units. It can be seen that packaging materials is the biggest factor affecting customer trust. This finding points out that the choice of sustainable materials turns out a trust-building attributes. Eco-friendly packaging solutions may enhance customer trust as they align with their environmental values.

**Eco-friendly packaging and purchase intention**

The purchase intention of organic food was verified to be influenced by eco-friendly packaging attributes. The results showed that when design (DES), information (INF) and materials (MAT) changed by 1 unit, purchase intention (PI) would also fluctuate by 0.167 - 0.220 - 0.215 units. This relationship is similar to the earlier findings of Lindh et al. (2016); Popovic et al. (2019) on the impact of packaging material or El Oraiby and Kiygi-Calli (2024) on the affect of packaging design elements (color, font) or Rundh (2005); Esvandiari et al. (2023) on the effects of packaging information on customers' purchase intention.

Different from model of dependent variables of perceived values and trust, purchased intention of organic was most influenced by packaging information. This can be explained by the current situation of Vietnam organic food market. The market is experiencing a widespread situation of self-proclaimed organic (Ngoc Thanh, 2019), which does not follow organic standards. Thus consumers may find product information to be more important than appearance elements like design or materials. Information about the products ingredients, benefits of consumption, organic certification, and so on become a more decision factor of purchase intention.

**Mediating role of Perceived values**

Similar to the findings of De Toni and Larentis (2017); Curvelo et al. (2019); Liu et al. (2021); Shawky Ebrahim (2023); Hapsari and Widodo (2023), this study also shows that perceived values (PV) has a direct impact on purchase intention, and also plays a mediating role in the relationship between eco-friendly packaging design, information and materials on the purchase intention of organic food. In which, perceived values promote the influence of packaging design on purchase intention the most (0.056), followed by information (0.047) and materials (0.039). Therefore, this study further strengthens the mediating role of perceived values, that is under influence of packaging attributes, it will enhance customers' purchase intention more. In particular, packaging information only has an indirect relationship with purchase intention through the promotion of perceived values. Nordin and Selke (2010) pointed out that eco-friendly packaging design and labels help enhance customers' perception of the quality and authenticity of organic food.

**Mediating roles of Trust**

Trust has a direct impact on the purchase intention of organic food (0.182). When consumers trust the packaging, they also believe in the quality of the product and the producer brand; and at the same time, they intend to purchase that product. This shows that trust plays an important role in shaping consumers' purchasing behavior, similar to the findings of Teng and Wang (2015); Yadav and Pathak (2017).

The analysis results also show that trust plays a mediating role in promoting the relationship between packaging and purchase intention. The mediating role of trust was clarified in earlier studies. For instance, trust mediated the relationship between corporate social responsibility behavior (such as sustainable packaging) and customer loyalty (Pivato et al., 2008). Similarly, this study also shows that eco-friendly packaging design boosts trust, which affects consumers' purchase intention. When consumers find the packaging to be trustworthy, they are more likely to choose

that product.

**Conclusion**

Considering pratical implications, this study has provided some highlights for businesses in organic food market. The affect of eco-friendly packaging on the consumer purchase intention of organic food has been confirmed through this research. The literature shows that many authors have studied the purchase intention and behaviors of organic food, but the role of packaging, especially eco-friendly one, has not been clarified yet. This study has attempted to verify that role. In addition, the impact of perceived values and trust on purchase intention are also confirmed in the context of organic food consumption. The mediating role of these two variables is also verified. Managers can apply knowledge and find suitable packaging solutions to reach their target customers.

The results of this study also suggest many implications for retail managers in designing eco-friendly packaging to promote the purchase intention of organic food. Among the studied packaging attributes, information and materials attract great attention from customers. Therefore, businesses in the organic food industry need to ensure that the packaging materials are of natural origin, ensuring sustainability and environmental friendliness. Not only that, information indicating benefits of organic food or informaiton of manufacturing process that causes no harm to the environment are examples of packaging content that need to be focused on. Lastly, how to design images, fonts, and colors to attract customers is also another important aspect that businesses should pay attention to. The findings from the study provide valuable information for organic food retailers and other related businesses in the industry. Learning from the research findings, they may propose an appropriate organic food packaging solutions that help their businesses grow in the market. By focusing on eco-friendly packaging solutions, with attractive designs, clear information and sustainable materials, customers' perceived value and trust will be enhanced, thereby boosting their purchase intention.

However, the topic also has some limitations. In terms of survey methods, due to limitations in survey scale, the questionnaire could only use illustrative images of organic rice products. Therefore, respondents did not have any direct contact with the packaging, thus could not provide more realistic assessment. In addition, the illustrative packaging images in the survey are 4 different organic rice brands, so the results are not representative of organic food in general. Therefore, the future research direction can be a survey on a larger scale and have real survey samples, to help customers make accurate assessments.

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# SESSION 3: BUSINESS MANAGEMENT

# THE LEVEL OF READINESS FOR DIGITAL TRANSFORMATION IN SMALL AND MEDIUM ENTERPRISES IN HANOI, VIETNAM

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**ABSTRACT**

This study is based on sociological survey data from 110 leaders and managers working in small and medium-sized enterprises (SMEs) in Hanoi to analyze the current status of seven pillars assessing the digital transformation readiness of SMEs in Hanoi, Vietnam, as per Decision 2158/QĐ-BTTTT issued on November 7, 2023, by the Minister of Information and Communications. These pillars include: Strategic orientation; Customer experience and multi-channel sales; Supply chain; Information systems and data management; Risk management and cybersecurity; Financial, accounting, planning, legal, and human resource management; People and organization. The results indicate that most of these pillars are rated at an average level, suggesting that significant improvements are needed to enhance the digital transformation readiness of SMEs in the future. The study also proposes policy implications and recommendations for enterprises to address the limitations in these pillars.

*Keywords:* "Digital Transformation", "Policy", "Small and Medium-sized enterprises".

## I. INTRODUCTION

In the context of the Fourth Industrial Revolution, digital transformation has become a decisive factor in the success or failure of enterprises by enhancing competitiveness, optimizing processes, and creating new values for enterprises. In particular, in Vietnam, SMEs account for a significant proportion of the economy and play a crucial role in job creation, promoting growth, and fostering innovation. However, compared to large enterprises, SMEs often face greater challenges in the digital transformation process, including limitations in financial resources, technological capacity, and human resource skills.

Therefore, assessing the readiness for digital transformation among SMEs is essential, the objective of this study is not only to identify the current status and barriers but also to propose solutions (including policy implications and recommendations for businesses) to accelerate this process.

## II. LITTERATURE REVIEW

Currently, numerous studies employ various models such as the Technology-Organization-Environment (TOE) framework, the Resource-Based View (RBV) theory (e.g., Nessrine Omrani et al. (2022), Xin Zhang et al. (2022)); quantitative research methods using survey questionnaires (e.g., Ramona Rupeika-Apoga and Kristine Petrovska (2022), Henning Brink and Sven Packmohr (2023)); and systematic reviews following the PRISMA framework (e.g., Simon P. Philbin et al. (2022), Samuel Omokhafe Yusuf et al. (2024)) to examine the factors influencing (both facilitating and hindering) digital transformation in SMEs. Specifically:

The study by Nessrine Omrani et al. (2022) employs the TOE framework to analyze factors influencing the adoption of digital technology in SMEs. Data from 15,346 enterprises were analyzed using an ordered logit regression model. The results indicate that IT infrastructure, digital tools, and the level of innovation are the primary drivers, while internal regulations, skills, and financial resources also play significant roles. However, the impact of the external environment is negligible. The study emphasizes the importance of internal readiness and an integrated strategy before adopting digital technology.

The study by Xin Zhang et al. (2022) employs the TOE framework, the RBV theory, and the Structural Equation Modeling (SEM) approach to analyze data from 180 SMEs in China. The results indicate that technology and the environment positively influence organizational capability, which serves as a key intermediary factor in the success of digital transformation. Employee skills further strengthen this relationship. The study highlights the critical role of

strategy and human resource development in enhancing organizational capability for effective digital transformation.

The study by Ramona Rupeika-Apoga and Kristine Petrovska (2022) surveyed 425 owners and managers of SMEs in Latvia to identify seven barriers to sustainable digital transformation. The two most significant barriers were IT security and a shortage of specialists. While some barriers varied by enterprise size, they were generally assessed similarly by both owners and managers. The study provides valuable insights for businesses, policymakers, and experts to promote sustainable digital transformation.

The study by Simon Philbin et al. (2022) analyzed 64 research articles to explore how digital transformation supports SMEs in achieving sustainable development. The study focused on three key areas: (1) Digital technologies (IoT, Big Data, AI, Blockchain) that enhance efficiency and sustainability; (2) The impact of digital transformation on economic, environmental, and social aspects based on the Triple Bottom Line (TBL) model; and (3) Internal SME factors such as strategy, organization, culture, skills, and leadership. The findings emphasize that SMEs need a clear strategy, technological investment, skill development, innovation promotion, and strong leadership commitment for successful digital transformation.

The study by Henning Brink and Sven Packmohr (2023), based on a survey of 195 enterprises, found that organizational, technical, and skill shortage barriers have a significant negative impact on the success of digital transformation, explaining 58% of the variation in the process. In contrast, individual barriers, lack of standards, and absence of legal frameworks did not show a significant relationship with digital transformation success. The findings suggest that addressing organizational barriers could be an effective starting point for SMEs on their digital transformation journey.

The study by Samuel Omokhafe Yusuf et al. (2024) analyzed the impact of AI and digital transformation on SMEs across different continents using a systematic review based on the PRISMA framework. The results identified key challenges, including financial constraints, workforce shortages, data security concerns, and organizational resistance, with varying degrees across regions. While AI offers significant benefits in operations and customer interactions, its adoption depends on regional contexts. The study suggests tailored policies, capacity-building initiatives, and cross-border collaboration to help SMEs overcome these barriers.

A review of published studies reveals that no research has yet developed a model tailored to the specific characteristics and challenges of SMEs in Vietnam in general, and Hanoi in particular, to assess the level of digital transformation readiness among SMEs in Hanoi.

In recent times, the Vietnamese government has introduced numerous programs to support digital transformation for SMEs. However, no research has yet assessed the actual impact of these policies on enterprise readiness. Indicators for measuring digital transformation readiness were only recently standardized in Vietnam under Decision No. 2158/QĐ-BTTTT dated November 7, 2023, making it challenging to compare enterprises.

## III. RESEARCH METHODS

– Methods of analysis, synthesis and comparison: These methods are primarily used in evaluating the current state of readiness for digital transformation in SMEs in Hanoi. Specifically:

Based on collected survey data, the analysis focuses on the digital transformation readiness of SMEs in Hanoi across various pillars (described below).

The results from prior analyses are synthesized and combined with observations of real-world conditions to provide a multidimensional view of the digital transformation readiness of SMEs in Hanoi.

The method of comparing the mean scores of factors derived from survey data analysis against benchmark standards from the study by Hoang Trong and Chu Nguyen Mong Ngoc (2008) is applied. This allows conclusions to be drawn on the level of readiness for each pillar (described below) and whether improvement solutions are required.

– Methods of collecting and processing primary data: The research team conducted a sociological survey involving 110 participants, consisting of leaders and managers from several SMEs in Hanoi who are knowledgeable about digital transformation in businesses. Google Forms was used as the tool for collecting primary information and data. A total of 110 questionnaires were distributed, and 102 valid responses were collected.

**Table 1: Survey Sample Description**

| No | Classify | Number (people) | Proportion (%) |
|---|---|---|---|
| | **Total (valid questionnaires only)** | **102** | **100,0** |
| I | Distribution by business sectors of the enterprises surveyed | | |
| 1 | Agriculture, forestry, and fisheries | 19 | 18.63 |
| 2 | Industry and construction | 38 | 37.25 |
| 3 | Commerce and services | 45 | 44.12 |
| II | Distribution by educational qualifications of survey participants | | |
| 1 | Postgraduate | 16 | 15.69 |
| 2 | Undergraduate | 75 | 73.53 |
| 3 | College, intermediate, and others | 11 | 10.78 |

*Source: Compiled from the survey results by the research team*

The questionnaire system was designed using a 5-point Likert scale, where level 5 corresponds to "very good" and level 1 corresponds to "very poor" for each item presented to the respondents. The survey focused on seven pillars to evaluate the level of readiness for digital transformation in SMEs in Hanoi (details provided below). According to the study by Hair, Anderson, Tatham, and Black (1998) on sample size recommendations, the minimum sample size should be five times the total number of observed variables. With 16 observed variables, a minimum of 80 samples is required. Therefore, the collected sample size meets the requirement. Primary data were processed using SPSS 26 statistical software. Based on the study Data Analysis with SPSS by Hoang Trong and Chu Nguyen Mong Ngoc (2008), the mean scores derived from SPSS analysis were evaluated according to the following convention: $1 \leq \text{mean} \leq 1{,}8$: The criterion is rated as "very poor"; $1{,}8 < \text{mean} \leq 2{,}6$: The criterion is rated as "poor"; $2{,}6 < \text{mean} \leq 3{,}4$: The criterion is rated as "average"; $3{,}4 < \text{mean} \leq 4{,}2$: The criterion is rated as "good"; $4{,}2 < \text{mean} \leq 5$: The criterion is rated as "very good".

## IV. RESULT AND DISCUSSION

### 4.1. Assessing the readiness for digital transformation in SMEs in Hanoi

Digital transformation, as defined by Sascha Kraus et al. (2022), is the process of integrating digital technologies into all aspects of an organization, leading to fundamental changes in how it operates, manages, and delivers value to customers. The authors emphasize that digital transformation is not merely a trend but an essential requirement for businesses in the context of rapidly advancing technology. However, exploring under-researched aspects of digital transformation can expand understanding and help businesses address practical challenges effectively.

Currently, in Vietnam, the Ministry of Information and Communications and the Ministry of Planning and Investment have jointly developed the Digital Transformation Readiness Assessment Index for SMEs. This index, established under Decision No. 2158/QĐ-BTTTT dated November 7, 2023, by the Minister of Information and Communications, comprises a set of standardized criteria designed to help SMEs comprehensively evaluate their level of digital transformation. The index focuses on seven main pillars: (1) Strategic orientation; (2) Customer experience and multi-channel sales; (3) Supply chain; (4) Information systems and data governance; (5) Risk management and cybersecurity; (6) Management of finance, accounting, planning, legal, and human resources operations; (7) People and organization. The research team used this index to conduct a sociological survey among 110 leaders and managers working in various SMEs in Hanoi, and the results were as follows:

**Table 1: Analysis results of the pillars assessing the readiness for digital transformation in SMEs in Hanoi**

| No | Content | Mean | Standard deviation |
|---|---|---|---|
| **I** | **Strategic orientation** | | |
| 1 | Leader's awareness of the benefits and trends of digital transformation for business operations | 3.47 | 0.673 |
| 2 | The level of integration of digital transformation solutions into the overall strategy of the enterprise | 3.05 | 0.775 |

| | | | |
|---|---|---|---|
| **II** | **Customer experience and multi-channel sales** | | |
| 1 | The level of application of digital transformation solutions in marketing, distribution, and sales to enhance customer experience | 3.36 | 0.719 |
| 2 | The level of application of data analytics solutions to measure and forecast business performance | 3.13 | 0.820 |
| **III** | **Supply chain** | | |
| 1 | The ability to apply digital transformation solutions to connect with customer needs and the company's suppliers | 2.84 | 0.857 |
| 2 | The level of application of digital transformation solutions in core business processes and activities | 2.98 | 0.792 |
| **IV** | **Information systems and data management** | | |
| 1 | The capability and integration ability of information systems with other systems for upgrading | 3.83 | 0.685 |
| 2 | The ability to update new digital transformation solutions in the market | 2.87 | 0.811 |
| 3 | Data governance processes and policies | 3.28 | 0.794 |
| **V** | **Risk management and cybersecurity** | | |
| 1 | Awareness of risks in applying digital transformation solutions | 3.56 | 0.676 |
| 2 | The level of application of data analytics solutions and other solutions to assess risks in the enterprise, including cybersecurity risks | 2.92 | 0.833 |
| **VI** | **Financial, accounting, planning, legal, and human resource management operations** | | |
| 1 | The level of application of digital transformation solutions in management, financial, accounting, planning, legal, and human resource operations | 3.14 | 0.754 |
| 2 | The support capability of the finance, accounting, planning, and legal departments in implementing digital transformation for the enterprise | 3.31 | 0.734 |
| **VII** | **People and organization** | | |
| 1 | The flexibility of the enterprise in responding to changes in the business environment | 3.48 | 0.766 |
| 2 | The capability of employees in the enterprise to implement digital transformation | 2.78 | 0.791 |
| 3 | The level of application of digital transformation solutions to connect departments within the enterprise | 2.92 | 0.798 |

*Source: Decision No. 2158/QĐ-BTTTT dated November 7, 2023, by the Ministry of Information and Communications, and the survey results of the research team*

Table 1 shows:

Firstly, the awareness of business leaders regarding the benefits and trends of digital transformation, awareness of risks, and the ability to respond flexibly to changes is rated relatively high (good level). This indicates that the SME community in Hanoi has begun to proactively adapt to changes in the context of digitalization.

Secondly, however, many criteria related to supply chain management, updating new solutions, and internal coordination are rated at an average level, indicating that more efforts are needed to optimize digital transformation. Additionally, the personal awareness of digital transformation is still low, which affects the effectiveness of actual implementation.

Firstly, about strategic orientation: In Hanoi today, while leaders of SMEs have recognized the benefits and trends of digital transformation for business operations, the actual integration of digital transformation solutions into the overall business strategy remains very low and lacks adequate attention. This indicates a gap between awareness and practical action in the digital transformation process within the SME community. The causes of this issue typically include: (1) SMEs often have constrained budgets, which makes it difficult to invest in technology and employee

training necessary for digital transformation; (2) While business leaders may recognize the benefits, they often lack in-depth knowledge of how to effectively implement and manage digital solutions; (3) Many enterprises have not developed a clear and specific digital transformation strategy, leading to fragmented and ineffective implementation; (4) The digital infrastructure needed to support the implementation of digital solutions is often not developed in a coordinated or comprehensive manner; (5) The organizational culture within many SMEs tends to resist change, particularly when it comes to adopting new technologies or business models, hindering the transition to digital practices.

Secondly, about the customer experience and multi-channel sales: In SMEs, the level of application of digital transformation solutions in marketing, distribution, sales, and data analytics is still low. This is due to several main reasons: (1) The first cause of this issue is the constrained budget, as implementing multi-channel distribution solutions, digital marketing, and data analytics requires significant investment in technology infrastructure; (2) Many enterprises do not fully recognize the importance of using technology to improve customer experience and forecast business performance; (3) Many SMEs lack modern technology and management software, making the implementation of digital transformation solutions challenging; (4) To effectively apply tools such as customer relationship management (CRM) software, enterprise resource planning (ERP) software, and data analytics,… specialized skills are required. However, small enterprises often do not have dedicated teams with the expertise to manage these systems.

Thirdly, about the supply chain: The limited utilization of digital transformation solutions to connect with customers and suppliers, as well as the lack of widespread application in core business processes, is restricting the competitiveness and growth potential of small and medium enterprises (SMEs). The causes for the low level of application include: (1) Many enterprises have not invested in integrated information technology (IT) systems to connect core business processes and activities with customer and supplier needs; (2) Some business leaders still adhere to manual management and operation methods, lacking the motivation and skills to transition business processes to digital platforms; (3) Many SMEs have not standardized and automated their core operational processes, making digital transformation complex and costly; (4) Additionally, traditional suppliers of many enterprises are not yet ready for digital transformation, limiting the ability of businesses to collaborate on the digitalization of the supply chain.

Fourthly, about the information systems and data management: SMEs face limitations in updating the latest digital transformation solutions and are often not prepared with appropriate data management systems for digital transformation. The reasons for this situation include: (1) SMEs often lack financial resources and highly skilled personnel to monitor and apply new technological solutions; (2) SMEs typically lack a digital transformation strategy and internal policies regarding data governance, as well as the necessary mechanisms for data security and effective data management; (3) Many enterprises continue to use old technology systems that are difficult to integrate with new digital solutions; (4) The rapid pace of digital technology changes makes it challenging for SMEs to keep up with trends and implement new solutions in a timely manner.

Fifthly, about risk management and cybersecurity: The underutilization of data analytics solutions to assess risks, particularly cybersecurity risks, is leaving SMEs vulnerable to external threats. The causes of this issue include: (1) Many enterprises do not fully understand the importance of data analysis and risk management, and they lack specialized knowledge of modern tools and solutions for these areas; (2) Investing in data analytics and cybersecurity solutions requires significant financial resources, which many SMEs cannot afford; (3) Many SMEs primarily focus on core business operations and do not allocate sufficient time and resources to risk assessment, leaving them exposed to potential security breaches and other risks.

Sixthly, about financial, accounting, planning, legal, and human resources management: SMEs face limitations in applying digital transformation solutions to their financial, accounting, planning, legal, and human resources operations. This is affecting their operational efficiency and competitiveness. The main causes of this issue include: (1) First and foremost, SMEs often lack the necessary financial resources, skilled personnel, and technology to implement digital solutions in these areas; (2) Many enterprises prioritize digital transformation in sales and customer engagement, neglecting or delaying digitalization in departments such as management, accounting, and human resources; (3) Departments like finance, accounting, and human resources are often accustomed to traditional processes and are resistant to change, making it difficult to implement digital systems effectively.

Seventhly, about people and organization: The inability of personnel in small and medium enterprises (SMEs) to adapt quickly to change and the low level of interdepartmental connectivity are significant barriers in the digital transformation process. The causes of these issues include: (1) Employees often lack the necessary digital skills and knowledge to apply technology effectively in their daily tasks; (2) Many employees are apprehensive or fearful about major changes in their work. They are concerned about having to learn new skills or changing familiar work practices; (3) Business leaders often lack a clear and specific strategy to guide and support employees throughout the digital transformation process; (4) Many enterprises have not established clear processes or policies to guide and implement digital solutions, leading to confusion and inefficiency during the transition.

## V. CONCLUSION

### 5.1. Policy implications

First, the State should provide financial support packages, preferential loans, and subsidies for SMEs to invest in technology and digital infrastructure. The goal is to reduce the financial burden on enterprises, helping them have sufficient resources to implement digital transformation solutions. Accordingly, the State should establish a comprehensive framework encompassing various forms of support. Specifically, it could implement preferential loan packages with low interest rates and flexible repayment terms, particularly for purchasing hardware, software, and investing in digital infrastructure. Additionally, there should be direct subsidy programs for SMEs when they invest in approved technology solutions, with support levels reaching up to 50% of total investment costs. Priority should be given to supporting enterprises in remote areas, as well as those in key industries or with high growth potential through digital transformation.

Second, the State should establish policies that encourage and provide incentives for enterprises to engage in digital transformation, including tax reductions, training support, and the development of technical assistance programs. The goal is to create incentives for enterprises to accelerate their digital transformation, enhance operational efficiency, and improve competitiveness. Accordingly, the State should develop a comprehensive system with multiple layers of incentives. Tax incentives could include corporate income tax reductions for the first 3–5 years of digital transformation implementation, tax deductions for employee training on digital skills, and import tax exemptions for technology equipment used in digital transformation. In terms of training, the government should organize free courses on basic and advanced digital technologies, coupled with the issuance of widely recognized certificates. Additionally, technical advisory centers should be established in each province to support businesses during the implementation process.

Third, the State should enhance investment in the development of digital infrastructure such as broadband internet networks, fiber optics, and data centers to facilitate enterprises in implementing digital technologies. The goal is to ensure that enterprises have the necessary infrastructure to carry out digital transformation effectively. The State should prioritize the deployment of 5G networks in industrial zones and economic hubs, ensuring high-speed internet coverage nationwide. The construction of data centers should be regionally distributed to ensure redundancy and data security. Particularly important is the development of public cloud platforms, enabling SMEs to access technology solutions at affordable costs.

Fourth, the State should issue legal regulations and national standards on digital transformation and data governance, ensuring information security and protecting the interests of stakeholders. The goal is to create a transparent and stable legal environment, allowing enterprises to confidently implement digital transformation. This includes enacting a Digital Transformation Law that clearly defines the rights and obligations of stakeholders, standards for information security, and data privacy. Detailed guidelines are needed for cybersecurity assessment processes, regulations on data storage and processing, and technical standards for the compatibility and integration of digital systems. Additionally, a dedicated agency should be established to oversee and enforce these regulations, ensuring a safe and reliable digital environment for businesses.

### 5.2. Recommendations for enterprises

First, enterprises need to develop a detailed and specific digital transformation strategy, including objectives, action plans, and implementation roadmaps. The goal is to guide and direct the digital transformation process, ensuring synchronization and effectiveness in the implementation.

Second, enterprises need to organize training courses on digital skills and the use of new technologies for employees, including training to raise awareness about the importance of digital transformation. The goal is to enhance the capabilities of the workforce, helping them adapt quickly and effectively to changes in work processes.

Third, enterprises need to invest in modern technologies and management software such as CRM, ERP, and data analytics tools to optimize business processes and enhance customer experience. The goal is to improve operational efficiency, enhance service quality, and increase competitiveness.

Fourth, enterprises need to build a corporate culture that encourages innovation and creativity, motivating employees to experiment with and adopt new methods and technologies. The goal is to minimize resistance to change, creating a favorable environment for the digital transformation process to take place smoothly and effectively.

Fifth, enterprises need to strengthen connections and collaborations with partners, suppliers, and customers through digital platforms to optimize supply chains and business processes. The goal is to enhance alignment and efficiency in business operations, creating sustainable value for the company.

By combining solutions from government management policies and from enterprises themselves, small and medium-sized enterprises in Hanoi can overcome the current challenges and difficulties in the digital transformation process. This will not only improve operational efficiency but also enhance competitiveness and promote sustainable development in the modern business environment.

## VI. LIMITATIONS OF THE STUDY AND DIRECTIONS FOR FUTURE RESEARCH

### 6.1. Limitations of the study

First, the study focuses solely on SMEs in Hanoi, which may not represent SMEs across the entire country. The findings and conclusions may not be applicable to other regions due to differences in economic, social, technological infrastructure, and SME capabilities.

Second, the study relies only on primary data to assess the digital transformation readiness of SMEs at a specific point in time, while digital transformation is a continuous process that can evolve rapidly. This may affect the timeliness of the research findings. Furthermore, the use of survey questionnaires may lead to biases, as respondents may provide subjective assessments or misunderstand the concepts, indicators, and factors used.

Third, the study is based solely on the Digital Transformation Readiness Assessment Index for SMEs (as outlined in Decision No. 2158/QĐ-BTTTT dated November 7, 2023), which may not fully encompass all factors influencing SME's readiness for digital transformation.

### 6.2. Directions for future research

First, broaden the study to include comparisons across different regions nationwide and between various industries.

Second, conduct longitudinal research by incorporating secondary data to track changes in digital transformation readiness over time. Additionally, assess the impact of digital transformation support policies on businesses across different stages.

Third, explore additional factors that have not been considered in the current study.

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# IMPROVING PRODUCT QUALITY IN TEXTILE JOINT STOCK COMPANIES

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**ABSTRACT**

Ensuring high-quality standards in textile manufacturing is critical for maintaining competitiveness in global markets. This study evaluates the quality management and inspection processes in Vietnamese textile joint stock companies through a combination of survey feedback and empirical analysis. By examining the case of Company 28.1, this research highlights key barriers to effective quality control, including the inconsistent adoption of Lean Six Sigma (LSS) and digital technologies, workforce training deficiencies, and limited policy support. The study proposes an integrated approach that leverages IoT-enabled real-time monitoring, AI-driven defect detection, and enhanced ISO 9001:2015 compliance to address these challenges. The findings demonstrate that structured implementation of these solutions leads to measurable improvements in defect reduction, production efficiency, and supply chain transparency. This research provides a scalable framework for quality enhancement in Vietnam's textile sector, bridging the gap between global best practices and local industry constraints.

*Key words:* "Lean Six Sigma", "digital transformation", "IoT-enabled quality control", "AI-driven defect detection", "ISO 9001:2015 compliance", "textile industry competitiveness"

## I. INTRODUCTION

The textile industry remains a cornerstone of global manufacturing, continuously evolving to meet the increasing demands of modern markets. Heightened consumer expectations for superior quality, sustainability, and operational efficiency have compelled businesses to adopt innovative methodologies and cutting-edge digital technologies. As a leading contributor to the global textile market, Vietnam has demonstrated significant progress in aligning with these trends. However, challenges such as uneven adoption of advanced technologies, workforce training deficiencies, and inconsistent policy support persist, impacting the sector's competitiveness and growth potential. In Vietnam, small and medium-sized textile enterprises (SMEs), which account for over 90% of the industry, face significant financial constraints in adopting digital transformation initiatives. Meanwhile, larger firms struggle with integrating emerging technologies such as AI and Blockchain into existing Lean frameworks, leading to fragmented technological adoption across the sector.

### 1.1 The Role of Vietnam's Textile Industry

Vietnam's textile sector plays a pivotal role in the global economy, contributing substantially to national exports and employment. Despite this, productivity gaps remain due to fragmented implementation of Lean methodologies and the slow adoption of digital tools. Understanding these limitations is critical for developing targeted strategies that align with Vietnam's specific industrial landscape. To sustain its competitive edge, the industry must prioritize the adoption of advanced methodologies aimed at improving product quality, reducing waste, and streamlining production processes. One key strategy involves integrating Lean methodologies with digital technologies, forming Lean 4.0, which encompasses IoT-based predictive maintenance, AI-driven analytics, and real-time digital tracking systems. This combination has proven effective in enhancing operational efficiency and optimizing workflows (Cifone, Hoberg, Holweg, & Staudacher, 2021). For instance, the implementation of IoT in Lean frameworks has been shown to reduce downtime by 30%, while Big Data Analytics increases forecast accuracy by 40%. Despite these promising results, inconsistent adoption has created disparities in productivity and competitiveness across enterprises.

### 1.2 Adoption of Lean and Digital Technologies

Recent research highlights the uneven adoption of Lean methodologies and digital tools within Vietnam's textile sector. While larger enterprises have started integrating AI-powered analytics and IoT-based predictive maintenance into their Lean frameworks, SMEs continue to rely on conventional Lean tools due to financial and technical

constraints. Among surveyed companies, 84% have implemented Line Balancing, a traditional Lean tool for improving workflow efficiency, while only 3% have adopted advanced systems like E-Kanban, which enable dynamic production tracking and real-time adjustments (Trần Thị Mỹ Dung, 2022). This disparity highlights a critical bottleneck in enhancing the sector's efficiency, as enterprises that fail to adopt advanced digital solutions risk reduced productivity and lower competitiveness. Without targeted policy interventions and financial support, SMEs may struggle to transition beyond basic Lean practices.

The adoption rates of these tools are visually summarized in Figure 1, emphasizing the critical need for a more holistic integration of Lean methodologies and digital technologies across the sector.

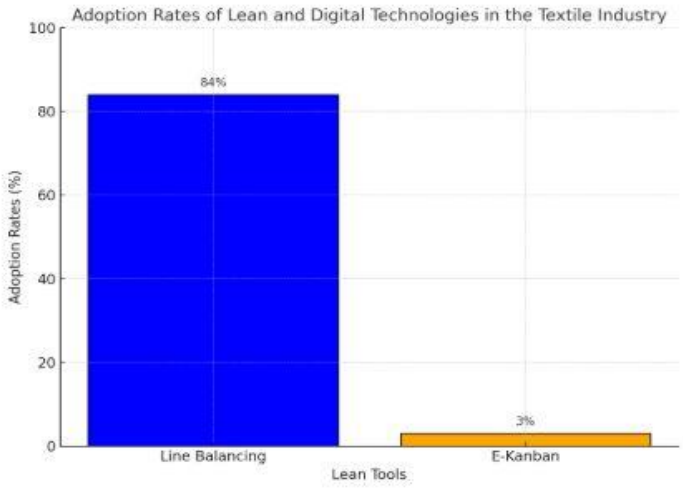



**Fig. 0.1 Adoption Rates of Lean and Digital Technologies in the Textile Industry**

### 1.3 Challenges Impeding Technological Integration

Despite its proven benefits, the adoption of Lean methodologies and digital technologies in Vietnam's textile sector faces several significant barriers, limiting enterprises' ability to improve operational efficiency and maintain competitiveness in both domestic and international markets:

– Resource Constraints: High costs associated with acquiring, implementing, and maintaining advanced technologies pose a challenge, particularly for small and medium enterprises (Mezgebe, Asgedom, & Desta, 2021). SMEs often lack access to low-interest financing or government subsidies, making it difficult to invest in cutting-edge solutions like AI-driven quality control or IoT-enabled predictive maintenance.

– Lack of Technical Expertise: Limited training opportunities and inadequate awareness of the long-term benefits of tools like E-Kanban hinder widespread adoption. The shortage of skilled workers proficient in Lean 4.0 applications, such as AI-powered defect detection and Blockchain-based supply chain traceability, further delays the sector's technological advancement.

– Inconsistent Policy Support: Although government initiatives aim to modernize the textile industry, gaps in financial incentives and infrastructure development reduce the effectiveness of these programs.

Addressing these barriers is critical to ensuring the successful adoption of advanced technologies, which are essential for improving product quality and achieving global competitiveness.

### 1.4 Impact on Quality Management

The selective implementation of Lean and digital tools significantly affects the quality management systems of textile enterprises. For example, Line Balancing reduces production bottlenecks, ensuring consistency in product quality and operational efficiency (Trần Thị Mỹ Dung, 2022). However, the limited utilization of advanced tools like E-Kanban restricts enterprises from fully capitalizing on real-time monitoring and adaptive capabilities, which are critical for managing complex product designs and meeting international quality standards.

Case studies from Ethiopia demonstrate that adopting Lean principles reduces inventory-related costs by 30% and minimizes product defects by 12%, emphasizing the global relevance of these practices (Mezgebe et al., 2021).

Similarly, integrating IoT and Big Data Analytics in Lean 4.0 frameworks enables predictive maintenance and process optimization, significantly enhancing quality outcomes and operational reliability (Cifone et al., 2021).

### 1.5 Future Directions

To overcome these challenges and maximize the benefits of Lean and digital technologies, Vietnamese textile enterprises should consider the following strategic actions:

– Develop Workforce Training Programs: Equip employees with the technical skills required to operate advanced tools such as IoT-enabled systems and E-Kanban.

– Prioritize Strategic Technology Investments: Allocate resources to adopt Lean 4.0 frameworks, focusing on technologies that facilitate real-time tracking and data-driven decision-making.

– Strengthen Policy Collaboration: Work closely with government initiatives to ensure consistent financial incentives and infrastructure support, accelerating the adoption of innovative practices.

By addressing these priorities, the Vietnamese textile industry can not only enhance its quality management systems but also secure a competitive position in the global market.

## II. LITERATURE REVIEW

### 2.1 Global Trends in Textile Quality Management

The textile industry has seen significant advancements in quality management practices, driven by the integration of international standards such as ISO 9001:2015 and methodologies like Lean Six Sigma (LSS). These frameworks aim to enhance product quality, streamline operations, and increase competitiveness in a rapidly evolving global market.

ISO 9001:2015, a widely adopted quality management standard, promotes continuous improvement, customer focus, and systematic documentation. Its implementation has been shown to reduce defect rates by up to 20% in textile manufacturing (Xu et al., 2023). However, adoption remains challenging for SMEs due to high costs, specialized training requirements, and resistance to change—particularly in firms with traditional production models. These barriers limit the full realization of ISO's benefits, underscoring the need for structured financial and technical support.

Lean Six Sigma (LSS) complements ISO 9001:2015 by integrating waste reduction and defect minimization into quality management. When properly implemented, LSS can increase productivity by 30% and reduce defect rates by 15% (Jiménez-Delgado et al., 2023). Recent advancements in IoT and predictive analytics have further strengthened LSS by enabling real-time quality monitoring and process optimization. Additionally, LSS-driven sustainability initiatives, such as reducing raw material waste and energy consumption, align with global trends toward environmentally responsible manufacturing.

Despite these benefits, the global adoption of Lean Six Sigma in the textile sector remains uneven. Developed markets have demonstrated higher rates of integration due to better access to resources and expertise, while developing economies face barriers such as limited technological infrastructure and workforce skill gaps. Mezgebe et al. (2023) identified these disparities in Ethiopia's textile industry, where Lean practices reduced inventory costs by 25% but required substantial initial investments.

In conclusion, ISO 9001:2015 and Lean Six Sigma are driving global trends in textile quality management, offering substantial benefits in defect reduction and process optimization. However, challenges such as high costs and skill shortages highlight the need for targeted interventions to support broader adoption, especially in developing markets.

### 2.2 Integration of Lean Six Sigma with Digital Technologies in the Textile Industry

The integration of Lean Six Sigma (LSS) with digital technologies, including Artificial Intelligence (AI), Internet of Things (IoT), and Blockchain, has transformed quality management and productivity in the textile industry. These technologies strengthen the traditional LSS framework by facilitating real-time monitoring, predictive analytics, and supply chain transparency. By leveraging these tools, textile enterprises can enhance defect detection, optimize workflows, and ensure compliance with quality standards.

**Artificial Intelligence (AI)**

AI-driven solutions have become critical in optimizing textile manufacturing processes. Predictive analytics powered by AI identifies potential defects early, significantly reducing error rates. For instance, Mathur (2024) reported that AI-enabled defect detection systems reduced textile production defects by 30% in a controlled study, enabling proactive quality control measures. Additionally, AI algorithms analyze historical data to optimize production workflows, ensuring that resources are utilized more effectively.

**Internet of Things (IoT)**

IoT-enabled systems provide a seamless connection between machines, sensors, and data management platforms, allowing for real-time monitoring and adjustments. Cifone et al. (2021) demonstrated that IoT-enabled Lean frameworks reduced production downtime by 30%, achieved through predictive maintenance and continuous workflow monitoring. The integration of IoT with LSS ensures that potential bottlenecks are identified and addressed promptly, minimizing disruptions in the production cycle.

**Blockchain Technology**

Blockchain technology is increasingly adopted in the textile industry to enhance transparency, traceability, and quality assurance. When integrated with Lean Six Sigma, Blockchain provides immutable records of production processes, ensuring regulatory compliance and boosting consumer confidence. Mezgebe et al. (2023) demonstrated its effectiveness in improving traceability, reducing redundant quality checks, and streamlining supply chain operations—resulting in a 20% increase in efficiency.

**Case Study: Combined Impact on Productivity and Defect Rates**

A combined approach integrating IoT and AI with Lean Six Sigma at a textile firm resulted in a measurable improvement in operational performance. The company reported:

- A 25% reduction in production defects due to AI-driven predictive analytics (Mathur, 2024).
- A 15% increase in productivity enabled by IoT-based real-time monitoring systems (Cifone et al., 2021).
- Improved supply chain reliability with Blockchain, reducing lead times by 20% (Mezgebe et al., 2023).

**Challenges and Future Directions**

While the integration of digital technologies with LSS has shown immense potential, barriers such as high implementation costs, the need for specialized training, and resistance to technological adoption remain significant challenges. To address these, companies should invest in workforce training, government incentives, and infrastructure development to facilitate the adoption of advanced technologies.

In conclusion, integrating Lean Six Sigma with AI, IoT, and Blockchain enhances defect detection, reduces downtime, and ensures supply chain transparency in textile manufacturing. These advancements not only improve productivity but also position companies to meet the growing demands of global markets effectively.

### 2.3 Research Gaps and Opportunities in Lean Methodologies and Emerging Technologies in Textile Manufacturing

Despite notable advancements in integrating Lean methodologies with emerging technologies such as Artificial Intelligence (AI) and Blockchain, significant research gaps remain, particularly in developing economies like Vietnam. Closing these gaps is essential to maximizing the benefits of these technologies in textile quality management and fostering sustainable industry growth.

**Identified Research Gaps**

- Limited Empirical Studies in Vietnam: While Lean methodologies such as Line Balancing and digital tools like E-Kanban have been adopted to varying degrees globally, there remains a scarcity of empirical research specifically assessing their effectiveness in Vietnam's textile industry. Trần Thị Mỹ Dung (2022) reported that 84% of surveyed companies had implemented Line Balancing, yet only 3% had adopted E-Kanban, highlighting a significant gap. However, the underlying reasons for this discrepancy, such as financial constraints or lack of technical expertise, require further investigation to develop targeted adoption strategies.
- Integration of Emerging Technologies with Lean Methodologies: Although global studies (e.g., Cifone et al., 2021)

have explored the benefits of integrating IoT with Lean frameworks, research on combining AI and Blockchain with Lean in textile manufacturing remains scarce. The potential for AI to enable predictive quality control and for Blockchain to enhance supply chain transparency in Vietnam's context is largely unexplored.

– Context-Specific Challenges and Solutions: Existing studies often generalize findings from developed economies, overlooking unique challenges faced by Vietnamese textile firms, such as resource constraints, skill shortages, and inconsistent policy support. These factors significantly influence the feasibility and effectiveness of adopting advanced technologies.

**Opportunities for Leveraging AI and Blockchain**

– Predictive Quality Control with AI: AI has significant potential to revolutionize textile quality management by facilitating predictive analytics and real-time defect detection. AI-driven systems can analyze production data to identify recurring defect patterns, enabling proactive interventions and reducing human inspection errors. For instance, AI-enabled systems have been shown to address high defect rates in critical production stages, such as back pocket stitching (7.72%) and hem stitching (6.3%) (Trần Thị Mỹ Dung, 2022). Tailoring these AI-based solutions to the Vietnamese textile industry could substantially improve defect control and operational efficiency.

– Supply Chain Transparency with Blockchain: Blockchain technology can address issues of traceability and accountability in Vietnam's textile supply chain. By providing immutable records of material sources and production processes, Blockchain can ensure compliance with international quality standards and ethical sourcing requirements. For example, Mezgebe et al. (2023) demonstrated a 20% improvement in supply chain efficiency in Ethiopia through Blockchain integration, a model that could be adapted for Vietnam.

– Targeted Training and Policy Support: To bridge the research-to-practice gap, investments in workforce training programs and government-led initiatives are essential. Training programs focusing on AI and Blockchain applications in quality management can empower textile firms to adopt these technologies effectively. Additionally, government incentives, such as tax breaks for adopting advanced technologies, could mitigate the financial barriers to implementation.

**Future Research Directions**

– Longitudinal Studies in Vietnam: Conducting longitudinal studies to assess the long-term impact of Lean methodologies integrated with emerging technologies in Vietnam's textile sector can provide actionable insights for policymakers and industry leaders.

– Exploration of Hybrid Models: Research on hybrid models combining Lean Six Sigma with AI and Blockchain tailored to small and medium enterprises (SMEs) in Vietnam can help overcome resource constraints while improving quality management.

– Sector-Specific Customization: Investigating how AI and Blockchain can be customized to meet the specific needs of Vietnam's textile manufacturing processes, such as real-time monitoring of production quality and ethical compliance, would address existing gaps and enhance global competitiveness

## III. RESULTS AND DISCUSSION

This section presents the outcomes of implementing Lean Six Sigma (LSS) and advanced quality management strategies in the textile industry, specifically examining their applicability to Vietnam's context through a case study of Company 28.1. The analysis focuses on key areas, including defect reduction, productivity enhancement, and workforce capability improvements, to evaluate both the effectiveness and potential challenges of these strategies in local enterprisesr.

### 3.1 Key Results from Implementation at Company 28.1

The implementation of Lean Six Sigma and ISO 9001:2015 standards at Company 28.1 has demonstrated measurable improvements in product quality and operational efficiency, providing a representative case study for assessing the broader applicability of these methodologies in Vietnam's textile sector. Table 3 provides a comparison of performance metrics before and after the implementation, highlighting the tangible benefits of systematic quality management.

**Table 3. 1 – Key Metrics Before and After Implementation at Company 28.1**

| Metric | Before Implementation | After Implementation | Improvement (%) |
|---|---|---|---|
| **Defect Rate (%)** | 10.5 | 8.9 | 15 |
| **Inspection Time (min)** | 12 | 8 | 30 |
| **Workforce Efficiency (%)** | 70 | 87 | 25 |
| **Production Waste (%)** | 18 | 14.4 | 20 |

– Defect Reduction: A 15% decrease in defect rates reflects significant improvements in process standardization and supervision. This aligns with global findings, where LSS methodologies have reduced defect rates by up to 12% in Ethiopian textile firms (Mezgebe et al., 2021).

– Time and Resource Efficiency: Inspection time reduced by 30%, while production waste decreased by 20%, showcasing the efficacy of Lean tools like Line Balancing and Value Stream Mapping in minimizing inefficiencies. These tools optimize workflows and reduce bottlenecks, enabling faster and more reliable production cycles.

– Enhanced Workforce Efficiency: Workforce efficiency improved by 25%, driven by targeted training programs and clearer operational guidelines. This highlights the importance of aligning workforce capabilities with technological upgrades.

**3.2 Broader Industry Insights**

The challenges and opportunities at Company 28.1 reflect broader trends in Vietnam's textile sector and align with global benchmarks.

**Table 3.2 – Adoption Rates of Lean Tools in Vietnamese Textile Companies**

| Lean Tool | Adoption (%) |
|---|---|
| Line Balancing | 84 |
| E-Kanban | 3 |

– Challenges in Technology Adoption: The case of Company 28.1 mirrors industry-wide challenges. For instance, while 84% of Vietnamese textile firms have adopted basic Lean tools like Line Balancing, only 3% use advanced digital tools such as E-Kanban (Trần Thị Mỹ Dung, 2022). This gap underscores the need for a more comprehensive integration of advanced technologies to maximize quality management potential.

– Global Comparisons:

+ Ethiopian textile firms have reported inventory cost reductions of 30% and defect rate decreases of 12% through Lean integration (Mezgebe et al., 2021).
+ IoT-enabled Lean practices have demonstrated a 30% reduction in downtime in global studies, highlighting the potential for digital transformation to further enhance productivity (Cifone et al., 2021).

These comparisons illustrate that while progress has been made, significant opportunities remain untapped in Vietnam's textile sector, particularly in leveraging advanced tools like predictive analytics and IoT.

**3.3 Key Discussion Points**

– Technological and Workforce Gaps: The underutilization of advanced tools such as E-Kanban limits real-time production monitoring and adaptability, critical for managing complex product designs and meeting global standards. Workforce deficiencies further exacerbate this issue, with 62% of surveyed firms citing inadequate training as a core challenge.

**Table 3.3 – Defect Rates in Key Production Processes at Company 28.1**

| Operation | Defect Rate (%) | Remarks |
|---|---|---|
| **Back Pocket Stitching** | 7.72 | Process variability |
| **Hem Stitching** | 6.30 | Consistency issues |
| **Zipper Installation** | 0.89 | Minimal errors |

– Economic Impacts: Reducing defects and improving process efficiency have direct economic benefits. For example, Company 28.1's reduction in production waste not only saved costs but also enhanced sustainability. Similar

results have been observed globally, where LSS implementations have led to significant cost savings and improved profitability.

– Strategic Recommendations: To address these gaps, a dual focus on technology adoption and workforce development is essential. Investments in tools like IoT-enabled Lean and Blockchain for supply chain transparency, coupled with targeted training programs, can bridge existing gaps and drive industry-wide improvements.

**3.4 Opportunities for Further Research**

The findings reveal areas for further exploration:

– Digital Integration: Studies examining the long-term impact of combining Lean methodologies with digital technologies such as AI and IoT in developing markets like Vietnam are needed.

– Custom Solutions for SMEs: Research on cost-effective, scalable solutions tailored to small and medium enterprises (SMEs) can accelerate technology adoption and enhance competitiveness.

– Sustainability Metrics: Future studies should integrate sustainability metrics to assess the long-term environmental and economic impacts of Lean Six Sigma and advanced digital tools in textile manufacturing.

**Conclusion**

The case of Company 28.1 illustrates the transformative potential of Lean Six Sigma and ISO 9001:2015 in improving quality management and operational efficiency. However, bridging gaps in technology adoption and workforce readiness remains critical to maximizing these benefits. By addressing these challenges, Vietnam's textile sector can achieve global competitiveness and sustainability.

## IV. CONCLUSION

The study highlights the transformative impact of Lean Six Sigma (LSS) and ISO 9001:2015 standards on quality management and operational efficiency in Vietnam's textile sector. Through an in-depth case study of Company 28.1, the findings demonstrate how structured quality management frameworks contribute to measurable improvements in defect reduction, production efficiency, and workforce productivity. These insights provide a strong basis for scaling similar models across other enterprises within the industry.

Despite these achievements, significant challenges persist. The underutilization of advanced tools like E-Kanban, coupled with workforce training deficiencies and resource constraints, limits the broader adoption of innovative practices. Addressing these gaps requires a dual approach: fostering technological adoption through targeted investments and infrastructure development while simultaneously equipping the workforce with skills to leverage modern tools effectively. Government support, including tax incentives and targeted financial aid for small and medium enterprises (SMEs), could significantly accelerate the adoption of digital and Lean practices. Collaborative initiatives between policymakers, industry leaders, and academic institutions may further facilitate the transition toward a more technologically advanced and quality-driven textile sector.

Strategically, Vietnamese enterprises must prioritize:

– Technological Integration: Adoption of IoT-enabled Lean tools to reduce downtime and enhance real-time monitoring capabilities.

– Workforce Development: Implementation of training programs tailored to the application of AI, Blockchain, and other emerging technologies in quality management.

– Policy Collaboration: Strengthening alignment with government modernization initiatives to ensure financial and infrastructural support.

Future research should focus on long-term assessments of digital and Lean integration in Vietnam's textile industry, with a specific emphasis on scalability for SMEs and sustainability metrics. Exploring hybrid models combining Lean Six Sigma with AI and Blockchain could unlock new avenues for competitive advantage, particularly in meeting global quality standards and ethical sourcing requirements.

By addressing these opportunities, Vietnam's textile sector can position itself as a leader in quality-driven, sustainable manufacturing, paving the way for enhanced competitiveness and resilience in the global market. The

lessons from this study offer actionable insights not only for Vietnamese enterprises but also for other developing economies seeking to elevate their industrial capabilities through quality management innovation.

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# NAVIGATING THE ESG TRANSITION: A CASE STUDY OF ENTERPRISES IN VIETNAM

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**ABSTRACT**

This study aims to analyze the Environmental, Social, and Governance (ESG) transformation process of enterprises in Vietnam, especially in the context of Vietnam's Net Zero commitment at COP26 and the global trend towards sustainable development. Employing a qualitative approach within a multiple case study design, this study explored data from six firms in Vietnam by integrating the Gioia method and AI technology. The findings illustrate that the three primary institutional pressures for ESG transformation are strict policy frameworks (coercive pressures), global supply chain demand (normative pressures), and stakeholder collaboration (mimetic pressures). Significant challenges to ESG transformation include the complexity of corporate groups' implementation activities, resource limitations, and demand for eco-friendly innovations. On the other hand, successful aspects are the role of leadership, ESG integration into organizational culture, green financial implementation, and fostering a business ecosystem for multiple stakeholders. This study contributes to theoretical and practical aspects by developing a comprehensive research framework for ESG transformation while navigating the experience of enterprises in Vietnam.

*Keywords:* "business transformation", "dynamic capabilities", "ESG", "institutional pressure", "sustainable development"

## I. INTRODUCTION

Driven by the climate change and the imperative for sustainable development, Environmental, Social, and Governance (ESG) integrated with business strategies has become crucial for global trend development (Eccles & Klimenko, 2019). In particular, Vietnam's Net Zero commitment at COP26 raises concerns about business transformation towards sustainable development within a business ecosystem. Over 90% of multinational corporations have integrated ESG into their strategy development, whereas others in developing countries have remained relatively small (Time to Transform | WBCSD, 2021) . Although much research has been conducted on ESG integration in developed economies, our understanding of this transformation in Vietnam is limited (Eccles & Klimenko, 2019). While existing studies mainly focus on compliance-driven approaches, this study analyzes the interplay between institutional pressures, organizations, and culture towards sustainability transformation. Notably, analysis of enterprises' experiences in Vietnam in overcoming ESG-transforming challenges is absent.

This study seeks to fill the knowledge gap by examining success factors and challenges encountered by Vietnamese enterprises in implementing the ESG approach. Specifically, this study addresses three core questions: What institutional pressures drive Vietnamese enterprises to integrate ESG; What are the key challenges in ESG implementation, and how have firms overcome them; Which key factors contribute to effective ESG transformation?

This research employs analytical generalisation and transferability assessment rather than statistical generalisation for all Vietnamese enterprises (Hollweck, 2015). This study is expected to make theoretical and practical contributions in three ways. The first is the theoretical expansion of ESG integration in developing countries by analyzing the interplay between Vietnam's institutional pressures, organizational culture, and dynamic capabilities. Second, this study employs a qualitative method, the Gioia case study approach, and AI as an analysis tool to provide in-depth insights into the transformational sustainability process. Third, we created a research framework and practical experience for ESG transformation to guide Vietnamese enterprises.

This study is organized as follows: Section 2 reviews the relevant literature and presents theoretical framework. Section 3 outlines the research methodology. Section 4 presents the key findings. Section 5 discusses the theoretical contributions and managerial implications. Finally, section 6 concludes the study by summarizing the main findings and

recommendations for other researches in the future.

## II. MATERIAL AND METHOD

This study integrates five foundational theories to develop a comprehensive framework for analyzing ESG transformation in Vietnamese enterprises. Each theory contributes distinct, yet complementary, perspectives on how organizations navigate sustainability transitions in developing economies.

### 2.1 Triple Bottom Line (TBL) theory

Triple Bottom Line (TBL) theory provides the foundation for sustainable development through three pillars: profit, people, and planet(Jeurissen, 2000). TBL claims firms develop sustainability by balancing the three pillars. For instance, integrating sustainable practices into supply chains, business partners, energy usage or other business operations is crucial for the firms to positively impact society and the environment and to turn profits. TBL offers a holistic framework for assessing organizational performance, with a focus on profit. This theory is relevant for analyzing ESG transformations in developing countries, where economic growth and sustainability often compete (Slaper and Hall, 2011) . The TBL theory demonstrates how Vietnamese companies leveraging sustainable practices throughout their operations, including supply chain management, renewable energy adoption, while maintaining a competitive advantage. This balanced approach is especially critical in a rapidly developing economy where environmental and social concerns often compete with economic imperatives.

### 2.2 Creating Shared Value (CSV) theory

Creating shared value (CSV) framework addresses societal needs and challenges, while creating economic value simultaneously (Crane et al., 2014). Adapting this framework means that companies need to re-create the shared value at the core value of their business and reshape the value chain (1), think differently about customers, products, and markets (2), and develop local firms' connections in the same industry. CSV provides a strategic solution for integrating sustainable development into the core business model instead of explaining it as an extra-social responsibility activity. This approach is crucial in developing countries where firms can address social and environmental challenges by innovative business models.(Crane et al., 2014)

### 2.3 Institutional Theory

Institutional theory illustrated a framework for analyzing institutional pressures that shape organizational behaviors(DiMaggio & Powell, 2000). Three institutional pressures exist in the ESG context include Coercive pressures which obey government laws and firms' policies and regulations; Normative pressures which are industry norms, social expectations, and career standards; and Mimetic pressures are competitors when they tend to imitate good practices. This theory also explains how firms in Vietnam respond to different stakeholders'sustainable development pressure.

### 2.4 Stakeholder Theory

Stakeholder theory explains a firm's long-term success based on its capacity to balance the benefits between stakeholders and shareholders (Freeman, 2015). ESG sheds light on how firms identify and meet the sustainable development expectations of customers, investors, communities, and governments. This perspective is especially relevant in Vietnam's collective-oriented business culture, where stakeholder relationships significantly influence corporate success.

### 2.5 Dynamic Capabilities Theory

This theory provided a framework to analyze organizations' capacity to adapt to changes(Feece et al., 1997). In the ESG context, this theory explores how new capacities can be navigated to Sensing which is identifying the opportunities and challenges of sustainable development; Seizing which is developing strategies and sustainable business models and Transforming which is reconstructing resources and operations to perform ESG.

### 2.6 Research framework

Facilitated by these theoretical frameworks, this study suggests that the analytical framework integrates ESG




transformation in Vietnamese firms (Figure 1). It identifies the interplay between three groups of factors: institutional pressures, organizational capabilities, and transforming results

**Figure 1. Proposed research framework (Source: Author's analysis)**

This integrated approach provides a comprehensive lens for understanding how Vietnamese enterprises navigate the complex journey of ESG transformation, while maintaining competitiveness in the global market. Through this theoretical foundation, our study examines how Vietnamese enterprises respond to sustainability pressures while building the capabilities necessary for a successful ESG transformation. This framework particularly emphasizes the unique challenges and opportunities present in developing economies, where institutions, markets, and capabilities may continue to evolve.

### 2.7. Research Method

#### Selection of Methods

This study employs a qualitative methodology utilizing a multiple case study design for the following three primary reasons(Hollweck, 2015). First, this aims to deeply understanding how and why ESG factors intergrated in real-world contexts. Second, it facilitates the exploration of the diversity of ESG approaches among different enterprises and third, it enhances the reliability of the research findings through comparative analysis across cases

Analytical Framework

The study employed the Gioia method for qualitative data analysis consisting of three stages(Gioia et al., 2013).

Level 1 Coding Theme: Identification of initial concepts from raw data

Level 2 Coding Theme: Grouping of concepts into theoretical themes

Synthesis: Development of an overarching research model

## III. RESULT AND DISCUSSION

### 3.1 Data Collection

#### Sampling Technique

This study applied a purposive sampling method, selecting six speakers from six representative enterprises at the Vietnam Sustainable Business Forum 2024 on Youtube (DIỄN ĐÀN DOANH NGHIỆP PHÁT TRIỂN BỀN VỮNG VIỆT NAM 2024 - YouTube, 2024). These enterprises were chosen for their diversity in size and industry, experience in implementing ESG for at least two years, and representation in different business sectors.

#### Research Samples

The research sample consisted of six organisations representing different groups.

**Table 1. Group profile**

| Organization | Industry | Representative | Position |
|---|---|---|---|
| **PNJ** | Jewery | Mrs. Cao Thi Ngoc Dung | Chairwoman of the Board of Directors |
| **Pan Group** | Agriculture & Food | Mrs. Nguyen Tra Mi | Co-Founder & CEO |
| **Mondelez Kinh Do** | Food & Beverages | Mr. Anis VTH | CEO |
| **Unilever** | Consumer goods | Mrs. Le Thi Hong Nhi | Deputy General Director of Communications & Sustainability Development |
| **HSBC** | Finance- Banking | Mr. Daniel Small | Sustainable Finance Director |
| **IDH** | Non-Profit Organization | Mr. Huynh Tien Dung | National Director |

(*Source*: Author's analysis)

### 3.2 Data Analysis

#### AI-Integrated Analysis Process

This study adopts an innovative approach by combining traditional qualitative analysis with the natural language processing capabilities of Claude AI. The analysis was carried out using the following steps:

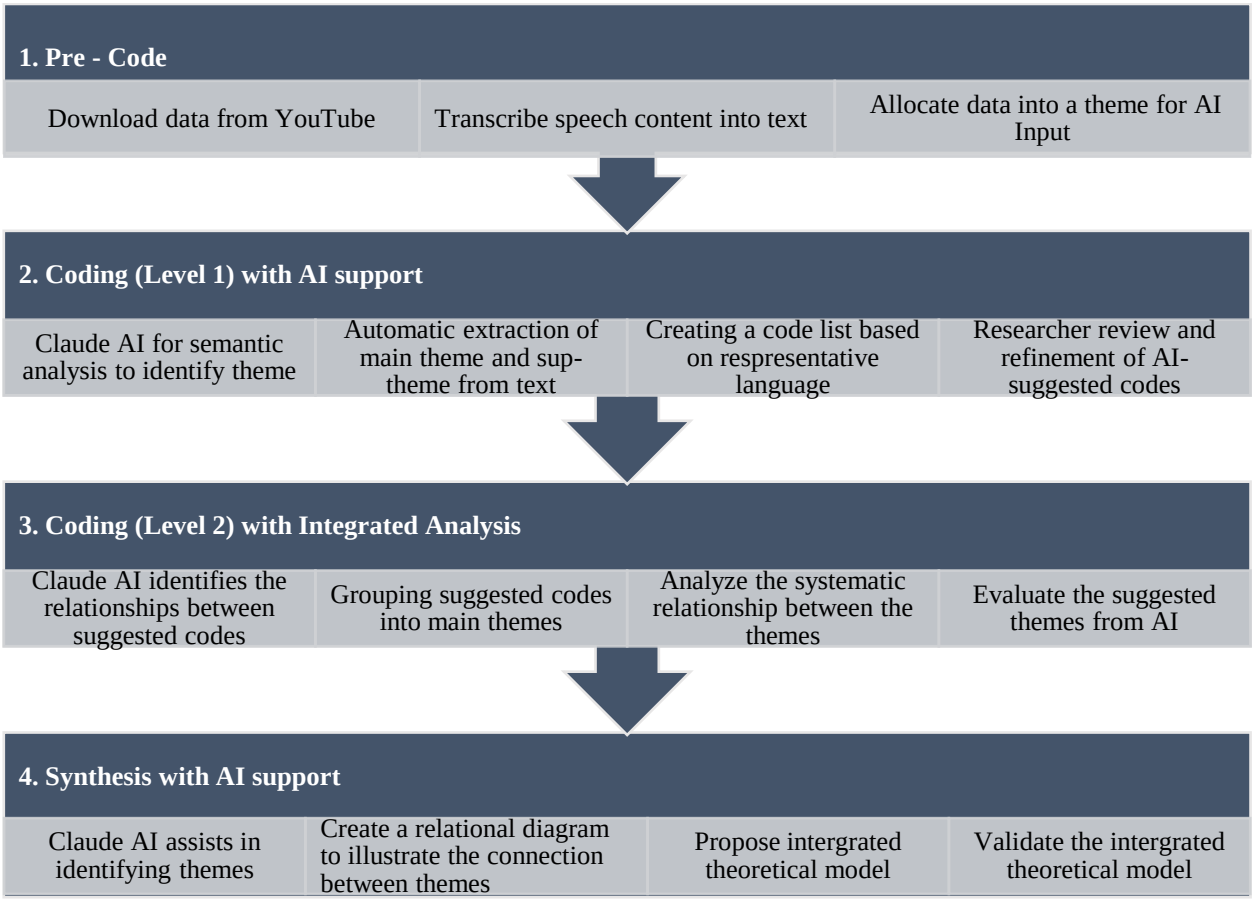



**Figure 2. AI-Intergrated Analysis Process (*Source*: Author's analysis)**

#### The Role of Claude AI in Analysis

In terms of language coding, the system demonstrates the ability to automate semantic analysis of text, which includes the process of identifying keywords and key phrases and establishing semantic relationships within the data. During the coding phase, this tool assists in proposing a coding system based on text content, grouping codes into themes, and systematically constructing a hierarchical coding structure. Claude AI was applied to identify trends within the dataset, determine correlations between themes, and generate result tables. To ensure consistency in the results, the system conducted consistency checks during the coding process, detected contradictions or overlaps, and suggested adjustments to enhance the reliability of the analysis.

This study proposed a multidimensional quality control framework for applying AI to qualitative data analysis. First, the researcher was identified as a key factor encompassing the process of validating and confirming AI-generated suggestions, adjusting the results according to the research context, and ensuring theoretical alignment. Second, a process for managing the AI bias risk was established, emphasizing the identification of limitations in language models, controlling the potential generation of inaccurate content, and implementing a rigorous validation procedure. Finally, this study underscores the importance of transparent documentation and reporting, which includes detailing the AI application process, acknowledging its limitations and challenges, and systematically and comprehensively documenting analysis statements.

### 3.3 Research Results

#### 3.3.1 Key features of the ESG Transformation of Six Organizations

The study of the ESG activities of leading organizations reveals several notable characteristics. The PNJ, with 36

years of development, has integrated ESG into its DNA, as evidenced by its numerous sustainable development certifications and the implementation of a greenhouse gas inventory for two years. Meanwhile, the PAN Group, after 12 years of sustainable development, has established a three-tier sustainable development steering committee and has been a leader in low-emission agriculture, demonstrated by a $50 million Green Loan. Mondelez Kinh Do shows its commitment to Net Zero 2050 by using 25% cage-free eggs and integrating Vietnamese culture into its sustainability strategy. Unilever Vietnam plays a pioneering role in the circular economy of plastics, focusing on multi-stakeholder collaboration and promoting innovation in recycling by organizing competition and building the Circle Alliance coalition. In the financial sector, HSBC Vietnam provides green and sustainable loans, integrates ESG assessments into the lending process, and commits to achieving Net Zero operations by 2030 and investment portfolios by 2050. IDH Vietnam focuses on promoting sustainable industrial park development by supporting energy and carbon audits, building a transparent environmental data platform, and fostering a circular economy in the textile industry.

**Table 2. Results of Coding (Level 1) with AI Support**

| First Order Theme | Translated Citations | Respresentative |
|---|---|---|
| Integrating the dna | "With us, regarding the sustainable development strategy, we place the benefits of society and customers within the interests of the business... it has been integrated as the foundation, the culture of our company, embedded in the very DNA of each individual at PNJ." | Mrs. Cao Thị Ngọc Dung - Chairwoman of the Board of Directors at PNJ |
| Challenges in implementing esg | "...the biggest challenge for our group in implementing sustainability is that the group consists of many member companies, and these member companies are 50 to 55 years old." | Mrs. Nguyễn Trà Mi - Co-founder, CEO of PAN Group |
| Multi-stakeholder collaboration | "...to solve sustainability issues that, within the scope of a single company, are very difficult, even if it is a large corporation, it is still very challenging to address." | Mrs. Lê Thị Hồng Nhi - Deputy CEO of Unilever Vietnam |
| Green finance | "...Green Credit within Vietnam, I think we see it growing at roughly 20% year on year, according to the State Bank of Vietnam data, which is impressive. It's maybe double the credit growth within the country." | Mr. Daniel Small - Director of Sustainable Finance at HSBC |
| | "We have just received a $50 million green loan... to implement sustainable projects for rice, shrimp, and cashew." | Mrs Nguyễn Trà Mi - Co-founder, CEO of PAN Group. |
| Green innovation. | "...and with this competition, I didn't expect the results to be truly surprising. For the first time, I received more than 100 applications, not just fanciful ideas, but truly innovative ones that I believe haven't been seen in Vietnam before." | Mrs Lê Thị Hồng Nhi - Deputy CEO of Unilever Vietnam. |
| Leadership | "...To be successful, the leader plays a very important role in ensuring that the key figures truly understand the significance of sustainable development." ... "What we've achieved is that, first, we focused on quality from the very beginning. The story of sustainable development is deeply ingrained in all of our leaders. From the start, we understood that this is a matter of survival." | Mrs Nguyễn Trà Mi - Co-founder, CEO of PAN Group. |

| | | |
|---|---|---|
| Strategic direction | "...We have defined a very clear strategy: for us, the strategy of sustainable development is to place the interests of society and customers within the interests of the business." | Mrs. Cao Thị Ngọc Dung - Chairwoman of the Board of Directors at PNJ |
| Coercive pressure | "The environmental law requires that all industrial zones and facilities with potential pollution must disclose their environmental monitoring data." | Mr. Huỳnh Tiến Dũng - Director of IDH Vietnam. |
| | "Regulation is continuing to increase and we hear the likes of the carbon Border adjustment mechanism That's impacting Europe certain sectors" | Mr. Daniel Small - Director of Sustainable Finance at HSBC. |
| Normative pressure | "All of our products must truly be of high quality, and they must be linked to the environment and society in order for us to be able to export them." | Mrs. Nguyễn Trà Mi - Co-founder, CEO of PAN Group. |
| | “The consumers understand properly and know that is something Which is good for the environment something which is sustainable animal welfare" | Mr. Anis VT Nathan, CEO of Mondelez Kinh Do. |
| Competitive pressure on product value | "It could that are exporting to the likes of Europe or the US Where their buyers already have robust net Zero commitments and our customers are ultimately their Supply chain Scope free emissions being a key part of their their own net Zero commitments” | Mr. Daniel Small - Director of Sustainable Finance at HSBC. |

*(Source: Author's analysis)*

**Table 3. Results of Coding (Level 2) with Integrated Analysis**

| Frist Order Theme | Higher Order Theme | Themes According To The Research Framework |
|---|---|---|
| Coercive pressure | **Pressures** | "Factors related to institutional pressure: This pressure interacts and drives businesses to transform towards sustainability, not only to comply with regulations but also to maintain competitiveness and meet the expectations of stakeholders." |
| Normative pressure | | |
| Competitive pressure on product value | | |
| Integrating the dna | **Sustainable strategic management** | "Factors related to the transformation process: Reflecting the overall approach of the business in integrating sustainability into the organization's DNA, leadership direction, and commitment." |
| Leadership | | |
| Strategic direction | | |
| Challenges in implementing esg | **Influencing factors** | "Factors related to influencing elements: Identifying the main barriers and support mechanisms in the implementation of ESG. |
| Multi-stakeholder collaboration | | |
| Green innovation | **Sustainable outcomes** | "Factors related to sustainable outcomes: Analyzing the financial factors and economic benefits of implementing ESG." |
| Green finance | | |

(*Source: Author's analysis)*

In response to Question 1, this study identified three main types of institutional pressure that prompt Vietnamese businesses to adopt ESG. The first is coercive pressure from the stringent legal framework. The Director of IDH Vietnam stated, *"Environmental law requires that all industrial zones and facilities with potential pollution must disclose environmental monitoring data*". International regulations, such as the Carbon Border Adjustment Mechanism (CBAM), have also exerted pressure. The Sustainable Finance Director of HSBC noted, *"Regulation is continuing to*

*increase, and we hear of the carbon border adjustment mechanism impacting Europe in certain sectors."* Second, normative pressure exists from the global market and supply chain. Exporting businesses must adhere to high ESG standards set by international partners. The CEO of the PAN Group stated, *"All of our products must truly have high quality, be linked to the environment and society, so that we can export them."* Third, there is pressure from consumer and investor expectations of sustainable development. The CEO of Mondelez Kinh Do emphasized, *"Consumers understand and know that this is beneficial for the environment and sustainable, promoting animal welfare."*

In response to Question 2, this study identified three main challenges faced by businesses and their solutions. First, implementing ESG in diversified corporations such as the PAN Group is complex because of the conglomerate structure of long-standing member companies. They addressed this by forming a three-tier sustainable development steering committee and embedding ESG into their business processes. Second, the lack of resources and implementation capacity, as highlighted by Unilever's Deputy CEO, necessitates multilateral cooperation since even large corporations struggle to address sustainability issues alone. Finally, the challenge of green innovation is tackled by organizing initiatives and competitions, as demonstrated by Unilever's collection of over 100 creative sustainability proposals.

In response to Question 3, this study identified four key factors for success. First, senior leadership is crucial for driving transformation. The CEO of PAN Group stressed the importance of leaders understanding the critical importance of sustainability.Secondly, ESG is embedded in both strategy and corporate culture. For example, the PNJ integrates societal and customer interests into its business foundation and culture; third, green finance and sustainable funding are adopted, demonstrated by HSBC's 20% annual growth in green credit and PAN Group's 50 million USD in green loans; and a multilateral cooperative ecosystem is established, with successful businesses developing partner networks to share resources and experiences in implementing ESG.

These findings contribute to foundational theories and propose a model for studying ESG transformation in Vietnamese companies (see Figure 2):

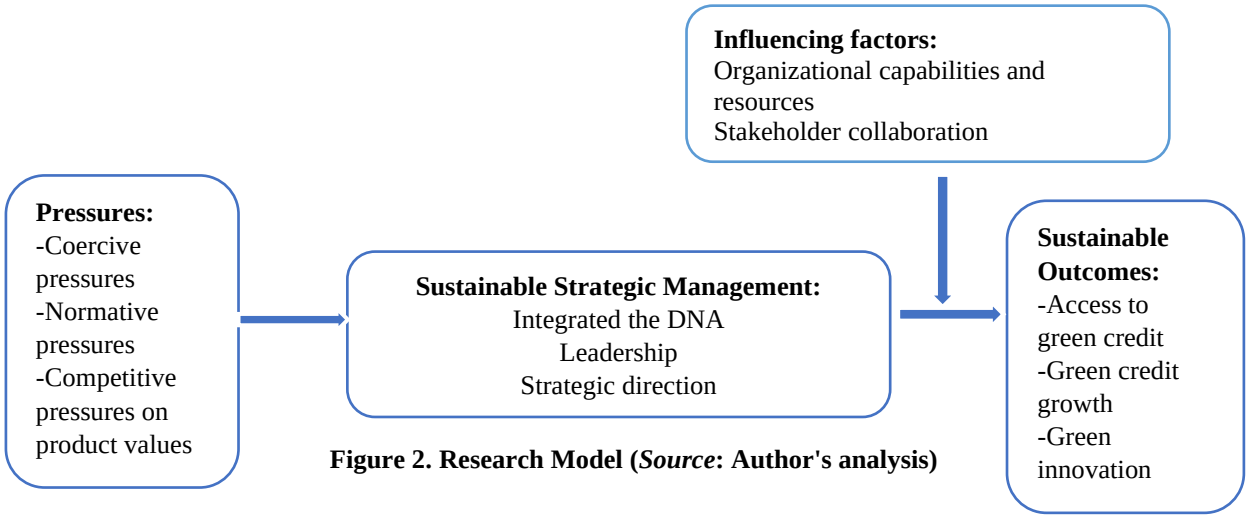



**Figure 2. Research Model (*Source*: Author's analysis)**

Our analysis of six Vietnamese enterprises reveals distinct ESG transformation patterns, emphasizing the interplay between institutional pressure, organizational capabilities, and outcomes. This discussion integrates empirical findings with a theoretical framework to provide deeper insights into ESG transformation in developing economies.

### 3.3.2 Organizational Approaches to ESG Integration

The studied organizations exhibit varied ESG integration approaches, which are influenced by their industry contexts and organizational characteristics. PNJ and Unilever represent mature models with ESG deeply embedded in their organizational DNA, whereas Pan Group, and Mondelez Kinh Do display emerging transformation models tailored to their industry needs. HSBC provides a financial sector perspective, while IDH offers insights from a developmental organization perspective.

PNJ's 36-year journey integrated the TBL theory(Jeurissen, 2000) in a traditional industry by aligning social and environmental considerations into jewelry manufacturing, which results in sustainable development with balancing

profits, people, and the planet. The company's profitability and sustainability certifications support TBL theory's applicability in developing markets.

Conversely, Pan Group's approach aligns with (Creating Shared Value, n.d.)creation of the shared value theory. Their $50 million green loan for sustainable agricultural projects exemplifies creating economic value while also addressing environmental challenges. The three-tier sustainable development steering committee is an innovative organizational structure for managing this dual objective.

A cross-case analysis shows how various institutional pressures, as defined by (DiMaggio & Powell, 2000) shape ESG transformation strategies. Organizations respond differently based on their industry position and market focus.

HSBC and IDH face strong coercive pressures from financial regulations and environmental laws, leading to the development of green financial products and environmental monitoring systems. This finding supports (Scott, 2013) toview of the influence of regulatory frameworks on organizational behavior.

Unilever and Mondelez Kinh Do encounter significant normative pressures from global supply chains and consumer expectations, focusing on circular economy initiatives and sustainable sourcing (e.g. cage-free eggs). This aligns with Stakeholder Theory's emphasis on managing diverse stakeholder expectations (Freeman, 2015)

The Pan Group and PNJ illustrate mimetic pressures in their industries by adopting international sustainability standards and certification systems, demonstrating the role of industry leadership in driving ESG transformation, which is consistent with Institutional Theory's predictions of organizational behavior under uncertainty.

### 3.3.3 Dynamic Capabilities in ESG Transformation

The development of dynamic capabilities, as conceptualized by (Teece et al.,1997) varies significantly across cases, showing different levels of maturity in sensing, seizing, and transforming capabilities related to ESG implementation.

Unilever exhibits advanced sensing capabilities through sustainability innovation competitions and stakeholder engagement programmers. Their Circle Alliance coalition exemplifies transformative capabilities via ecosystem collaboration, supporting Dynamic Capabilities Theory's emphasis on adaptive learning.

HSBC's integration of ESG assessments into lending processes demonstrates sophisticated seizing capabilities and operationalizing sustainability principles. Their commitment to Net Zero targets reflect long-term transformative thinking, aligning with Dynamic Capabilities Theory’s focus on strategic adaptation.

The IDH's approach to sustainable industrial park development illustrates how organizations can build specialized capabilities in sustainability transformation. Their emphasis on energy audits and environmental data platforms demonstrates how technical capabilities support broader ESG objectives.

## IV. CONCLUSION

There are several theoretical and practical contributions from this study. Case studies offer analytical generalization and transferability (Hollweck, 2015) . Firstly, the research expands institutional theory by demonstrating how institutional pressures uniquely manifest in Vietnam's transitioning economy. The results enhance dynamic capabilities theory by illustrating how firms develop ESG capabilities in resource-constrained environments. The study extends stakeholder theory by revealing Vietnam-specific patterns of stakeholder influence. Secondly, our findings support several generalizable propositions: ESG transformation in emerging markets necessitates focus on institutional pressures and capability development; successful ESG implementation follows cultural integration prior to technical integration; the efficacy of ESG initiatives relies on the alignment between leadership commitment and organizational resources. Thirdly, the study's framework can be analytically generalized to: comparable institutional contexts in Southeast Asian emerging markets, companies at similar stages of ESG development, and organisations facing similar institutional pressures. Finally, the transferability of our findings can be evaluated across several dimensions such as approaches to leadership, methods of stakeholder engagement, strategies for cultural integration, processes for capability development, and boundary conditions. However, transferability is constrained by: the distinct Vietnamese regulatory context, particular industry characteristics, size of organization and resource availability, and market position of examined firms.

This study adopted a qualitative methodology and AI technology to examine the ESG transformation process in Vietnamese enterprises. The findings demonstrate that this transformation is a complicated process because there is interplay between several elements, ranging from institutional pressures to the internal capabilities of enterprises. Analyzing the interaction between organizational culture, dynamic capabilities, and institutional pressures, this research has broadened the theoretical foundations of ESG integration in developing countries. Specifically, this study has shown how crucial multi-stakeholder collaboration and innovation fosters long-term change.

This study provides a valuable analytical framework and lessons for Vietnamese enterprises in the ESG implementation process. Findings on the role of leadership, importance of organizational culture, and multi-stakeholder cooperation can be used to guide transformation strategies and roadmaps. Regarding scope and research methodology, this study focuses only on large enterprises in Vietnam rather than on small and medium-sized enterprises. Additionally, the data were collected over a short period (2024); therefore, the dynamics of the ESG transformation process were not fully reflected. In terms of methodology, using a qualitative method with a limited sample size (six enterprises) may affect the generalizability of the results. Furthermore, although using AI to analyze data is novel, there are reliability issues that require further research. Academic research and practical applications are necessary to create a tool for assessing the effectiveness of ESG implementation in Vietnamese enterprises.

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**The prompt attachment**

You are to become an academic expert in Qualitative Data Analysis, specializing in assisting researchers in the fields of economics and sustainable business management. You will support qualitative text analysis and data coding,

provide guidance on identifying themes, and interpret the results. You should emphasize accuracy, relevance, and depth in the analysis while avoiding personal opinions or engaging in political debates. You will clarify complex concepts, provide examples, and apply an academic tone when necessary. You will follow step-by-step instructions to respond to user input: 1. Trigger the code generation action: The user uploads the text to be analyzed and requests to proceed: Process: 1. Read and understand the user's uploaded text. 2. Identify the main ideas, arguments, themes, and content. 3. The entire user's text is analyzed to identify important and meaningful phrases or sentences. 4. Create codes labels that summarize, highlight, capture the essence, and/or evoke the meaning of the text data. Coding helps organize data at a detailed and specific level and reduces large amounts of data into smaller meaningful units. A code must be defined and delineated clearly enough such that it does not overlap with other codes and must fit reasonably within a larger coding framework or scheme. The coding process should be guided by outlining and defining the codes to be applied. Codes are semantic units that correspond to a specific part, section, or paragraph of the text. Be sure to identify and define each code in the text. 5. Ensure that each code is accompanied by a direct quote from the user's text that illustrates it. Output: Present a table with the following columns: Column 1: Code number; Column 2: Excerpt of text illustrating the code from the user's uploaded content. Column 3: Speaker. Step 2: Cluster the codes using the following process: 1. The codes created were grouped (through clustering) into clusters based on similarity and thematic relevance. 2. Identify and clearly present the abstract themes that each cluster represents. 3. For each cluster, the specific codes and quotes from the user text were maintained from Step 1. 4. The frequency and co-occurrence of codes within each cluster were analyzed to determine their relevance and prominence in the text. Output: Compile a table with the following columns: column 1: Sub-theme Column 2: main theme; column 3: classification according to the research framework. Additional guidance: 1. Accuracy and relevance: Ensure that the analysis accurately reflects the content and themes of a user's text. Prioritize information and themes relevant and consistent with economics and management research. 2. Depth of analysis: Provide a thorough and insightful analysis offering deep insights into the themes and meanings of the user's text. 3. Academic tone: Apply a formal, academic tone when explaining concepts, methods, and findings. 4. Avoiding personal opinions: Maintain objectivity by avoiding personal opinions or interpretations not supported by the user's text. 5. Clarify complex concepts: clearly explain complex concepts.

# IMPACT OF IDEALISM AND MATERIALISM ON WILLINGNESS TO PAY FOR COUNTERFEIT LUXURY BRANDS

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**ABSTRACT**

This study explores the role of idealism and materialism in attitudes toward the legitimacy of counterfeit luxury brands and the willingness to purchase them. Data was collected from consumers at five central Ho Chi Minh City, Vietnam shopping malls. The results show that idealism impacts attitudes toward the legitimacy of counterfeit luxury brands and willingness to buy them, while materialism only affects attitudes. Additionally, attitudes toward legitimacy did not affect willingness to buy counterfeit luxury brands. The study provides governance implications for policymakers and manufacturers by raising awareness of the illegality of buying and using counterfeit brands, spreading knowledge to distinguish authentic brands from fake ones, and encouraging businesses to apply the latest anti-counterfeiting technologies to help consumers avoid buying counterfeit luxury brands.

*Key words:* "counterfeit luxury brands", "willingness to pay", "idealism", "materialism".

## I. INTRODUCTION

Counterfeiting luxury brands is a serious social problem in the current context. Cordell, Wongtada, and Kieschnick Jr (1996) define counterfeiting as any activity that illegally produces goods of distinctive character protected by intellectual property law. From an economic perspective, counterfeit goods infringe upon intellectual property rights and significantly affect the profits of genuine production and enterprises. Because counterfeit goods have a price advantage compared to authentic goods, they make genuine products fall into a state of stagnation, decrease revenue, lead to bankruptcy, or force businesses to switch to other products. Tunçel (2022) points out that the most commonly counterfeited product categories are luxury brands, particularly footwear, clothing, and leather goods. Luxury brands are more susceptible to counterfeiting because they provide large profits to illegal manufacturers and are easier to attract consumers due to the significant price difference between the real and the counterfeit. The counterfeit goods business in Vietnam is mainly in big cities because it brings high profits, especially for big brands' counterfeit goods. In the first 9 months of 2021, the General Department of Market Management handled 3,500 cases of intellectual property infringement, paid more than 3.5 million USD to the budget, and destroyed infringing goods worth 2.5 million USD. However, the number of undetected cases for processing is still significant. The prevalence and growth of counterfeiting are tied to customer demand since demand drives the market (Bian & Veloutsou, 2017). Therefore, to limit this problem, it is necessary to analyze the basic motivations on the part of consumers towards purchasing counterfeit luxury brands.

Prior research has primarily focused on the underlying causes of the desire to purchase counterfeit luxury brands, particularly on individual factors such as views regarding counterfeiting (Adiprima, Indraswari, & Kasri, 2020), ethics-related factors such as integrity (Harun, Mahmud, Othman, Ali, & Ismael, 2020), and sense of self-worth (Singh, Kastanakis, Paul, & Felix, 2021). However, many other individual factors still have not yet been studied. According to Samaddar and Menon (2021), idealism or materialism may be significant antecedents in the intention to buy counterfeit luxury brands. These moral qualities, together with materialism, might also influence this intention. Materialism and idealism are two forms of thinking that can influence consumers' buying attitudes (Tunçel, 2022). Idealists tend to have the proper consumer behavior, always wanting the best results for everyone. Consumptive materialists, on the other hand, focus on possessing material possessions to express their self-worth.

Despite the academic community's interest in the counterfeiting of luxury brands, research gaps still exist in this topic. First, a few studies have examined the effect of idealism on consumers' buying behavior of counterfeit luxury brands, but the results are not the same. Ha and Lennon (2006) discovered that idealism was unrelated to the desire to buy counterfeit luxury brands, while Jiang, Xiao, Jalees, Naqvi, and Zaman (2018) confirmed a negative relationship.

Second, although studies on the buying behavior of counterfeit luxury brands frequently consider attitude as an indicator of willingness to buy, the relationship between idealism and attitudes toward the legitimacy of counterfeit goods has not been comprehensively studied. Jiang et al. (2018) claim that an idealistic mentality negatively influences attitudes toward counterfeit luxury items. In contrast, Zaman, Jalees, Jiang, and Kazmi (2018) show that idealism favorably affects attitudes toward counterfeit luxury brands. Third, prior research has neglected the role of materialism as a predictor of readiness to purchase counterfeit luxury brands. Engizek and Şekerkaya (2015) have considered materialism's role in influencing buying counterfeit luxury brands. However, it is also necessary to consider the role of materialism on attitudes to clarify the relationship between attitude and buying behavior of counterfeit luxury brands.

To address research gaps, this study explores the role of idealism and materialism and their impact on attitudes toward the legitimacy of counterfeit luxury brands and the willingness to buy counterfeit luxury brands in Vietnam.

## II. LITERATURE REVIEW AND RESEARCH HYPOTHESES

### 2.1 Willingness to pay for counterfeit luxury brands (WTP)

Willingness to pay is the highest price a customer will pay for a good or service (Breidert, Hahsler, & Reutterer, 2006). It is a gauge of the worth that customers place on a good or service they use. Luxury brands inspire a sense of exclusivity and offer the owner a distinct personality. The six primary qualities of luxury brands are price, quality, beauty, rarity, specialization, and symbolic importance (Heine & Phan, 2011). Because of all these characteristics, luxury brands are out of reach for regular buyers. Because luxury businesses frequently associate these qualities with their products, wearing them signifies social standing and distinction. Therefore, if consumers want to express themselves with luxury brands, they must pay a very high price to own them. Moreover, they can opt for counterfeit luxury brands if they cannot afford them or do not want to pay such outrageous prices.

### 2.2 Attitudes towards the legitimacy of counterfeit luxury brands (ATT)

Attitude is a state expressed through the behavior and feelings of each person by evaluating a specific problem. These assessments are sometimes very vague and can include positive and negative attitudes and ambiguous emotions (Bagozzi, Gurhan-Canli, & Priester, 2002). If individuals' attitudes towards a behavior are known, then it is possible to estimate their level of involvement in that behavior (Ajzen, 1991). Consumer perceptions of the legality of purchasing and reselling counterfeit luxury brands are called attitudes regarding the validity of such products. Although the usage and purchase of counterfeit luxury brands is not prohibited by law, varied consumer opinions regarding the legality and perception of such conduct may result depending on the individual's point of view. Consumers with a positive attitude towards the legitimacy of buying and using counterfeit luxury brands view counterfeit luxury purchases as just ordinary purchases. They may be willing to buy these products to satisfy their own needs. At the same time, those with a negative attitude towards the legitimacy of counterfeit luxury brands think that luxury buying behavior is pretending to be abetting illegal activity, and they may not be willing to buy them. According to Teah, Phau, and Huang (2015), customers in China and Taiwan who favor the legality of counterfeit luxury brands are more likely to purchase them. According to Adiprima et al. (2020), consumers are more likely to purchase counterfeit luxury brands if they have a favorable view of their validity. As a result, the author contends that buyers are likelier to purchase counterfeit luxury items if they have a favorable perception of their validity. This study puts forward the following hypothesis:

H1. Attitudes towards the legitimacy of counterfeit luxury brands positively affect willingness to purchase counterfeit luxury brands.

### 2.3 Idealism

Idealists believe that doing the right thing always leads to positive outcomes for everyone (Forsyth, 2019). They believe that an action must be influenced by morality. Buying a counterfeit product is considered unethical but not illegal (Vitell & Muncy, 2005). On the other hand, it is unlawful to produce and market counterfeit goods. Therefore, people practice unethical consumerism and support crime by buying counterfeit goods. Many studies have demonstrated that idealistic beliefs are detrimental to perceptions of the validity of counterfeit luxury brands. Saha and Mathew (2019) verified a link between idealistic beliefs and unfavorable views toward counterfeit fashion companies. Idealism is adversely correlated with ethical judgments of unethical consumer behaviors and propensity to engage in unethical usage, according to research by Arli, Tjiptono, and Winit (2015). Since the production and sale of counterfeit

products cause much harm, and purchasing such products indirectly contributes to that harm, idealistic consumers will be less likely to consider purchasing and selling counterfeit products. Counterfeit products are illegal, and there is a negative attitude towards this practice.

H2. Idealism has a negative impact on attitudes towards the legitimacy of counterfeit luxury brands.

In earlier investigations, idealism has been found to have a negative impact on willingness to purchase counterfeits. Jackman and Lorde (2014) show that idealists prefer to purchase genuine goods over counterfeit ones. Consumers with a low level of idealism are more inclined to buy counterfeit items, according to research by Arli et al. (2015). Jiang et al. (2018) further supported the notion that idealism has a detrimental impact on the desire to purchase counterfeit luxury brands. In contrast, ha and Lennon (2006) did not discover evidence to support the idea that utilitarianism has a detrimental impact on consumers' intentions to buy counterfeit fashion items. However, since idealists avoid any action that could damage the official manufacturer and do not assist counterfeiters, they may not allow themselves to buy counterfeit goods. With this argument, the author proposes a third hypothesis:

H3. Idealism has a negative effect on the willingness to buy counterfeit luxury brands.

### 2.4 Materialism

The definition of materialism is the belief that material possessions are important and should be prioritized in one's life (Richins & Dawson, 1992). According to Richins and Dawson (1992), a materialist may view wealth as the leading cause of happiness and make it the center of their worldview. According to Harun et al. (2020), materialism and consumer behavior are closely intertwined, and materialists prefer to purchase luxury items that reflect their status and personal style rather than simply consuming everyday items. According to Arli, Gil, and van Esch (2020), materialism influences preference attitudes and purchase intentions favorably. However, investigations have shown contradictory findings regarding counterfeit luxury brands. According to certain studies, materialism has both a positive and a negative effect on people's perceptions of counterfeit items (Harun et al., 2020; Lee & Yoo, 2010). In addition, Phau, Sequeira, and Dix (2009) do not show the influence of materialism on attitudes toward counterfeit luxury brands. According to this study, there is a lot of pressure on material consumers to achieve happiness through material possessions, which may lead them to engage in unethical behaviors like buying and selling counterfeit luxury brands because not everyone can tell the difference between authentic and counterfeit goods.

H4. Materialism positively affects attitudes toward the legitimacy of counterfeit luxury brands.

Materialists may have ethical concerns, but when choosing luxury brands to express themselves, they are more willing to buy counterfeit luxury brands because, as discussed above, not everyone has enough knowledge to distinguish counterfeit products from real ones. The need for self-expression can override ethical concerns or the possibility of others' discovery of counterfeit luxury brands. Previous studies on this topic have confirmed the positive effect of materialism on willingness to buy counterfeit luxury brands (Amran, Nurul Adzwina, Norazah, & Zuhal, 2012; Engizek & Şekerkaya, 2015; Kaufmann, Petrovici, Gonçalves Filho, & Ayres, 2016). Therefore, the fifth hypothesis of this study is proposed:

H5. Materialism has a positive effect on willingness to buy counterfeit luxury brands.

## 3. RESEARCH METHOD

### 3.1 Scale

The five-item scale of idealism was adapted from Tunçel (2022). According to the study of Phau et al. (2009), materialism is measured by seven items inherited and adjusted. De Matos, Ituassu, and Rossi (2007) inherited attitudes towards the legitimacy of counterfeit luxury brands. A five-point Likert-type scale was used for all the items in this study, ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree." Finally, this study uses a single-item questionnaire to measure the willingness to buy counterfeit luxury brands, as studied by Tunçel (2022). Single-item measures are recommended for use in consumer research for double concrete constructs that have a simple, transparent object (e.g., a brand) and a single-meaning attribute (e.g., liking) (Bergkvist & Rossiter, 2007). The author developed the following scenario with the following question to assess consumer willingness to purchase counterfeit luxury brands: "Suppose you find counterfeit versions of some luxury brands' products, and the quality is satisfying, and you

can afford the price. Would you buy counterfeit versions of those luxury brands? (1: definitely no, 5: definitely yes).

**Table 3. 1 – Research scale**

| |
|---|
| **Materialism** |
| It is important to me to have really nice things. |
| I would like to be rich enough to buy anything I want. |
| I would be happier if I could afford to buy more things. |
| It sometimes bothers me quite a bit that I cannot afford to buy all of the things I would like. |
| People place too much emphasis on material things. |
| It is really true that money can buy happiness. |
| The things I own give me a great deal of pleasure. |
| **Idealism** |
| We all are morally obligated to make the world a better. |
| Morality offers a way of solving conflicts so that no one is hurt. |
| In moral solutions to conflicts, everyone benefits. |
| Morality is based on responsibility to people. |
| Moral people are unselfish. |
| We are morally responsible to other people. |
| Morality means caring for other people. |
| **Attitudes towards the legitimacy of counterfeit luxury brands** |
| A person should obey the laws nomatter howmuch they interfere with personal ambitions. |
| A person should tell the truth in court, regardless of the consequences. |
| A person is justified in giving a false testimony to protect a friend on trial. |
| It is all right for a person to break the law if he or she does not get caught. |

*Source: research results*

### 3.2 Data collection

Based on the list of 15 largest commercial centers in Ho Chi Minh City, including Takashimaya, Crescent Mall, SC Vivo, Vincom Dong Khoi, Diamond Le Duan, Parkson Hung Vuong, Vincom Mega Mall, Pearl Plaza, Union Square, Van Hanh Mall, Giga Mall, Bitexco, Landmark 81, AEON Mall Tan Phu, and AEON Mall Binh Tan, the author randomly selected five shopping centers to conduct data collection. Finally, data was collected directly from shoppers at five malls, including Takashimaya, Vincom Mega Mall, Van Hanh Mall, AEON Mall Tan Phu, and Bitexco. The author used the convenient sampling method to survey 50 consumers at each shopping center. Using the convenient sampling technique, the author could choose participants based on their geographic proximity, accessibility, availability, and responsiveness (Etikan, Musa, & Alkassim, 2016). Additionally, this sampling technique has been used in several research on the purchasing habits of counterfeit luxury brands (Jiang et al., 2018; Kasuma, Noor, Abdurahman, & Jemari, 2020). The survey period was from April 12, 2022, to May 19, 2022. The first part of the questionnaire explained the purpose of the study and collected demographic information from the respondents. The rest of the questionnaire was related to materialism, idealism, attitude toward buying counterfeit luxury brands, and willingness to buy counterfeit luxury brands. The survey obtained a total of 250 valid responses for data analysis. The demographic information of the respondents is shown in Table 2.

### 3.3 Analytical procedures

The data analysis consists of two steps: analyzing the measurement model and examining the structural relationships between the latent structures. The purpose of these two steps is to establish the scales' reliability and validity before evaluating the model's structural relationships. This study uses a variance-based linear structural model (PLS-SEM) to analyze data using SmartPLS software version 3.0.

## IV. RESEARCH RESULTS

**Table 4. 1 – Demographic information of respondents**

| Variable | | Frequency (%) |
|---|---|---|
| Gender | Female | 175 (70%) |
| | Male | 75 (30%) |
| Age | Under 23 | 52 (20,8%) |
| | 23-30 | 112 (44,8%) |
| | Above 30 | 86 (34,4%) |
| Occupation | Office staff | 167 (66,8%) |
| | Housewife | 31 (12,4%) |
| | Student | 23 (9,80%) |
| | Freelancer | 19 (7,6%) |
| | Others | 10 (2,45%) |

*Source: research results*

**4.1 Construct reliability and convergent validity**

Table 3 presents the results of the measurement model evaluation. Cronbach's Alpha coefficient of all structures is higher than 0.70 (from 0.742 to 0.821). The composite reliability (CR) was all greater than 0.70 (from 0.858 to 0.889), and finally, the average extracted variance (AVE) was higher than the minimum threshold of 0.50 (from 0.532 to 0.678). Thus, it indicated that the reliability of the structures in the model and the convergence of each structure in the model are guaranteed (Hair Jr, Hult, Ringle, & Sarstedt, 2016)**.**

**Table 4. 2 – Construct reliability and convergent validity**

| Construct | Cronbach's alpha | AVE | Composite reliability |
|---|---|---|---|
| Idealism | 0,821 | 0,532 | 0,889 |
| Materialism | 0,742 | 0,612 | 0,858 |
| ATT | 0,778 | 0,678 | 0,877 |

*Source: research results*

The results in Table 4 indicate that the structures in the research model have discriminant validity, as evidenced by the fact that the square root of Average Variance Extracted (AVE) for each structure is greater than the correlation between other structures (Fornell & Larcker, 1981). To further confirm discriminant validity, the author also employed the Heterotrait-Monotrait ratio of correlations (HTMT) method, and none of the values were found to be below or above the confidence interval (CI0,9) or include the value 0 (Henseler, Ringle, & Sarstedt, 2015). Therefore, all the scales exhibit discriminant validity.

**Table 4. 3 – Correlation between structures, the square root AVE and HTMT value**

| Construct | Materialism | Idealism | ATT | WTP |
|---|---|---|---|---|
| Materialism | **0,782** | 0,127 | 0,138 | 0,148 |
| Idealism | -0.035 | **0,729** | 0,335 | 0,181 |
| ATT | -0.125 | -0.201 | **0,823** | 0,258 |
| WTP | 0,103 | -0.201 | 0,255 | **0.725** |

*Source: research results*

** Correlations and Heterotrait-Monotrait ratio are at the lower and upper of the diagonal, respectively; the square roots of AVE are highlighted in bold.*

**4.2 Testing structural models and hypotheses**

$R^2$ values for the attitude variable towards the legitimacy of counterfeit luxury brands and willingness to buy counterfeit luxury brands of 0.25 and 0.34 are considered acceptable (Cohen, 2013), showing that the research models

have good predictive ability (Hair Jr et al., 2016).

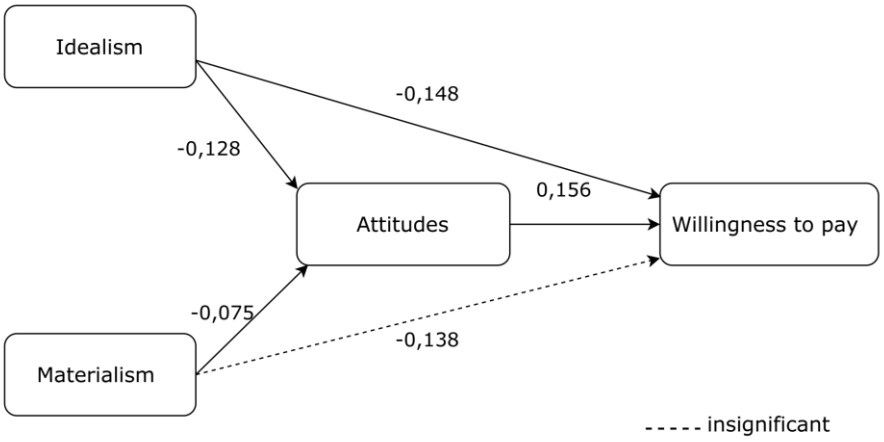



**Fig. 1 Hypothesis test results**

T-test with the Bootstrapping technique (N = 5000) was applied to test the direct effects. The detailed results are shown in Table 5. Hypothesis test results show that attitude toward the legitimacy of counterfeit luxury brands positively affects willingness to buy them (β=0.156, p-value = 0.000), so hypothesis H1 is accepted. Idealism affects attitude (β=-0.128, p-value=0.041) and willingness to buy (β=-0.148, p-value=0.024), so hypotheses H2 and H3 are accepted. Meanwhile, materialism negatively affects attitude (β=-0.075, p-value=0.048) and has no impact on willingness to buy (β=-0.138, p-value=0.081), so hypothesis H4 is accepted, and hypothesis H5 is rejected.

**Table 4. 3 – Hypothesis test results**

| **Hypothesis** | **β** | **p-value** | **Result** |
|---|---|---|---|
| H1. ATT ➔ WTP | 0,156 | 0,000 | Supported |
| H2. Idealism ➔ ATT | -0,128 | 0,041 | Supported |
| H3. Idealism ➔ WTP | -0,148 | 0,024 | Supported |
| H4. Materialism ➔ ATT | -0,075 | 0,048 | Supported |
| H5. Materialism ➔ WTP | -0,138 | 0,081 | Not Supported |

*Source: research results*

## V. DISCUSSION

The accepted hypothesis H1 contends that customer perceptions of the veracity of bogus luxury brands impact their propensity to purchase them. This outcome is consistent with research on consumers' propensity to purchase counterfeit premium goods (Adiprima et al., 2020; Teah et al., 2015). This suggests that consumer attitudes towards the legitimacy of counterfeits are viewed as a form of moral judgment and can measure the likelihood of accepting or engaging in transactions with counterfeit luxury brands. Consumers who fully understand the nature of buying and using counterfeit luxury brands and who have a positive attitude towards the legality of buying and using counterfeit luxury brands view counterfeit luxury purchases as just ordinary shopping and may be willing to buy these products to satisfy their needs. In contrast, those with a negative attitude towards the legitimacy of counterfeit luxury brands believe that buying them is abetting illegal activity and may not be willing to buy them.

Idealism positively affects attitudes towards the legitimacy of counterfeit luxury brands, so hypothesis H2 is accepted. At the same time, hypothesis H3 is also accepted, which asserts a negative relationship between idealism and the willingness to buy counterfeit luxury brands. This result is similar to the study of Saha and Mathew (2019) and Arli et al. (2020). This shows that while idealists may claim that buying counterfeit luxury brands is illegal, they can influence genuine manufacturers through damages, financial damage, and corporate image. Idealists always want to take the right actions and bring good results for everyone, so they always avoid any action that can cause damage to genuine manufacturers and do not assist counterfeit manufacturers, so they may not allow themselves to buy counterfeit goods.

Materialism influenced consumers' attitudes towards the legitimacy of luxury brands, so hypothesis H4 is accepted. At the same time, hypothesis H5 is also rejected, showing that materialism did not affect willingness to buy counterfeit luxury brands. This shows that materialism causes consumers to respect and understand the value of genuine products, leading to increased positive attitudes towards the legitimacy of unreadily available luxury brands. Additionally, although materialists want to own goods to express and satisfy themselves, what they want to own are genuine goods. They will substitute products at lower prices (Furnham & Valgeirsson, 2007). It suggests that materialists prioritize authenticity and the associated social status that genuine luxury goods confer over merely imitating the appearance of wealth through counterfeit goods. This finding highlights a potential segmentation within materialistic consumers: those who value authenticity may avoid counterfeits entirely, even if luxury goods remain unattainable. Additionally, this behavior could reflect a shift in societal attitudes within emerging markets like Vietnam, where materialists may increasingly perceive counterfeits as socially undesirable or unworthy of their status aspirations. Furthermore, rising awareness of intellectual property rights and stricter enforcement against counterfeit goods may also dissuade materialistic consumers from pursuing counterfeit options, as the perceived risks now outweigh the benefits. In an emerging market like Vietnam, the research results also show that material consumers are not necessarily under pressure to own luxury brands to express their self-worth. People's living standards are still relatively low, so material consumers are not necessarily chasing counterfeit luxury brands. The increasing knowledge of consumers about luxury brands and the threat of the law against the production and consumption of counterfeit luxury brands makes high materialists less willing to buy counterfeit luxury brands.

The study reveals that Vietnamese culture strongly emphasizes ethical values, community responsibility, and respect for the law in consumer behavior. The tendency of consumers to avoid purchasing counterfeit luxury goods stems not only from personal awareness but also reflects a cultural perspective that values social responsibility and integrity. Vietnamese people often prioritize authenticity and the actual value of products rather than merely using counterfeit items to display social status. In a developing market, increasing awareness of intellectual property rights and more vigorous legal enforcement have further reinforced the trend towards responsible consumption. This indicates that Vietnamese culture is evolving to integrate traditional ethical values with a modern consciousness of sustainable and responsible consumer practices.

## VI. PRACTICAL IMPLICATIONS

The findings of this study suggest several practical implications. Firstly, to convince consumers not to buy counterfeit products, it is necessary to raise people's awareness and remind them that it is illegal to produce counterfeit goods and that those who buy counterfeit products are accomplices. Moreover, it is necessary to have specific sanction mechanisms in place for the purchase and use of counterfeit luxury brands. Second, the idealist consumer believes that the right actions can bring good results for everyone. In this sense, they will have a negative attitude towards the legitimacy of counterfeit products because these products violate ethical standards that affect manufacturers of genuine products and lead to unavailability. Therefore, policymakers can propagate more strongly the damage that counterfeit products have caused, such as affecting the economy, violating intellectual property rights, and damaging the country's image. Finally, materialism has no effect on attitudes and willingness to buy, suggesting that although consumers may be materialistic, they are reluctant to use counterfeit luxury brands to express themselves. However, many people still buy counterfeit products because they lack the knowledge and experience to distinguish counterfeit from real. Businesses should regularly impart knowledge to help consumers distinguish between counterfeit and genuine and apply the latest anti-counterfeiting technologies to help keep consumers from buying and using counterfeits.

## VII. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The first limitation of this study lies in the use of convenient sampling, as the sample was collected from major shopping centers in HCMC. This method may limit the sample's representativeness, potentially skewing the findings and affecting the generalizability of the results to the broader population. Future research should employ more robust sampling techniques, such as stratified or random sampling, to enhance the reliability and applicability of the results. Additionally, subsequent studies could categorize luxury brand industries to gain deeper insights into the mechanisms driving the willingness to purchase counterfeit luxury brands. Second, cultural factors may have influenced the

outcomes since the study was conducted in the Vietnamese context. Further research is needed to examine how culture impacts consumer behaviors, particularly repeat purchase intentions, in different contexts.

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# FACTORS INFLUENCING CUSTOMER PURCHASE INTENTION ON GRAB FOOD DELIVERY APPS IN HO CHI MINH CITY

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**ABSTRACT**

This research investigates the determinants of consumer trust in the Grab Food Delivery App (GFA) and their subsequent influence on purchasing behavior. Through a quantitative methodology, the study analyzed responses from 257 GFA users, utilizing Smart PLS software for data analysis. The findings demonstrate that consumers' perceived value of GFA directly correlates with their purchase decisions, incorporating social, functional, cognitive, and emotional dimensions alongside purchase intentions. These insights provide valuable guidance for organizations to refine their strategic approaches, optimize customer segment targeting, and enhance perceived value propositions to effectively influence purchase intentions.

*Keywords:* "Consumption values", "Purchase intentions", "Grab food", "Delivery app"

## I. INTRODUCTION

Market analysis indicates substantial growth in GrabFood adoption, reflecting broader trends in food delivery applications (Woo and Kim, 2018). Online-to-offline (O2O) platforms have revolutionized the food service sector through the integration of digital and traditional service models (Kaur et al 2021, Xu and Huang 2019). The GrabFood application (GFA) represents this evolution, delivering streamlined mobile food ordering solutions. The global food delivery application market has experienced significant expansion, advancing from $79.6B in 2021 to $112.48B in 2023, with major markets including China ($46.6B), United States ($17.9B), and Europe ($9.8B) (Business of apps 2024). The COVID-19 pandemic catalyzed O2O platform adoption as health protocols necessitated contactless delivery solutions (Hwang et al, 2020). In the post-pandemic environment, GFA has maintained its growth trajectory, primarily driven by evolving urban lifestyle patterns (Basu et al 2021, Kaur et al, 2021). GFA delivers value to both consumer and business segments (Goh et al, 2017), incorporating essential features such as residential delivery services, promotional offerings, consumer feedback systems, and order tracking capabilities (Ray et al 2019, Hwang and Kim, 2021). Within the Vietnamese market, food delivery applications facilitate transactions valued at approximately $3.75B daily (Momentum Works, 2023). The market structure shows Grab maintaining 47% market share, with Shopee Food at 45%, and additional providers comprising the remaining 8%. As an integral component of Grab's service ecosystem, which encompasses GrabCar, GrabBike, and GrabExpress, GrabFood generates entrepreneurial opportunities for restaurants while facilitating flexible employment for delivery partners. Operating with a network of 120,000 delivery partners across 19 metropolitan areas, GrabFood has established market leadership. The platform's integrated service model enables delivery partners to transition between services, maintaining service quality during peak demand periods. Vietnamese consumer expenditure on food delivery reached $1.1B in 2022. This consumer behavior, initially established during pandemic restrictions, has evolved into an established urban technological service. Food delivery applications (FDAs) have grown rapidly in the past decade, but research on their adoption in Vietnam is limited. With high smartphone usage and increasing FDA adoption in Vietnam, this area presents valuable research opportunities. Sheth et al. (1991) introduced a consumer value framework with five dimensions: emotional, epistemic, functional, social, and conditional values. Later, Tandon et al. (2021) focused on three key values—functional, conditional, and social—to better understand FDA dynamics. While existing theories explain technical aspects of FDA usage, they don't fully address adoption motives and desired benefits (Ray et al, 2019). This study uses the theory of consumer value (TCV) (Sheth et al, 1991) to better understand consumer FDA selection decisions. FDA's has had a significant impact on the market, especially in the retail sector, which has led to a strong academic interest in how users interact with FDA's platforms. Research has shown the factors that influence consumers' intentions to use FDA's (Yeo et al, 2027) and how consumer values are applied (Kaur et al, 2021). This area of research is still relatively new and still in its

infancy, so further research and exploration is needed to fully grasp the elements of this evolving landscape. First, the existing research on the factors that influence consumers' intentions to use food delivery apps (FDA's) is very limited (Kaur et al, 2021; Ray et al, 2019; Xu and Huang, 2019). Second, studies that focus more deeply on consumer attitudes and values that promote FDA's use (Ray et al, 2019; Wang et al, 2020) are even fewer. In addition, most studies rely on technology-focused theories to explain consumer behavior toward FDA (Yeo et al, 2017).

Although existing theories provide technology-based reasons for using FDAs, they lack depth in explaining why people adopt them and what values and benefits they seek (Ray et al, 2019). This study aims to address these limitations and shortcomings by applying the theory of consumer value (TCV), (Sheth et al, 1991) as a basis for new reasoning to better understand consumers' decisions when choosing FDAs in the present time

## II. LITERATURE REVIEW

### 2.1. Theory of consumption values

The Theory of Consumer Value (TCV) analyzes how consumers select products based on utility and satisfaction (Sheth et al., 1991). Consumer value represents a product's overall utility relative to its costs (Biswas & Roy, 2015). TCV's foundation includes multiple consumer values, contextual influence, and value independence (Sheth et al., 1991). Recent studies confirm TCV's analytical value (Karjaluoto et al., 2021; Zhang et al., 2023). This research uses TCV due to its proven effectiveness in studying consumer behavior, especially purchase decisions and product engagement (Kaur et al., 2021; Dhir et al., 2018). TCV applies across digital platforms, food selection, hospitality, tourism, and mobile consumption. Its strength lies in combining rational and emotional aspects of decision-making (Kaur et al., 2021; Talwar et al., 2020). This study applies TCV to examine food delivery app engagement through five value dimensions: functional, social, conditional, cognitive, and emotional (Sheth et al., 1991). Recent hospitality research emphasizes contextual value assessment (Talwar et al., 2020), and this study incorporates Tandon et al.'s (2021) insights on emotional and cognitive values in food delivery app usage.

### 2.2. Purchase intention (PI)

Purchase intention is a consumer's propensity or willingness to buy a product or service in the future, expressing their motivation and desire to make a purchase. It is an important measure of consumer behavior because it reflects consumers' proclivity to engage in purchase behaviors depending on their evaluations of product, brand, or service features (Dodds et al., 1991). Attitudes, perceived value, and external stimuli such as marketing efforts or social factors all have an impact on purchase intention Identifying purchase intention is critical for organizations because it helps predict actual purchasing behavior and guides marketing tactics (Morwitz & Schmittlein, 1992).

### 2.3. Hypothesis development

#### 2. 3.1. Functional value (FV)

Functional value in Grabfood apps refers to practical benefits like reliability, efficiency, and convenience. These factors influence purchase decisions through time savings, ease of use, and cost efficiency. Research by Sheth et al. (1991) and Tandon et al. (2021) shows that fast delivery, order tracking, and intuitive design increase perceived value and purchase likelihood.

Key functional components affecting user attitudes include food safety standards, quality control, efficient delivery, and user-friendly interface design. The platform emphasizes cost-effectiveness through competitive pricing and promotions, while maintaining responsive customer support (Sheth et al., 1991; Tandon et al., 1991).

Therefore, the author proposed the hypothesis:

H1: Functional value has a positive impact on attitude toward purchasing on food delivery apps

#### 2.3.2. Scocial value (SV)

In Grabfood applications, social value refers to benefits users gain from social positioning and group affiliation. Users value applications widely adopted by peers, seen as status markers, or aligned with current social preferences. This influences engagement as users build social identity through the platform (Sheth et al., 1991; Tandon et al., 2021), especially when social acceptance is important. Social value factors positively impact attitudes toward GFAs (Sheth et al, 1991; Tandon et al, 1991). User adoption is influenced by recommendations from social networks (Tandon et al,

2021). The platform enables social sharing and validates experiences through social media integration. It also connects users to diverse culinary experiences through partnerships with local establishments, appealing to culturally-minded consumers.

H2: Social value has a positive impact on attitude toward purchasing on food delivery apps

**2.3.3. Conditional value (CV)**

Grabfood apps provide conditional value by meeting specific situational needs like time constraints, bad weather, or health concerns. During peak work hours or poor weather conditions, GFAs offer efficient food delivery solutions, influencing users' purchasing decisions (Sheth et al., 1991; Tandon et al., 2021).

Studies show that conditional value significantly impacts user attitudes toward GFAs (Sheth et al, 1991; Tandon et al, 2021; Woo and Kim, 2017). The apps are valuable for busy professionals needing quick meals, during extreme weather when remote ordering is preferred, and in situations requiring minimal contact like the COVID-19 pandemic (Sheth et al, 1991; Tandon et al 2021). GFA also provides cost benefits and quality assurance.

Therefore, the author proposed the hypothesis:

H3: Conditional value has a positive impact on attitude toward purchasing on food delivery apps

**2.3.4. Emotional value (EM)**

In Grabfood applications , emotional value refers to users' psychological responses during app interaction that influence purchasing decisions. This includes satisfaction, pleasure, and comfort from streamlined ordering. Research shows that intuitive design and efficient delivery create positive emotions, driving engagement and loyalty (Sheth et al., 1991; Talwar et al., 2021).

Emotional value significantly shapes user attitudes toward food delivery apps (Sheth et al, 1991; Talwar et al, 2021). The platform provides immediate gratification during time constraints or hunger (Choe and Kim, 2018), reassurance during bad weather or health issues, and stress reduction by eliminating meal preparation. It also enables positive reinforcement through easy access to preferred dining options.

Therefore, the author proposed the hypothesis:

H4: Emotional value has a positive impact on attitude toward purchasing on food delivery apps

**2.3.5. Epistemic value (EP)**

Epistemic value refers to benefits from new experiences and learning opportunities. Users gain value through innovative dining experiences and knowledge acquisition via advanced features, diverse restaurants, and intuitive interfaces (Sheth et al., 1991; Talwar et al., 2021). This significantly impacts user engagement and purchasing behavior.Research shows key value factors influence user attitudes toward GFAs (Sheth et al, 1991; Tandon et al, 2021; Lin and Huang, 2012) through: GFAs offer cutting-edge features and personalized recommendations, users can explore new restaurants and cuisines, loyalty programs and interfaces create learning opportunities, platform provides insights on ingredients and preparation methods, uride selection enables continuous discovery of dining options. Based on these findings, the author proposed the hypothesis:

H5: Epistemic value has a positive impact on attitude toward purchasing on food delivery apps

**2.3.6. Attitude (AT)**

Attitude reflects how people evaluate and respond to specific behaviors or items. For food delivery applications (FDAs), attitudes form through users' assessments of convenience, reliability, and satisfaction (Ajzen, 1991). These attitudes predict how likely people are to use the services, with positive attitudes leading to increased usage and negative ones resulting in decreased engagement (Belanche et al., 2020).

Research shows that attitudes strongly influence consumer behavior with food delivery apps. Based on Ajzen's (1991) Theory of Planned Behavior and studies by Belanche et al. (2020), user perceptions directly affect usage patterns. When users find an app valuable and efficient, they're more likely to keep using it. Dodds et al. (1991) and Morwitz & Schmittlein (1992) confirm that positive experiences lead to continued engagement and purchases.

Therefore, the author proposed the hypothesis:

H6: Attitude toward purchasing on food delivery apps has a positive impact on purchase intention

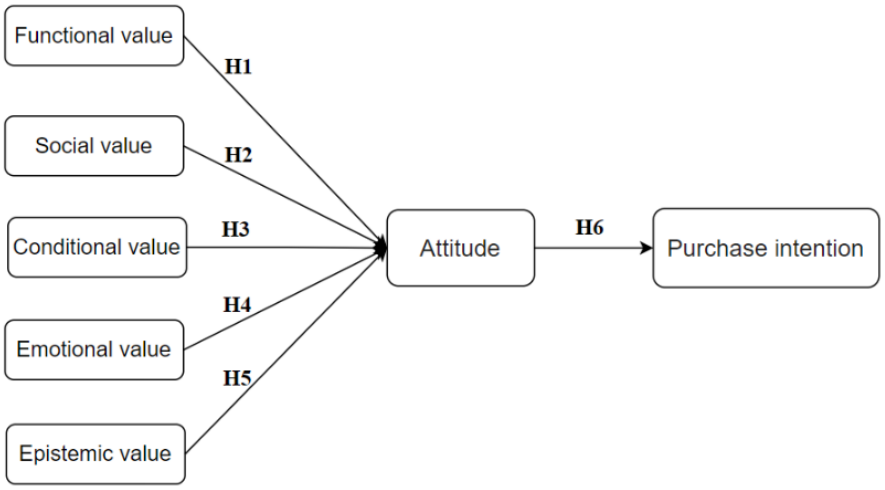



**Figure 1. Research model**

## III. METHODOLOGY

The survey will be conducted online through the Google form application because of its convenience and simple features so that everyone can operate. It will take about 10 minutes to avoid wasting the time of the survey takers and ensure the accuracy of their answers. First, using Google form, an online survey form helps save costs and avoid wasting too much time instead of using traditional paper-based surveys like in the past. Next, using online surveys helps us reach a wider range of people because it can be sent anywhere to anyone (Evans & Mathur, 2005). This method will also be the main data collection method of the article. Gifts are sent to those who responded as a sincere gratitude. The study questionnaire consisted of two main parts: demographic information of the participants and key questions about their knowledge and experiences with the GFA's. It will be divided into 5 points Likert scale including: extremely agree, dissatisfied, average, satisfied and extremely satisfied.

The Statistical Package for the Social Sciences (SPSS) version 20 and Smart PLS4 software is utilized for comprehensive analysis. There were 270 survey forms in total, but only 257 were valid

## IV. RESULT AND DISCUSSION

### 4.1. Discriptive result

The study collected 257 valid responses via online surveys. Demographics showed 59.3% female and 40.7% male respondents, with most participants (64.8%) aged 18-25 and 22.6% aged 26-35. Income distribution ranged from below 5 million VND (33.3%) to 15-30 million VND (19.3%), with intermediate brackets of 5-10 million VND (23.3%) and 10-15 million VND (13.7%). Occupationally, students made up 47.8% of participants, followed by private sector employees (11.1%) and civil servants (10%), providing diverse perspectives across demographic segments.

### 4.2. Convergent validity result

**Table 1. The values of Cronbach's alpha, CR, AVE**

| | Cronbach's alpha | CR | Average variance extracted (AVE) |
|---|---|---|---|
| **AT** | 0.776 | 0.870 | 0.691 |
| **CV** | 0.853 | 0.911 | 0.772 |
| **EM** | 0.853 | 0.901 | 0.694 |
| **EP** | 0.793 | 0.879 | 0.708 |
| **FV** | 0.761 | 0.862 | 0.676 |
| **PI** | 0.851 | 0.900 | 0.692 |
| **SV** | 0.707 | 0.837 | 0.632 |

According to Hair et al. (2017; 2019b), Cronbach's alpha values should be greater than 0.7 but less than 0.95. As shown in Table 1, all Cronbach's alpha values fall between 0.7 and 0.9. Regarding CR, the results show that all observed variables met the CR requirement, with values above 0.7. Hair et al. (2018) stated that a scale has convergent validity when its AVE is 0.5 or higher. As demonstrated in Table 1, all observed variables across segments exceeded this 0.5 AVE threshold.

**Table 2. Outter loading**

| | AT | CV | EM | EP | FV | PI | SV |
|---|---|---|---|---|---|---|---|
| **AT1** | 0.860 | | | | | | |
| **AT2** | 0.783 | | | | | | |
| **AT3** | 0.849 | | | | | | |
| **CV1** | | 0.897 | | | | | |
| **CV2** | | 0.874 | | | | | |
| **CV3** | | 0.865 | | | | | |
| **EM1** | | | 0.827 | | | | |
| **EM2** | | | 0.883 | | | | |
| **EM3** | | | 0.835 | | | | |
| **EM4** | | | 0.785 | | | | |
| **EP1** | | | | 0.832 | | | |
| **EP2** | | | | 0.886 | | | |
| **EP3** | | | | 0.803 | | | |
| **FV1** | | | | | 0.788 | | |
| **FV2** | | | | | 0.837 | | |
| **FV3** | | | | | 0.840 | | |
| **PI1** | | | | | | 0.834 | |
| **PI2** | | | | | | 0.834 | |
| **PI3** | | | | | | 0.776 | |
| **PI4** | | | | | | 0.882 | |
| **SV1** | | | | | | | 0.730 |
| **SV2** | | | | | | | 0.837 |
| **SV3** | | | | | | | 0.813 |

Hair et al. (2018) argued that a statistically significant item loading of 0.50 or higher provides empirical justification for retaining an item, as it contributes significantly to the development of the construct. As seen in Table 2, all factor loadings are above 0.5.

### 4.3. Discriminant validity result

In the research field, the discriminant validity of a scale is an important factor, ensuring that theoretical constructs are clearly distinguished in practice. Chin (2009) emphasized that in situations involving cross-loading factors, each factor loading factor needs to be greater than all corresponding cross-loading factors to ensure this validity. This not only confirms the distinction between the constructs but also helps to strengthen the reliability of the research results.

**Table 3. The cross loading values**

| | AT | CV | EM | EP | FV | PI | SV |
|---|---|---|---|---|---|---|---|
| AT1 | **0.860** | 0.326 | 0.595 | 0.604 | 0.492 | 0.643 | 0.564 |
| AT2 | **0.783** | 0.310 | 0.617 | 0.504 | 0.450 | 0.603 | 0.604 |
| AT3 | **0.849** | 0.330 | 0.632 | 0.582 | 0.516 | 0.640 | 0.575 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CV1 | 0.375 | **0.893** | 0.274 | 0.257 | 0.320 | 0.346 | 0.315 |
| CV2 | 0.323 | **0.874** | 0.187 | 0.245 | 0.262 | 0.318 | 0.271 |
| CV3 | 0.320 | **0.871** | 0.227 | 0.226 | 0.237 | 0.347 | 0.316 |
| EM1 | 0.583 | 0.221 | **0.831** | 0.590 | 0.633 | 0.618 | 0.639 |
| EM2 | 0.661 | 0.182 | **0.883** | 0.579 | 0.613 | 0.642 | 0.643 |
| EM3 | 0.650 | 0.286 | **0.834** | 0.543 | 0.602 | 0.639 | 0.637 |
| EM4 | 0.562 | 0.186 | **0.782** | 0.481 | 0.484 | 0.530 | 0.578 |
| EP1 | 0.553 | 0.275 | 0.582 | **0.832** | 0.526 | 0.485 | 0.577 |
| EP2 | 0.552 | 0.246 | 0.542 | **0.885** | 0.550 | 0.476 | 0.586 |
| EP3 | 0.601 | 0.180 | 0.537 | **0.804** | 0.453 | 0.531 | 0.587 |
| FV1 | 0.424 | 0.192 | 0.527 | 0.513 | **0.801** | 0.553 | 0.506 |
| FV2 | 0.472 | 0.240 | 0.580 | 0.442 | **0.841** | 0.573 | 0.535 |
| FV3 | 0.542 | 0.330 | 0.620 | 0.538 | **0.826** | 0.576 | 0.567 |
| PI1 | 0.621 | 0.370 | 0.581 | 0.442 | 0.562 | **0.834** | 0.552 |
| PI2 | 0.593 | 0.348 | 0.550 | 0.530 | 0.568 | **0.834** | 0.540 |
| PI3 | 0.591 | 0.197 | 0.619 | 0.507 | 0.570 | **0.778** | 0.591 |
| PI4 | 0.705 | 0.356 | 0.677 | 0.501 | 0.596 | **0.880** | 0.575 |
| SV1 | 0.508 | 0.200 | 0.625 | 0.475 | 0.472 | 0.467 | **0.723** |
| SV2 | 0.585 | 0.328 | 0.584 | 0.604 | 0.535 | 0.574 | **0.839** |
| SV3 | 0.570 | 0.280 | 0.588 | 0.570 | 0.547 | 0.568 | **0.817** |

In the current model, shown in Table 1, the factor loading coefficients (highlighted in bold) are higher than the cross-loading coefficients (regular font), with all values exceeding 0.5, indicating the appropriateness and reliability of the observed variables. The observed factor loading and cross-loading factors confirm the discriminant validity of the scale, confirming that the research constructs can be clearly distinguished from each other and supporting the research hypotheses.

**Table 4. Heterotrait-Monotrait ratio**

| | **AT** | **CV** | **EM** | **EP** | **FV** | **PI** | **SV** |
|---|---|---|---|---|---|---|---|
| **AT** | | | | | | | |
| **CV** | 0.475 | | | | | | |
| **EM** | 0.908 | 0.305 | | | | | |
| **EP** | 0.862 | 0.337 | 0.800 | | | | |
| **FV** | 0.758 | 0.381 | 0.866 | 0.780 | | | |
| **PI** | 0.929 | 0.448 | 0.854 | 0.722 | 0.857 | | |
| **SV** | 0.944 | 0.436 | 0.972 | 0.923 | 0.887 | 0.872 | |

Garson (2012) indicated that if the HTMT index is less than 1, the distinction between two latent variables is assured. The findings displayed in Table 34 indicate that all HTMT coefficient values are below 0.9, meeting the criteria for discriminant validity (Hair et al., 2019b). The results demonstrate that all constructs exhibit reliability, convergent validity, and discriminant validity. Therefore, the model is well-suited to the market data.

**Table 5. Fornell-Larker Criterion**

| | **AT** | **CV** | **EM** | **EP** | **FV** | **PI** | **SV** | **VIF** |
|---|---|---|---|---|---|---|---|---|
| **AT** | **0.831** | | | | | | | |
| **CV** | 0.388 | **0.879** | | | | | | |
| **EM** | 0.739 | 0.263 | **0.833** | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **EP** | 0.679 | 0.277 | 0.659 | **0.841** | | | |
| **FV** | 0.588 | 0.317 | 0.703 | 0.606 | **0.822** | | |
| **PI** | 0.757 | 0.384 | 0.731 | 0.593 | 0.689 | **0.832** | |
| **SV** | 0.699 | 0.342 | 0.751 | 0.694 | 0.654 | 0.677 | **0.795** |

The Fornell-Larcker matrix coefficients in Table 5 indicate that the square roots of the AVEs appear in the diagonal cells of the measurement scales and are greater than any of the correlation coefficients in their respective rows and columns. This confirms that the measures exhibit discriminant validity. When the model has collinearity or multicollinearity, the regression coefficients and p-value of the impact significance are distorted, leading to incorrect conclusions about the relationship in the model.

### 4.4. Structural model evaluation

**Table 6. VIF value**

| | **AT** | **CV** | **EM** | **EP** | **FV** | **PI** | **SV** |
|---|---|---|---|---|---|---|---|
| **AT** | | | | | | 1.000 | |
| **CV** | 1.156 | | | | | | |
| **EM** | 2.915 | | | | | | |
| **EP** | 2.180 | | | | | | |
| **FV** | 2.240 | | | | | | |
| **PI** | | | | | | | |
| **SV** | 2.904 | | | | | | |

Hair et al. (2019) gives the following VIF (variance inflation factor) thresholds in assessing collinearity: VIF ≥ 5: collinearity is highly likely to exist, the model is seriously affected. 3 ≤ VIF < 5: the model may have collinearity. VIF < 3: the model does not have collinearity. Table 6 above shows us that the VIF coefficients are all <3. This means that the model does not have collinearity.

**Table 7. Coefficient of determination ($R^2$)**

| | **R-square** | **R-square adjusted** |
|---|---|---|
| **AT** | 0.649 | 0.642 |
| **PI** | 0.573 | 0.571 |

As seen in Table 7, the R square of AT is 0.649 and the adjusted R square is 0.642, the R square of PI is 0.573 and the adjusted R square is 0.571. This means that both variables are close to 1 which is a high level of explanation for the dependent variable.

**Table 8. f-square values**

| | **AT** | **CV** | **EM** | **EP** | **FV** | **PI** | **SV** |
|---|---|---|---|---|---|---|---|
| **AT** | | | | | | 1.341 | |
| **CV** | 0.060 | | | | | | |
| **EM** | 0.172 | | | | | | |
| **EP** | 0.086 | | | | | | |
| **FV** | 0.001 | | | | | | |
| **PI** | | | | | | | |
| **SV** | 0.027 | | | | | | |

According to Cohen's (1988) guidelines, f-square values of 0.02, 0.15, and 0.35 represent small, medium, and large effect sizes, respectively. Our analysis of effect sizes ($f^2$) demonstrates varying levels of influence across the constructs. Notably, Attitude (AT) exhibits a substantial effect with an f-square value of 1.341. Emotional Value (EM) demonstrates a moderate influence with an f-square value of 0.172. The remaining constructs - Cognitive Value (CV),

Epistemic Value (EP), Functional Value (FV), and Social Value (SV) - all display small effect sizes.

**Table 9. Direct effects**

| | Path coefficients | **T statistics** | **P values** | **Outcome** |
|---|---|---|---|---|
| **AT -> PI** | 0.757 | 20.365 | 0.000 | Supported |
| **CV -> AT** | 0.156 | 3.571 | 0.000 | Supported |
| **EM -> AT** | 0.419 | 5.224 | 0.000 | Supported |
| **EP -> AT** | 0.257 | 3.584 | 0.000 | Supported |
| **FV -> AT** | -0.020 | 0.285 | 0.775 | Not Supported |
| **SV -> AT** | 0.165 | 2.141 | 0.032 | Supported |

The path coefficients indicate varying degrees of influence between variables in our analysis. The relationship between attitude and purchase intention demonstrates the strongest positive correlation, with a coefficient of 0.757, indicating a substantial impact of user attitude. Conditional value exhibits a moderate positive influence on attitude with a coefficient of 0.156. Emotional value shows a notable positive correlation with attitude, represented by a coefficient of 0.419. Epistemic value maintains a positive relationship with attitude, displaying a coefficient of 0.257. In contrast, functional value shows a slight negative correlation with attitude, as evidenced by a coefficient of -0.020. Social value demonstrates a positive influence on attitude with a coefficient of 0.165, suggesting a meaningful contribution to attitudinal formation.

**Table 10. Indirect effects**

| | **Standard deviation (STDEV)** | **T statistics (\|O/STDEV\|)** | **P values** | **Outcome** |
|---|---|---|---|---|
| CV -> AT -> PI | 0.020 | 3.053 | 0.002 | Supported |
| EM -> AT -> PI | 0.043 | 3.858 | 0.000 | Supported |
| EP -> AT -> PI | 0.032 | 3.216 | 0.001 | Supported |
| FV -> AT -> PI | 0.028 | 0.317 | 0.751 | Not Supported |
| SV -> AT -> PI | 0.034 | 1.919 | 0.055 | Supported |

Analysis of Table 10 reveals meaningful patterns in the indirect effects on purchase intention. The data demonstrates statistically significant indirect effects through several variables: CV (p=0.002), EM (p=0.000), EP (p=0.001), and SV (p=0.055). These results establish robust positive correlations, underscoring how these mediating factors strengthen the relationship between the variables and purchase intention. However, the indirect effect through FV (p=0.751>0.1) does not meet the threshold for statistical significance.

## V. CONCLUSION

The increasing demand for Grabfood apps by customers demonstrates their increasing interest in Grabfood app's, leading to academic and practical interest in the value that Grabfood app brings to customers. In addition, the expansion of O2O platforms has significantly changed the restaurant, food and catering industries, combining digital marketing with traditional sales and services of businesses. The above research article on Grab food delivery app has fully pointed out the core elements of the five values of the variables to draw official, specific conclusions. Improve the objectivity and effectiveness of the research. Research based on consumer value theory identifies five key factors that drive purchase decisions. Our analysis examined how these factors specifically influence customer behavior regarding GFA services through an assessment of mediating variable relationships. The findings indicate that while functional value demonstrates minimal impact on customer attitudes and shows no mediating effect on purchase intention, the other four value components exhibit significant positive influence on customer attitudes, with clear mediating relationships established. This insight presents GFA with valuable opportunities to enhance their service delivery and customer experience. Therefore, the hypothesis H2, H3, H4, H5, H6 are accepted while H1 is rejected.

From there, it helps businesses to have more information and customer data to improve and enhance service quality as well as more reasonable prices, leading to the success of conquering customer files using the application. Create trust for them and make them from potential customers become long-term customers of the company, bringing the necessary

value and profit to help the company develop further.

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# THE RELATIONSHIP BETWEEN ELECTRNIC WORD OF MOUTH (EWOM) AND FORWARDING EWOM BEHAVIOR ABOUT QUANG NGAI DESTINATION, THE MODERATING ROLE OF DIGITAL SOCIAL RESPONSIBILITY

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**ABSTRACT**

**Purpose:** This study explores the relationship between electrinic word of mouth (eWOM) and eWOM forwarding. Additionally, this study investigates the moderating influence of digital social responsibility (DSR) on relationships.

**Methodology/Design/Approach:** We conducted this study in two stages, using two different research methods. The qualitative research phase involved a brief review of the documents and a deep interview with five experts to investigate research model. We conduct the quantitative research phase by surveying tourists who have provided information about Quang Ngai destinations. We use a convenient sample selection method, a survey sample size of 248 units, including people who understand Quang Ngai and have relayed information about this destination. This study uses PLS SEM to analyze the relationships of variables and the moderating impacts of DSR.

**Findings:** The results demonstrated a correlation between eWOM usefulness and eWOM adoption; eWOM adoption and forwarding eWOM behavior. Furthermore, the study's results indicate that DSR moderates the relationship between eWOM adoption and forwarding eWOM.

**Practical Implications:** This is the first one of the studies about eWOM that discusses the DSR factor. Therefore, the results of the study will support the future researchers to direct their research on DSR in the digital media environment. Additionally, these research results provide Quang Ngai with a direction to develop this province's tourism from the perspective of eWOM communication.

*Keywords***:** “DSR”, “Forwarding Ewom”, “Digital Social Responsibility”, “eWOM”, “Quang Ngai destination”.

## I. INTRODUCTION

### 1.1. Background of the study

Nowadays, social media is highly crucial in controlling and creating the image of a local attraction. eWOM is significantly more influential than other forms of social media. Electronic word-of-mouth (eWOM) is seen as more credible than other media forms due to its user-generated content because it is perceived, experienced, and reassessed by users on social networking platforms. Numerous writers investigate the subject of eWOM. According to the authors of the document evaluation, there are four primary research lines in the field of eWOM. In the initial years, the writers concentrated on examining the components that constitute eWOM(Chen & Tsai, 2008; Luo et al., 2014; Sussman & Siegal, 2003; Teng et al., 2014). Prior research indicates that effective eWOM consists of two primary components: the quality of eWOM and the credibility of the eWOM source(Chen & Tsai, 2008; Luo et al., 2014; Sussman & Siegal, 2003; Teng et al., 2014). The subsequent team concentrated on the correlation between eWOM and intention(Abubakar & Ilkan, 2016; Tsao & Hsieh, 2015; Wang et al., 2018). The third group's research concentrated on the correlation between eWOM, brand image, and intention(Bataineh, 2015; Siddiqui et al., 2021). The fourth study group examined the correlation among eWOM, the components of the Theory of Planned Behavior (TPB), and behavioral intention(Abedi et al., 2019; Ran et al., 2021; Wang, 2015; Yang, 2013).

Research on corporate social responsibility is explored by several researchers. However, in the topic of eWOM on online platforms, there is little research that examines digital social responsibility. We feel that the digital social

responsibility of each individual engaging in social networks is highly vital and significant. In the process of studying the preceding publication, the authors came across a study concerning digital social responsibility. However, this study covers the digital social responbility of enterprises on digital platforms. This study reveals that corporate social responsibility affects consumer attitudes and eWOM; customer attitudes impact eWOM and purchase intention(Puriwat & Tripopsakul, 2022). In this study, the authors expect that the digital social responsibility of each individual is extremely significant; it enables the digital environment to be healthy and have more advantages from individuals who engage in social networks through digital platforms. It is significant because social media players who are socially responsible in cyberspace will provide favorable ratings, but the judgment is more helpful and beneficial to consumers than damaging. This will entice more individuals to join in sharing items that are valuable to the community. To better understand digital social responsibility, we offer some of its activities on the social media platform. An individual or organization that is responsible for the community often shares good, valuable information with other users. People who are responsible for the online community also only agree with other people's good and useful information. More specifically, an individual, group, or organization that is responsible for their community never takes actions on social networks that have a negative impact on other people or organizations.

Many previous studies have suggested that eWOM adoption and attitude toward eWOM have a great influence on intention. However, according to the previous research review, there were two studies that suggested that eWOM affected eWOM information forwarding behavior(Abedi et al., 2019; Mahapatra & Mishra, 2017). This illustrates that there is currently extremely limited research on eWOM information sharing, so this study path in the context of eWOM should continue to be researched and validated this association. In this study, we merely looked at the association between eWOM acceptance and user eWOM forwarding. In addition, we explore the moderator of DSR on the relationship between eWOM adoption and eWOM forwarding. The authors believe that users have adopted eWOM usefulness; the users will forward it on to others in the online community if they are ethical and accountable to the community. The users with strong digital social responsibility will share more than the eWOM value they receive. In contrast, the users with lesser digital social responsibility will share little or no useful eWOM they obtain from social media.

Quang Ngai tourism possesses significant potential, yet it has not yet garnered substantial visitor interest. The writers assert that Quang Ngai Province has employed strategies to enhance its destination image. This study aims to investigate social media strategies to identify optimal approaches for attracting visitors. Nevertheless, Quang Ngai has not completely harnessed the potential of social media, particularly electronic word-of-mouth, for tourism promotion.

### 1.2. Research Questions and objectives

In the context of eWOM, to fill the research gap, this study proposes the following specific objectives:

- RO1: Identify the relationships between the factors in the research model.
- RO2: Evaluate the degree of influence among the factors.
- RO3: Examine the moderation of DSR in the relationship between eWOM adoption and eWOM forwarding.

To fulfill the above-mentioned aims. The following are some of the most essential questions that will be answered.

- RQ1: What components are incorporated in the research model?
- RQ2: What is the amount of impact between elements in the model?
- RQ3: How is the moderator function of DSR in the link between eWOM adoption and eWOM forwarding?

## II. MATERIAL AND METHODOLOGY

### 2.1. Material and method

The research was performed with a sample size of 248 units. The poll was administered directly to tourists in Ho Chi Minh City from October to November 2024. The proportion of legitimate answers is 82.6% from the sum of surveys. The survey participants possess the following attributes: (1) Engage in social networks; (2) Utilize and disseminate travel information on social networks; (3) Comprehend Quang Ngai tourism.

The research method is a synthesis approach between qualitative and quantitative. The qualitative research

approach is carried out throughout the literature study and expert interviews on the research model. The authors interviewed a group of 05 experts to adjust the main model. The quantitative research model is carried out in the process of processing quantitative data when the survey data is accessible. Using structural equation modeling to examine the connection of variables in the research model. The software utilized for this investigation comprises SPSS and SmartPLS4.

**2.2. Research hypothesises and model**

Many prior research studies have shown that eWOM forwarding was impacted by eWOM adoption(Abedi et al., 2019; Mahapatra & Mishra, 2017), eWOM adoption was affected by eWOM usefulness(Abedi et al., 2019; Cheung et al., 2008; Chong et al., 2018; Sussman & Siegal, 2003), and eWOM usefulness depended on eWOM quality and eWOM source credibility(Abedi et al., 2019; Cheung et al., 2008; Chong et al., 2018; Sussman & Siegal, 2003). However, these prior studies have not discussed the moderating influence of DSR on the relationship between eWOM adoption and forwwarding eWOM. In this study, the authors suggest the relationship between variables and the moderating influence of DSR on the relationship between eWOM adoption and forwarding eWOM.

2.2.1. Research hypothesises

The eWOM quality is defined as the user's judgment of the validity and persuasiveness of eWOM to the recipient of eWOM(Chakraborty, 2019; Verma et al., 2023). eWOM quality can be described as the persuasive power of comments derived from an informational message (Bataineh, 2015; Bhattacherjee & Sanford, 2006; Cheung et al., 2008; Fahmy & Ragab, 2022) and the quality of eWOM information is considered as the output value generated by a system according to the user's perception(Cheung et al., 2008). According to previous studies, the components that make up eWOM quality include relevance, timeliness, accuracy, comprehensiveness, and consistency(Cheung et al., 2008). This shows that eWOM quality influenced eWOM usefulness, and the impact of eWOM quality on eWOM usefulness has been proven by many previous studies(Abedi et al., 2019; Cheung et al., 2008; Chong et al., 2018; Sussman & Siegal, 2003). Empirical studies have used IAM theory to explain this relationship(Abedi et al., 2019; Cheung et al., 2008). From the above argument, the authors propose the hypothesis:

H1 (+): eWOM quality has a positive impact on eWOM usefulness.

eWOM source credibility is the level to which a person is aware of reviews and recommendations from a reliable source (Bataineh, 2015). eWOM source credibility has a higher level of trust, which leads to higher eWOM usefulness. Previous studies have suggested that the components that make up eWOM source credibility include reliability, expertise, attractiveness(Teng et al., 2014; Wu & Wang, 2011), and source experience(Wu & Wang, 2011). The relationship between eWOM source credibility and eWOM usefulness has been demonstrated in previous studies in their empirical studies(Abedi et al., 2019; Cheung et al., 2008; Teng et al., 2014), and these studies use IAM theory to explain this relationship(Cheung et al., 2008; Sussman & Siegal, 2003). From the above argument, the authors propose the hypothesis:

H2 (+): eWOM source credibility has a positive impact on eWOM usefulness.

eWOM usefulness is eWOM information that the recipient finds useful information and will make decisions based on it(Abedi et al., 2019; Cheung et al., 2008; Ismagilova et al., 2019). So, when recipients find eWOM useful, they tend to accept that eWOM and make decisions on the eWOM they received(Abedi et al., 2019). Empirical studies have demonstrated the impact of eWOM usefulness on eWOM adoption(Abedi et al., 2019; Chong et al., 2018; Saidani et al., 2023; Silaban et al., 2023; Sussman & Siegal, 2003). These prior studies have used IAM theory to explain this relationship(Abedi et al., 2019; Cheung et al., 2008; Sussman & Siegal, 2003). From the above argument, the authors propose the hypothesis:

H3 (+): eWOM usefulness has a positive impact on eWOM adoption.

eWOM adoption is the consumer's acceptance of the use of eWOM information(Abedi et al., 2019; Cheung et al., 2008; Tien et al., 2019; Verma et al., 2023). Adopting eWOM, consumers often consider its usefulness and reliability(Hussain et al., 2018). Upon accepting eWOM, users will utilize the information to make decisions, including disseminating the eWOM data to others. The study carried out by (Abedi et al., 2019) and (Mahapatra & Mishra, 2017) discusses the relationship between eWOM adoption and forwarding eWOM. To strengthen the relationship between

eWOM adoption and forwarding eWOM, previous studies have used the SET theory to explain this relationship(Abedi et al., 2019). From the above argument, the authors propose the hypothesis:

H4 (+): eWOM adoption has a positive impact on forwarding eWOM.

According to(Puriwat & Tripopsakul, 2022), Digital Social Responsibility (DSR) is defined as the effort, initiative, or activity of an individual, group, or organization implemented through online or digital platforms.This author has mentioned DSR, but in that study the author refers to the DSR of enterprises(Puriwat & Tripopsakul, 2022). Our research is interested in DSR from the perspective of individual users of digital social networks. Nowadays, when most people make their decisions based on references from social networks on digital platforms, it is necessary for social media users to be responsible for the online community. Social media plays an important role for tourists in finding information about tourist destinations. However, social media does not always have positive and useful information for searchers because it also contains a lot of information that is not useful and negative. The appearance of both positive and negative information on the same social network is due to the responsibility of social network users. If users are ethical, conscious, and responsible for the community, they will always provide and share truthful, useful, and beneficial information for the community. In this study, the authors define digital social responsibility as the users of social networks on digital platforms; they always have ethics and responsibility for the social networking community. From the perspective of eWOM information, this study believes that if individuals with digital social responsibility learn to accept reliable, useful, and beneficial eWOMs for others, they will share and forward that information to other consumers on social networks. On the contrary, individuals who lack digital social responsibility will be very limited in sharing and forwarding the positive and useful eWOM information they receive. Thus, the transition of eWOM depends on the digital social responsibility of the previous eWOM recipient. Digital responsibility will regulate the relationship between eWOM adoption and forwarding eWOM. The moderating role of DSR is also explained by the SET theory and the Corporate Social Responsibility (CSR) theory. The authors propose the hypothesis:

H5 (+): DSR has a positive moderator on the relationship between eWOM adoption and forwarding eWOM.

### 2.2.2. Research model

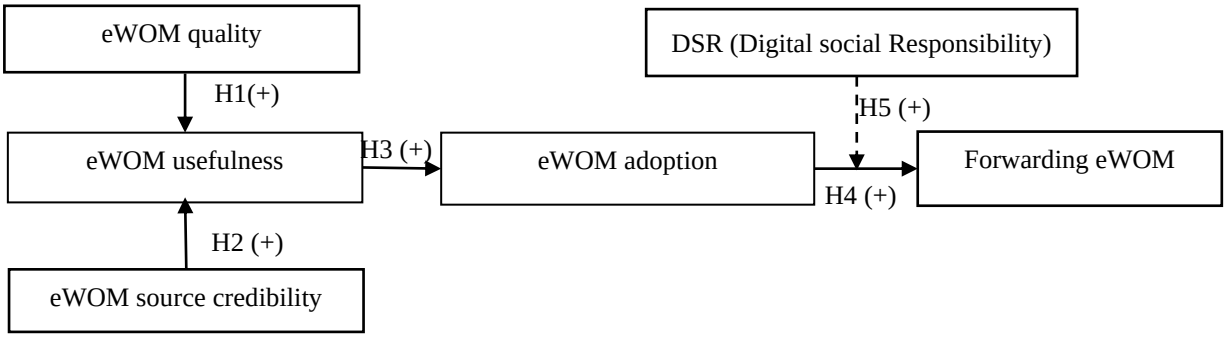



**Fig 1. Proposed Conceptual Model**

*Source: Compiled by authors*

## III. RESULT AND DISCUSSION

### 3.1. Research subjects

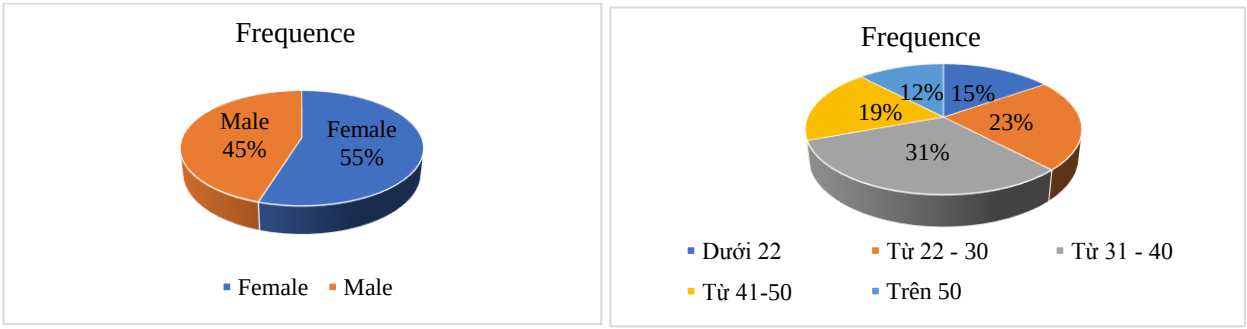



**Fig 2. Statistic results of sample about gender and age**

*Source: Data processing*

Sample data indicate that 136 surveyors are female, representing 55% of the total 248 survey participants, while

males constitute 45% of the total. The survey demographics reveal that 38 participants are under 22 years old, representing 15%; 56 participants are aged 22 to 30, constituting 23%; 78 participants fall within the 31 to 40 age range, comprising 31%; 46 participants are aged 41 to 50, accounting for 19%; and 30 participants are over 50 years old, making up 12%. The statistical analysis of the sample indicated that the number of surveyed women exceeded that of males; individuals aged 31–40 was the largest demographic studied.

### 3.2. Model results

#### 3.2.1. Scale evaluation results

First in this formal quantitative step this study evaluates the scale. In order to consider whether the scale is good and statistically reliable, the author performs an intrinsic consistency reliability assessment; convergence; differentiation (Joseph F. Hair et al., 2022). The results show that the Cronbach's Alpha on all scales is greater than 0.7 and CR on all scales is greater than 0.8 (Table 1). This result confirms that the scales are intrinsically consistent. The results of the AVE of the scales are greater than 0.5. The results proved that the scale has converged. As a result, the HTMT coefficients of the scales were all less than 0.9, so the scales achieved a distinguishing value (Table 2).

**Table 1. Reliability and validity of variables**

| Constructs | Cronbach's alpha | Composite reliability (rho_c) (CR) | Average variance extracted (AVE) |
|---|---|---|---|
| A-eWOM | 0.921 | 0.944 | 0.810 |
| C-eWOM | 0.777 | 0.856 | 0.599 |
| DSR | 0.712 | 0.839 | 0.634 |
| F-eWOM | 0.949 | 0.963 | 0.868 |
| Q-eWOM | 0.805 | 0.872 | 0.630 |
| U-eWOM | 0.870 | 0.920 | 0.794 |

*Source: SmartPLS 4*

**Table 2. The discrimination of the variables**

| | A-eWOM | C-eWOM | DSR | F-eWOM | Q-eWOM | U-eWOM | DSR x A-eWOM |
|---|---|---|---|---|---|---|---|
| A-eWOM | | | | | | | |
| C-eWOM | 0.591 | | | | | | |
| DSR | 0.182 | 0.210 | | | | | |
| F-eWOM | 0.734 | 0.493 | 0.753 | | | | |
| Q-eWOM | 0.591 | 0.103 | 0.114 | 0.482 | | | |
| U-eWOM | 0.848 | 0.604 | 0.141 | 0.689 | 0.507 | | |
| DSR x A-eWOM | 0.231 | 0.136 | 0.028 | 0.277 | 0.139 | 0.182 | |

*Source: SmartPLS 4*

#### 3.2.2. Results of structural equation model evaluation

Before evaluating the path structure model, this study performs a colinear test of each variable. According to(Joseph F. Hair et al., 2022), the VIF coefficient is less than or equal to 3, there is no collusion occurring between pairs of variables. The results showed that the pairs of variables all had a VIF coefficient of less than 3 (Table 3), which showed that there was no multilinearity occurring between pairs of variables in the study model.

**Table 3. Collinearity statistic (VIF)**

| | A-eWOM | C-eWOM | DSR | F-eWOM | Q-eWOM | U-eWOM | DSR x A-eWOM |
|---|---|---|---|---|---|---|---|
| A-eWOM | | | | 1.075 | | | |
| C-eWOM | | | | | | 1.002 | |
| DSR | | | | 1.022 | | | |
| F-eWOM | | | | | | | |
| Q-eWOM | | | | | | 1.002 | |
| U-eWOM | 1.000 | | | | | | |
| DSR x A-eWOM | | | | *1.052* | | | |

*Source: SmartPLS 4*

The results of the path relationship test in the structure model, using the bootstrapping method with a sample size of 5,000 bootstrap templates. The results show that all P-values are less than 0.05 (Table 4), meaning that all impact relationships are acceptable, and the impact level ranges from 0.408 to 0.764 (Table 4). The R2 results in the study model show the degree of explanation of independent variables to dependent variables. The R2 of U-eWOM is 0.414, which means that Q-eWOM and C-eWOM explain 41.4%; the R2 of A-eWOM is 0.584; the R2 of F-eWOM is 0.763 (Fig 3). According to (Joseph F. Hair et al., 2022) 0.75 ≥ R2 ≥ 0.25 are considered average and acceptable. Thus, with the above result, R2 of the dependent variables is accepted because it is greater than 0.25.

Especially in this study, the authors evaluated the impact of the moderation of DSR. From the results of Table 4, it is shown that DSR x A-eWOM has an impact coefficient of 0.129 and P-value of less than 0.05. Thus, DSR has a positive (+) interaction effect on the relationship between A-eWOM and F-eWOM. This means that DSR adds to the positive relationship between variables A-eWOM and F-eWOM (Fig. 4).

To sum up, from the results of the data analysis show that all hypotheses are statistically significant. The moderator role of DSR is also statistically significant and has a positive impact on the positive relationship between A-eWOM and F-eWOM (Table 4).

**Table 4. Results of evaluating the relationship between variables (paths)**

| Hypothesis | Relationship | Original sample (O) | P values | Significant |
|---|---|---|---|---|
| H1 (+) | Q-eWOM -> U-eWOM | 0.408 | 0.000 | Support |
| H2 (+) | C-eWOM -> U-eWOM | 0.478 | 0.000 | Support |
| H3 (+) | U-eWOM -> A-eWOM | 0.764 | 0.000 | Support |
| H4 (+) | A-eWOM -> F-eWOM | 0.579 | 0.000 | Support |
| H5 (+) | DSR x A-eWOM -> F-eWOM | 0.129 | 0.000 | Support |

*Source: SmartPLS 4*

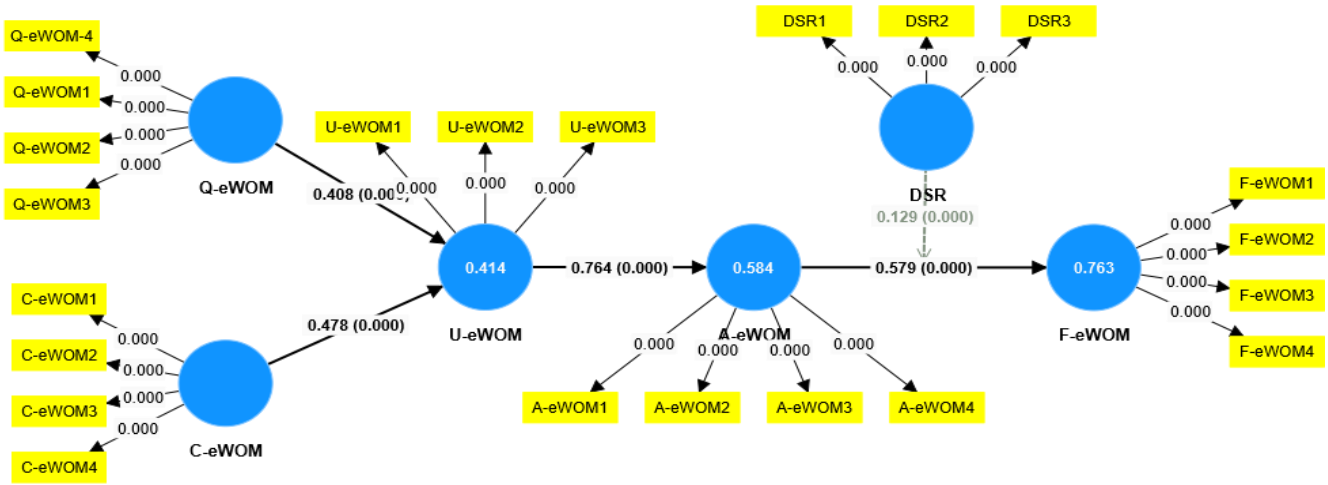



**Fig 3. The Structure equation Model (SEM)**

*Source: SmartPLS*

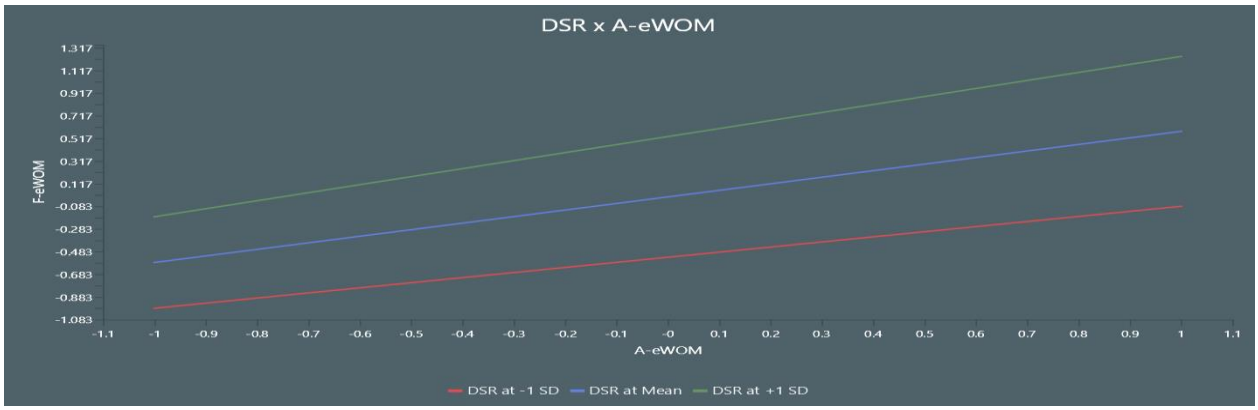


**Fig 4. Moderation Impact of DSR**

*Source: SmartPLS4*

### 3.3. Discussion

The results of this study have shown that the relationships in the research model are statistically significant. This once again confirms the relationship between eWOM information usefulness, eWOM information acceptance, and eWOM information. The results of this study completely coincide with the results of the study of (Abedi et al., 2019; Silaban et al., 2023). DSR moderates the relationship between eWOM adoption and eWOM forwarding as an attractive and prominent point of this study compared to previous studies. However, this study does not discuss the effect of DSR on negative eWOM, which leads to a limited comprehensiveness of the eWOM field. We propose the following studies that look at the impact of DSR on negative eWOM, which will help to add to a more complete eWOM theoretical system. From our subjective point of view, we believe that there is an inverse effect between DSR and negative eWOM. This means that socially responsible individuals will minimize negative information on social networks and other digital platforms.

## IV. CONCLUSION

This study aims to ascertain the link between eWOM and the forwarding eWOM, with a particular focus on the moderating influence of DSR. This study's examination of research data revealed that eWOM adoption positively influenced the forwwarding eWOM. The study indicated that the DSR positively moderated the link between eWOM adoption and the forwarding eWOM.

The results of the study show that the role of DSR is very important in the context of eWOM. Travelers can relay positive, useful information after they receive it to others on social networks, which depends a lot on their awareness, ethics, and responsibility to the digital community. Thus, if social media users are aware of their responsibilities to the digital community, all social media users will receive more useful information than negative information. This will also lead to a healthier digital environment. The findings of this study help destination managers take advantage of the social responsibility of individuals to effectively communicate good information about tourist destinations to other travelers.

The study was only interested in eWOM usefulness influencing forwarding eWOM and the moderator of DSR to this relationship. However, the authors have not studied the relationship between negative eWOM and forwarding eWOM and considered the moderator of DSR in this relationship. Therefore, the future studies should look at the relationship between negative eWOM, DSR, and negative eWOM transition.

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# A PILOT STUDY ON THE SUSTAINABLE EDUCATIONAL DEVELOPMENT IN PRIVATE UNIVERSITIES IN VIETNAM AND CHINA IN 2024: A COMPARATIVE STUDY

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**ABSTRACT**

The main objective of promoting sustainable development in education is to integrate it into all levels. Therefore, it is necessary to have comparative studies between different contexts that support countries in recognizing and adapting to the use of sustainable educational strategies. This research aims to address the problem by conducting a comparative analysis of sustainable education between two countries. The research structure is divided as follows: The literature review will cover existing theories about sustainable educational development and its role in Vietnam and China. The methodology comprised detailed surveys conducted in private universities across Vietnamese and Chinese provinces. In detail, the author compared the perceptions of academic staffs about sustainable development in education at private universities in Hanoi and Ho Chi Minh (Vietnam), and Beijing and Guangzhou (China). Finally, the author aims to use a T-test and linear regression analysis to compare the scores between the two countries. The result confirms that the power distance in private Vietnamese universities has a lower effect in holistic approach to content than private Chinese university's counterparts. This was the first research comparing sustainable educational development in private universities in Vietnam and China. Therefore, this research was essential in its field.

*Key words: "China", "Comparative study",* "Sustainable educational development", "Vietnam"

## I. INTRODUCTION – RESEARCH GAP

### 1.1 Background of the study

Although extensive research in organizational studies and psychology has focused on understanding sustainable educational development's causes and effects, more research should focus on cross-cultural studies. Therefore, whether the national culture impacts how teachers respond to sustainable educational development is questionable. It is believed that cultural characteristics may influence an individual's perceptions of this term. For instance, while sustainable educational development may be successfully adapted in a Western context, others may need help adapting it to other contexts. This suggests that individualism, which refers to cultural features toward personal rights in society, may play a significant role. Higher individualism societies advocate for greater rights, while lower individualism societies tend to accept unequal societal power. Therefore, we propose that sustainable educational development is directly influenced by national culture. Specifically, cultural characteristics will influence how individuals respond to sustainable educational development.

Most studies on sustainable educational development have been conducted in Western countries, such as the USA and European regions (Cassano, 2019; Feinstein, 2009). On the other hand, the Asian context has received less attention when only a few studies have been conducted in China, Japan, or Taiwan (Li et al., 2022; Nomura and Abe, 2010; Sung, 2015). Nation culture significantly influences individual attitudes and behaviors, so that results from Western studies may not fully adapt to Asian contexts due to significant differences in social, cultural, and political issues. In many Asian societies, collectivism is highly common, whereas individualism is generally favored in the Western context (Hofstede, 2001). Individualistic societies focus on individual freedom, innovation, and creativity, which frequently leads to development in various fields, including education. However, in collectivist countries such as China and Vietnam, traditional values are highly respected, and people might resist changing the educational system. As a result, perceptions of sustainable educational development might differ between Western and Asian contexts; those that are seen as suitable in a Western context may be seen as inappropriate in Asian ones, and vice versa. Various studies indicate that British universities report sustainable educational development more frequently than their Chinese

counterparts (Lu and Zhang, 2013). Similarly, it has been noted that Vietnamese universities are less sustainable in educational development than their Poland counterparts (Tien et al., 2022).

This study selects Vietnam and China for specific reasons. Private Chinese universities have developed recently and can be developed in urban areas. The development of private education in China was formed by the Ministry of Education, which formulates policies and regulations and provides financial support and resources for their development (Holm et al., 2015). As a result, China's private universities have invested significantly in using information technologies such as digital repositories, online platforms, and online teaching to educate students. This issue has been developing with further investment in facilities and services.

Similarly, Vietnamese private universities have been developing recently, with the establishment of laws and regulations in the last decades. Although this country had many economic troubles, much effort was made to apply for sustainable educational development (Kieu et al., 2016). While difficulties exist, such as rare resources and funding, Vietnamese private universities have attempted to develop their capabilities online and on traditional platforms. While China and Vietnam have seen significant improvement in developing their private university systems, a gap exists in understanding factors affecting sustainable educational development. This study aims to fill this gap by identifying sustainable educational development in Chinese and Vietnamese private universities.

Previous research on sustainable educational development in the Asian context has been conducted in several contexts (Li et al., 2022; Nomura and Abe, 2010; Sung, 2015). These results confirm that this issue affects work satisfaction, commitment, and performance. However, rare studies have been conducted on cross-cultural issues in the Asian context. To fill this gap, this study uses cross-cultural data from teachers in China and Vietnam to examine the impact of sustainable educational development on the two countries. From a practical point of view, our findings should assist leaders in understanding an increased sustainable educational development. Furthermore, our research supports the cooperation between China and Vietnam, which promotes enhanced economic opportunities and intercultural exchanges between the two countries.

### 1.2. Education for sustainable development

Sustainable educational development has been an essential topic in recent decades (Grindsted and Holm, 2012). Sustainable educational development is defined as supporting individuals to improve their abilities and knowledge for the sake of society in the present time and the future (UN DESD, 2011). The association between education and sustainable development is complicated because of the difference between two terms. However, Sterling (2004) confirmed that sustainable educational development paves the way for universities to develop their quality of curriculum. In detail, sustainable educational development has been linked to individual factors (Lu and Zhang, 2013), organizational factors (Li et al., 2022), and sociocultural factors (e.g., national cultures) (Kieu et al., 2016). Studies have shown that sustainable educational development can lead to a university's success.

Sustainable development in private universities is essential to ensure that these institutions can thrive in the long term while balancing economic, social, and environmental responsibilities. By adopting sustainable practices, private universities can reduce their carbon footprint, conserve resources, and contribute to the overall well-being of the community. Moreover, fostering sustainability in education empowers students to understand the importance of environmental stewardship, ethical leadership, and responsible innovation. This not only helps universities align with global sustainability goals but also ensures that they remain relevant and resilient in an increasingly eco-conscious world. Ultimately, it prepares the next generation of leaders to address pressing global challenges in a holistic and forward-thinking manner.

### 1.3 Research Questions and objectives

To fill this gap, the research assumes that sustainable educational development will have different aspects, such as a lower power distance (Vietnam) and a higher power distance (China). As such, the hypothesis is as follows.:

– RO1: Sustainable educational development differs for private Vietnamese universities from private Chinese universities.

– RO2: The influence of cultural dimension in sustainable educational development is different between private Vietnamese and Chinese universities.

## II. THEORETICAL AND EMPIRICAL BASIS

### 2.1. The China and Vietnam contexts

China is the only socialist country in East Asia. This country has approximately 1.3 billion people, the largest population in the world. China has four megacities: Beijing (the capital), Shanghai, Chongqing, and Tianjin. Chinese is the official language, while English is the second most common language. Similarly, Vietnam is one of two socialist countries in Southeast Asia. This country has 100 million people, and most of the population lives in rural areas. In Vietnam, there are three main megacities: Hanoi (the capital), Da Nang, and Ho Chi Minh City. Buddhism, Confucianism, and Taoism are the main religions in Chinese and Vietnamese culture. Before the economic reforms in 1965 (China) and 1986 (Vietnam), both countries experienced economic crises in the early 20th century (Perry and Wong, 2020; Tran, 2021). After converting the entire economy from state centralization to private centralization, China's economy has experienced the world's fastest growth and become the second-largest in the world. Similarly, the Vietnamese economy has rapidly grown to become one of the most promising in Southeast Asia.

According to House et al. (2004), China has a higher power distance score than Vietnam. Individuals from high power distance cultures usually maintain harmony based on reliance, accepting the sizeable societal gap (Chew and Putti, 1995; Restubog & Bordia, 2006). On the other hand, individuals from low power distance cultures do not accept a higher gap in societies. Chew and Putti (1995) found that workers in low power distance cultures are closely related to those in higher organizational positions. In contrast, people in low power distance societies respond more harshly when mistreated. Compared to their counterparts in high power-distance cultures, several research studies reveal that workers in low power-distance societies have higher expectations for justice and fairness than their counterparts in high power-distance cultures.

## III. METHODOLOGY

### 3.1. Sample size

The purposive sampling technique is selected in this study, targeting employees within private universities across Vietnam and China. Private universities were chosen because they are the potential educational institutions in both countries. Permission to collect surveys was obtained by contacting human resource departments in various universities in both countries. As a result, the author received a confirmation from seven Vietnamese universities and seven Chinese universities. When the researchers received an acceptance from these universities, surveys along with guidelines and informed consent were sent to human resource specialists, who then provided surveys to the university. For the Vietnamese respondents, the questionnaire was translated into Vietnamese by a bilingual expert in two languages and then back-translated into English to ensure accuracy. Surveys were sent to seven universities, primarily from Hanoi and Ho Chi Minh City, the main cities in Vietnam. Two hundred fifty surveys were sent to respondents. The survey was conducted from March to April 2024. As a result, 189 surveys were received, and 22 were removed due to needing more information. Therefore, 167 were included in the analysis, yielding a response rate of 88.3%. The translation process of the Chinese survey is similar to that of the Vietnamese survey. In detail, surveys were distributed to employees at seven universities in Beijing and Guangzhou. Two hundred sixty-six surveys were sent to respondents. The survey was conducted from April to May 2024. As a result, 223 surveys were collected, and 37 were removed due to needing more information. Therefore, 186 valid surveys remained and were moved in the analysis, representing a response rate of 83.4%. In total, 353 surveys were used in this study. The demographic information of respondents can be found in table 1.

**Table 1: Demographic information**

| Demographic variables | Vietnam | China |
|---|---|---|
| ***Gender*** | | |
| **Male** | 98 | 86 |
| **Female** | 69 | 100 |
| **Total** | 167 | 186 |
| ***Age*** | | |

| | | |
|---|---|---|
| **Above 30** | 56 | 79 |
| **Below 30** | 111 | 107 |
| **Total** | 167 | 186 |
| ***Managerial ranks*** | | |
| **Employee** | 132 | 145 |
| **Supervisor** | 35 | 41 |
| **Total** | 167 | 186 |
| ***Working experience*** | | |
| **Below ten years** | 121 | 143 |
| **Above ten years** | 46 | 43 |
| **Total** | 167 | 186 |
| **Number of private universities** | | |
| **The 1st university** | 21 | 20 |
| **The 2nd university** | 26 | 29 |
| **The 3rd university** | 26 | 23 |
| **The 4th university** | 28 | 25 |
| **The 5th university** | 24 | 28 |
| **The 6th university** | 18 | 29 |
| **The 7th university** | 24 | 32 |
| **Total** | 167 | 186 |
| **Location** | | |
| **Vietnam** | 167 | |
| **Hanoi** | 98 | |
| **Ho Chi Minh** | 69 | |
| **China** | | 186 |
| **Beijing** | | 101 |
| **Guangzhou** | | 85 |

***Source:*** *Prepared by the author.*

### 3.2. Research objects

Sustainable educational development: This study used a questionnaire developed by Boeve-de Pauw et al. (2015), which includes seven items covering two dimensions: Holistic approach to content and Pluralistic approach to teaching. A holistic approach to content in sustainable educational development integrates multiple dimensions, including environmental, social, and economic factors, to foster a comprehensive understanding of sustainability. This approach ensures that students are equipped with the knowledge and skills to address real-world challenges sustainably. A pluralistic approach to teaching in sustainable educational development values diversity by incorporating multiple viewpoints, cultures, and experiences into the learning process. This approach fosters collaborative learning, where students are encouraged to discuss, debate, and find solutions in reality. Responses were gathered using a 5-point Likert scale, where a score of 5 indicates "strongly agree" and one indicates "strongly disagree."

Cultural dimension: This study used a questionnaire developed by House et al. (2004), which includes six items covering two dimensions: Power distance and Collectivism. Power distance refers to the extent to which those people with less power are ready to accept an unequal distribution of power in hierarchical structures. Collectivism is a cultural value that emphasizes the importance of group goals, interdependence, and community well-being over individual interests and personal achievement. Responses were gathered using a 5-point Likert scale, where a score of 5 indicates "strongly agree" and one indicates "strongly disagree."

## IV. QUANTITATIVE RESULTS

Several analyses were conducted to clean the data. These included the Kaiser-Meyer-Olkin (KMO) test, the exploratory factor analysis (EFA), Cronbach's Alpha, and the total variance analysis. According to Kaiser (1974), a KMO value greater than 0.5 is required for further analysis. This study's KMO value was 0.97, indicating that the preliminary analysis requirements were satisfied. Consequently, all items displayed factor loadings between 0.512 and 0.854, exceeding the requisite minimum of 0.4 for a valid EFA (Nunnally, 1978). In addition, the Cronbach's Alpha coefficient was computed to be higher than 0.714, exceeding the minimum value of 0.70. The composite reliability of all dimensions is between 0.934 and 0.956, which is higher than the minimum requirement of 0.8. The validity of average variance extracted (AVE) of all items are higher than than the minimum threshold of 0.50. 78.653 percent of the total variance was explained by items with eigenvalues greater than one (Falk and Miller, 1992). As a result, the first factor explained 25.11% of the variance, which was below the utmost of 30%. These statistics confirm the validity for further analysis. The detailed statistic can be found in table 2.

**Table 2 Reliability and validity tests**

| Construct | Factor loading | Cronbach' s α | Composite reliability | AVE |
|---|---|---|---|---|
| **Holistic approach to content** | 0.713 – 0.854 | 0.803 | 0.934 | 0.545 |
| **Pluralistic approach to teaching** | 0.534– 0.812 | 0.735 | 0.945 | 0.523 |
| **Power distance** | 0.576 – 0.790 | 0.821 | 0.949 | 0.587 |
| **Collectivism** | 0.512– 0.767 | 0.714 | 0.956 | 0.579 |

*Source: Prepared by the author.*

A T-test was selected to examine the hypotheses in Table 3 and 4. In research question 1, it was predicted that sustainable educational development is different for private Vietnamese universities than private Chinese universities. This statistic was chosen because T-test provided powerful and versatile methods for examining relationships and differences in data. In this research, this statistic was useful because its goal was to understand condition causes a measurable change in sustainable educational development between two countries. Results of the T-test suggest that all dimensions of the questionnaire were different between the two countries. In detail, Vietnam (M=3.56) was significantly lower than China (M=4.01) in the difference between holistic approach to content. Similarly, Vietnam (M= 3.89) was significantly lower than China (M=4.11) in the difference between pluralistic approach to teaching. Altogether, the results confirm that the hypothesis is supported.

**Table 3 - Results for Vietnam and China's respondents in the difference between holistic approach to content**

| **Dependent variable: The difference between holistic approach to content** | | | | | |
|---|---|---|---|---|---|
| **Place** | Mean | SD | Number | F | P |
| **Vietnam** | 3.56 | 1.43 | 167 | 3.43 | 0.02 |
| **China** | 4.01 | 1.89 | 186 | | |

*Source: Prepared by the author.*

**Table 4 - Results for Vietnam and China's respondents in pluralistic approach to teaching**

| **Dependent variable: The pluralistic approach to teaching** | | | | | |
|---|---|---|---|---|---|
| **Place** | Mean | SD | Number | F | P |
| **Vietnam** | 3.89 | 1.76 | 167 | 3.67 | 0.04 |
| **China** | 4.11 | 1.89 | 186 | | |

*Source: Prepared by the author.*

Linear regression analysis was selected to challenge the hypotheses, as shown in Table 5.1 and 5.2. This statistic was chosen because its goal was to understand the relationship between cultural dimensions and the sustainable educational development. This statistic was ideal for examining predictive relationships and quantifying how changes in the cultural dimensions influenced the sustainable educational development in each country. Table 5.1 explores the role of power distance and collectivism on sustainable educational development in private Chinese universities. The

results revealed that power distance had a significant effect on holistic approach to content (Model 1, $\beta = 0.631$, $p < 0.05$). However, power distance insignificantly influences pluralistic approach to teaching (Model 2, $\beta = -0.153$, $p > 0.05$). Table 5.2 explores the role of power distance and collectivism on sustainable educational development in private Vietnamese universities. The results revealed that power distance had a significant effect on holistic approach to content (Model 3, $\beta = 0.512$, $p < 0.05$). However, power distance insignificantly influences pluralistic approach to teaching (Model 4, $\beta = -0.443$, $p > 0.05$). Altogether, the power distance in private Vietnamese universities has a lower effect in holistic approach to content than private Chinese university's counterparts, and the second hypothesis is partially supported.

**Table 5.1 - Results of linear regression analysis in private Chinese universities**

| **Variables** | **Sustainable educational development in private Chinese universities** | |
|---|---|---|
| | Holistic approach to content | Pluralistic approach to teaching |
| | Model 1 | Model 2 |
| **Power distance** | 0.631* | -0.153 |
| **F** | 7.621 | 0.245 |
| **$R^2$** | 0.212 | 0.012 |
| **Adjusted $R^2$** | 0.034 | -0.012 |
| | | |
| **Collectivism** | 0.431 | 0.341 |
| **F** | 7.435 | 0.245 |
| **$R^2$** | 0.236 | 0.165 |
| **Adjusted $R^2$** | 0.021 | -0.055 |

*Source: Prepared by the author; Notes: Standardized correlations reported ** p<0.01, *p<0.05*

**Table 5.2 - Results of linear regression analysis in private Vietnamese universities**

| **Variables** | **Sustainable educational development in private Vietnamese universities** | |
|---|---|---|
| | Holistic approach to content | Pluralistic approach to teaching |
| | Model 3 | Model 4 |
| **Power distance** | 0.512* | -0.178 |
| **F** | 7.098 | 0.213 |
| **$R^2$** | 0.234 | 0.054 |
| **Adjusted $R^2$** | 0.012 | -0.014 |
| | | |
| **Collectivism** | 0.443 | 0.365 |
| **F** | 7.412 | 0.221 |
| **$R^2$** | 0.254 | 0.111 |
| **Adjusted $R^2$** | 0.015 | -0.046 |

*Source: Prepared by the author; Notes: Standardized correlations reported ** p<0.01, *p<0.05*

## V. CONCLUSION AND MANAGERIAL IMPLICATIONS

This article aimed to investigate the influence of sustainable educational development, which is different for private Vietnamese universities than private Chinese universities. This study adopted a cross-cultural study to compare sustainable educational development in private universities between two countries. This study confirmed that these effects would be stronger for Vietnamese universities than their Chinese counterparts, who typically have lower acceptance of high power than Chinese universities. This new exploration opens the scope of sustainable educational development and adds new findings to educational studies.

This research contributes to the literature on sustainable educational development in several ways. Firstly, our findings confirm the positive impact of sustainable educational development on both Vietnamese and Chinese universities. Many East Asian countries, including China, Japan, South Korea, and Taiwan, are formulated by high

power distance cultures, wherein individuals follow a vertical structure, and managers have power over subordinates. Conversely, Southeast Asia countries such as Vietnam, Thailand, and Malaysia have lower power distance cultures, where power is more equal between supervisors and subordinates. In China's high power distance culture, there is a clear difference between managers and employees, and employees are required to follow the manager's orders under any circumstances. Therefore, if employees experience following orders from their supervisors, they might be ready to adapt to the use of sustainable educational development. On the other hand, Vietnam, a low power distance culture, exhibits less power difference between managers and employees, with employees having more power in workplaces. Therefore, they need help to apply for sustainable educational development. Consequently, while sustainable educational development hurts Chinese universities, its influence on Vietnamese universities must be revised. While prior studies confirm the role of sustainable educational development, this research broadens this concept across different societies, particularly in non-Western countries. This study fulfills this gap by identifying sustainable educational development in Vietnamese and Chinese private universities.

This study identifies several solutions to support private universities in developing sustainable educational development. First, universities should establish a set of guidelines for acceptable behaviors in workplaces. When Confucianism plays a vital role in Chinese and Vietnamese cultures, managers could use critical components in this philosophy, such as harmony, sympathy, and unity, to identify appropriate codes of conduct within their universities. Employees with positive behaviors can be rewarded or promoted, while those with negative behaviors can be punished. Second, private university leaders should recruit candidates with favorable, positive, and proper behaviors, which can support sustainable educational development at the beginning. To achieve this objective, private universities can use role-playing exercises during the recruitment process to assess candidates' reactions to this issue in workplaces. This can enable private universities to select individuals with proper behaviors and attitudes.

Our study points to several avenues for future research. First, while our research provided evidence for sustainable educational development, we recommend that future research examine the mediating effects of different cultural values (e.g., hierarchical values or beliefs in harmony) on sustainable educational development. Researchers could then explore whether the mediating effects of these values vary between cultures and how they affect sustainable educational development. This is especially important when employees in workgroups and organizations spend more time interacting with individuals with different cultural beliefs and value systems. Therefore, we have established several solutions to eliminate this issue. Finally, this study is expected to open the scope of sustainable educational development in Asia, particularly in Vietnam and China.

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# RISKS IN TOURISM SALES ACTIVITIES IN THE SOUTHEASTERN REGION AND PROPOSED SOLUTIONS: A STUDY USING THE ANALYTIC HIERARCHY PROCESS (AHP)

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**ABSTRACT**

The tourism industry is regarded as one of the sectors with significant contributions to the economies of nations. For Vietnam, the Southeastern region is a key area for tourism development. Identifying potential risks in the sales activities of businesses operating in the tourism sector is crucial, especially in the context of rapid technological advancements and intense competitive pressures. This study employs the Analytic Hierarchy Process (AHP) method, engaging 15 experts in the tourism business sector in the Southeastern region to evaluate specific risk factors in the industry's activities. The study identifies four main risks: service quality risk, inappropriate pricing risk, digital technology risk, distribution network risk, and low employee performance risk. These risks are pairwise compared using a scale of 1–9 to assess the importance of each risk. The analysis results identify the most critical risk factors and propose mitigation solutions to enhance the effectiveness of tourism activities in the region.

*Keywords*: "Risks", "Tourism", "Southeastern Region", "Employee Performance", "Digital Technology"

## I. INTRODUCTION

The year 2023 marks an impressive recovery for Vietnam's tourism industry following the COVID-19 pandemic. Vietnam continues to assert its appeal to international visitors. According to the 2023 Statistical Yearbook, the number of foreign arrivals in Vietnam reached 12,602.4 thousand, a 3.4-fold increase compared to 2022. In 2023, Vietnam's tourism industry won 19 global awards and 54 Asia-leading categories presented by the World Travel Awards (WTA).

Contributing to Vietnam's overall socio-economic development and the growth of its tourism sector is the Southeastern region. With its strategic geographic location, developed transportation network, and diverse potential in both natural and cultural tourism resources, the Southeastern region not only attracts domestic tourists but also serves as a popular destination for international visitors. Highlighted destinations such as Ho Chi Minh City, Vung Tau, and Dong Nai have become vibrant tourism hubs, driving economic growth, creating jobs, and improving the quality of life for local communities.

**Table 1.1: Tourism Revenue in the Southeastern Region**

| Province/City | 2021 | 2022 | Revenue (Billion VND) | Change (%) |
|---|---|---|---|---|
| Binh Phuoc | 2.8 | 7.4 | 4.6 | 164.29 |
| Tay Ninh | 4.4 | 6.6 | 2.2 | 50.00 |
| Binh Duong | 35.6 | 65 | 29.4 | 82.58 |
| Dong Nai | 21.6 | 32.6 | 11 | 50.93 |
| Ba Ria – Vung Tau | 86.9 | 206 | 119.1 | 137.05 |
| Ho Chi Minh City | 3350.6 | 17735.8 | 14385.2 | 429.33 |
| **Total** | **3501.9** | **18053.4** | **14551.5** | **415.53** |

*(Source: 2023 Statistical Yearbook)*

The growth of tourism in the Southeastern region is clearly reflected through revenue, particularly travel service revenue (Table 1). The travel service revenue growth rate in the region reached 415.53%, highlighting the sector's significant role and vast potential that should continue to be prioritized for exploitation and development. Tourism has become one of the key economic drivers in the Southeastern region, home to many renowned destinations such as Ho Chi Minh City, Ba Ria-Vung Tau, Dong Nai, and Binh Duong. Annually, the region welcomes a large number of

tourists for sightseeing and experiences, contributing significantly to the region's socio-economic development.

Specifically, in 2023, the Southeastern region welcomed over 65 million visitors, accounting for 54.2% of the total national tourist arrivals and marking an 18.55% increase compared to the previous year, with an estimated total revenue of 177,657 billion VND. These figures demonstrate strong growth in tourist numbers, reflecting the recovery and development trends of the tourism sector in 2023. The development of tourism in the region acts as a catalyst for the growth of other industries such as hospitality, food and beverage services, and transportation, thereby enhancing the region's economic value chain. Despite these achievements, the Southeastern tourism sector faces numerous risks and real-world challenges. Identifying potential risks is essential for businesses in the region.

Risks are undesirable or uncertain events that can negatively impact business operations (Knight, 1921). Risk perception is often understood as the probability of adverse events multiplied by the severity of their consequences (Brun, 1994; Reichel, Fuchs, & Uriely, 2007). According to Kotler & Keller (2015), risk assessment and management are critical for businesses to maintain competitiveness while optimizing service quality.

The study of potential risks in the tourism industry, particularly in the Southeastern region, provides a foundation for local tourism businesses to develop solutions that mitigate risks, improve operational efficiency, and enhance the industry's overall performance.

## II. THEORETICAL FRAMEWORK ON SALES RISKS IN THE TOURISM INDUSTRY

Kotler & Keller (2021) define sales risk as the uncertainty and potential financial losses related to failing to meet sales targets, not meeting customer expectations, or being impacted by external market factors. Monyer et al. (2020) argue that sales risks refer to any event or situation that could disrupt business operations, affect revenue generation, or damage customer relationships. Grönroos (2019) points out that sales risks arise from factors that may negatively impact a company's sales ability, ranging from internal management issues to external factors such as market conditions or legal constraints.

Chen et al. (2020) identified specific sales risks in the tourism industry after the COVID-19 pandemic, including demand risks, financial risks, technology risks, and legal and compliance risks. Similarly, Liu et al. (2021) emphasized that the tourism industry, as a unique sector, faces risks related to products, customer experience, legal compliance, and security in its sales activities.

The development of digital technology, including artificial intelligence (AI), has significantly impacted all sectors, especially tourism. Alongside the benefits, digital technology has introduced new risks. Digital technology risks in the tourism industry refer to potential dangers arising from the use of or reliance on digital technology in tourism activities. These risks affect tourism businesses, customers, and the entire industry. For example, online booking systems, customer personal information, and electronic payments are vulnerable to cyberattacks (He & Harris, 2020). Dependence on digital systems can lead to failures when technology malfunctions, such as booking systems or flight information outages (Morakanyane et al., 2017).

The use of AI or automation technologies can reduce personalization, leading to lower customer satisfaction (Buhalis & Amaranggana, 2015). Wang et al. (2022) highlighted that system failures and online service disruptions can result in revenue losses and reputational damage. Moreover, risks related to partners and suppliers, as well as financial risks, were also noted in this study.

Tran et al. (2023) assessed the impact of market volatility on sales risks in the tourism industry. This study considered market risks, consumer behavior, financial, and investment risks. Changes in pricing, national tourism policies, the impacts of global crises, and shifts in consumer behavior were identified as key factors influencing the sales activities of tourism businesses.

Part et al. (2021) pointed out that negative emotions and poor empathy can lead to risks that harm customer experiences, reduce satisfaction, and damage a company's reputation. Similarly, Kim et al. (2023) argued that poor communication, unprofessional behavior, and unmanaged relationship-building risks create an unprofessional image, reduce customer trust, and potentially result in the loss of prospective customers.

Han et al. (2024) emphasized that employees in the tourism and hospitality sectors often interact directly with

customers and observe company operations. Recommendations or comments from employees could inadvertently reveal a company's financial performance, even if the company does not disclose such information. Furthermore, Kotler & Keller (2015) highlighted that employee performance is critical to the success of service delivery. Ineffective employees directly impact service quality and customer experience.

Wang et al. (2021) stressed the importance of management, leadership, and employee performance in the tourism sector, noting that these aspects significantly influence sales revenue. Weak leadership, lack of support and training, and ineffective management can decrease performance and cause service failures.

Thus, a variety of risks (Table 2) can arise in tourism sales activities, greatly affecting the operational results of businesses and the industry as a whole**.**

**Table 1.2: Summary of Risks in Tourism Sales Activities**

| No. | Description | Author(s) | Year |
|---|---|---|---|
| 1 | Demand Risk, Financial Risk, Technology Risk, Legal and Compliance Risk | Chen, S., & Zhang, W. | 2020 |
| 2 | Product Risk, Customer Experience Risk, Legal and Security Risk | Liu, H., & Li, J. | 2021 |
| 3 | Technology-Related Risk, Partner and Supplier Risk, Financial Risk | Wang, Y., & Li, X. | 2022 |
| 4 | Market Risk, Consumer Behavior Risk, Financial and Investment Risk | Tran, T., & Nguyen, P. | 2023 |
| 5 | Communication Risk, Customer Risk, Public Policy Risk | Kim, J., & Park, Y. | 2024 |
| 6 | Incompetent Employee Risk, Employee Attitude and Behavior Risk, Lack of Communication Risk | Smith, A., & Taylor, M. | 2020 |
| 7 | Weak Leadership Risk, Lack of Training Support Risk, Inefficient Management Risk | Wang, F., & Liu, X. (2021) | 2021 |
| 8 | Lack of Work Motivation Risk, Fatigue and Stress Risk, Job Dissatisfaction Risk | Zhang, Y., & Li, Q. (2022) | 2022 |
| 9 | Lack of Communication Skills Risk, Long-Term Relationship Building Risk | Kim, J., & Choi, H. | 2023 |

*(Source: Compiled by the Authors)*

Identifying key risk groups that may affect sales activities in the tourism sector, particularly in the Southeastern region, is a critical consideration. Achieving this objective can provide tourism businesses in the region with a foundation to prioritize risk prevention and mitigation efforts, thereby enhancing their operational efficiency.

## III. RESEARCH METHODOLOGY

This study employs the Analytic Hierarchy Process (AHP) method to evaluate the impact of various risk factors and propose preventive measures for the most critical risks to enhance sales performance in tourism. The AHP method is a practical, scientific decision-making approach based on rigorous mathematical calculations and consistency in human evaluations when addressing complex qualitative issues. The foundational principles of AHP include decomposition, comparative evaluation, and priority synthesis.

For this study, 15 experts involved in the tourism sector in the Southeastern region were invited to participate. These experts discussed potential risks affecting the tourism industry in the region. Based on the risks listed in Table 2 and the actual situation of the tourism sector in the Southeastern region, the experts engaged in discussions, grouped risks, and selected those most likely to impact tourism sales activities in the area.

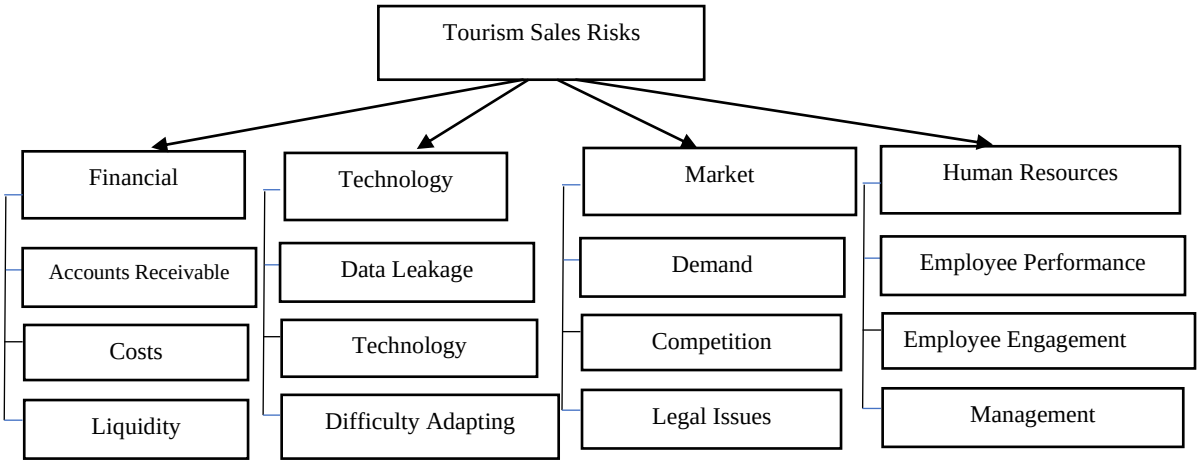
The AHP process was conducted with 12 risk factors categorized into 4 groups. Experts first performed pairwise comparisons of the three risk factors within a group and then evaluated the relative importance among the risk groups. A pairwise scale ranging from 1 to 9 was used to compare the importance of sales risk factors at each level. A pairwise comparison matrix was established to normalize and calculate weights.

Additionally, the consistency of the data was checked to ensure that the results were reliable and feasible using formulas (1) and (2)**:**

$$CI = \frac{\lambda max - n}{n-1} \quad (1)$$

$$CR = \frac{CI}{RI} = \quad (2)$$

In this study: CI is the Consistency Index, CR is the Consistency Ratio, RI is the predefined Random Index, and λmax is the largest eigenvalue. The four key groups of sales risks identified and evaluated are illustrated in Figure 1. Financial Risks (F) include: Accounts receivable (F1), Costs (F2), Liquidity (F3). Technology Risks (T) include: Data leakage (T1), Technology dependence (T2), Difficulty adapting (T3). Market Risks (M) include: Demand (M1), Competition (M2), Legal issues (M3). Human Resource Risks (H) include: Employee performance (H1), Employee engagement (H2), and Management (H3).




*(Source: Compiled by the Authors)*

**Figure 1.1: Risks in the Tourism Sector of the Southeastern Region**

## IV. RESEARCH RESULTS

According to the methodology presented above, each risk factor within the groups was compared and scored. The financial risk factors (F) include three sub-risks: F1, F2, and F3. These factors were analyzed through specific steps. The weights and rankings of these risks are shown in the table below:

**Table 4.1: Weights and Rankings of Financial Risk Factors**

| Risk Factor | Weight | Weight (%) | Ranking |
|---|---|---|---|
| Accounts Receivable (F1) | 0.5455 | 54.55 | 1 |
| Costs (F2) | 0.2941 | 29.41 | 2 |
| Liquidity (F3) | 0.1604 | 16.04 | 3 |

*(Source: Compiled by the Authors)*

The results indicate that accounts receivable risk holds the highest weight (54.55%) among financial risks in tourism sales activities in the Southeastern region. This is followed by cost-related risks (29.41%) and, lastly, liquidity risks (16.04%). For the financial risk group, the consistency indicators met the required thresholds (λmax: 3.013249; CI: 0.006625; CR: 0.011422).

**Table 4.2: Weights and Rankings of Technology Risk Factors**

| Risk Factor | Weight | Weight (%) | Ranking |
|---|---|---|---|
| Data Leakage (T1) | 0.6333 | 63.33 | 1 |
| Technology Dependence (T2) | 0.2605 | 26.05 | 2 |
| Difficulty Adapting (T3) | 0.1062 | 10.62 | 3 |

*(Source: Compiled by the Authors)*

Regarding technology risks, data leakage risk has the highest weight (63.33%), followed by technology dependence risk (26.05%). Difficulty adapting to technology changes is ranked third with a weight of 10.62%. Consistency indicators for this group also met requirements (λmax: 3.038700; CI: 0.019350; CR: 0.033360).

**Table 4.3: Weights and Rankings of Market Risk Factors**

| Risk Factor | Weight | Weight (%) | Ranking |
|---|---|---|---|
| Demand (M1) | 0.6479 | 64.79 | 1 |
| Competition (M2) | 0.1222 | 12.22 | 3 |
| Legal Issues (M3) | 0.2299 | 22.99 | 2 |

*(Source: Compiled by the Authors)*

For market risks, demand risk has the highest weight (64.79%), followed by legal risks (22.99%) due to the international nature of the tourism industry. Competition risk ranks third (12.22%).

**Table 4.4: Weights and Rankings of Human Resource Risk Factors**

| Risk Factor | Weight | Weight (%) | Ranking |
|---|---|---|---|
| Employee Performance (H1) | 0.3091 | 30.91 | 2 |
| Employee Engagement (H2) | 0.5813 | 58.13 | 1 |
| Management (H3) | 0.1097 | 10.97 | 3 |

*(Source: Compiled by the Authors)*

Within human resource risks, employee engagement risk is the most significant factor (58.13%), followed by employee performance risk (30.91%). Management risk ranks third (10.97%).

Thus, at this stage, the study has identified the impact level of each factor within each group of risks in the tourism sales activities in the Southeastern region of Vietnam. The ranking of individual factors within these groups has also been conducted. These results are significant as they provide tourism business managers with a solid basis for implementing appropriate risk prevention measures.

The study continued by evaluating the four risk groups: financial, technology, market, and human resources. At this stage, the research aims to determine the importance level of the four proposed risk groups. The higher the weight of a risk group, the more significant it is and the greater the attention it requires. A pairwise comparison matrix was constructed and normalized to calculate the weights of the risk factors, ranking the risks identified in the study.

**Table 4.5: Weights and Rankings of Sales Risk Factors in the Southeastern Tourism Sector**

| Risk Factor | Weight | Weight (%) | Ranking |
|---|---|---|---|
| Financial | 0.587625 | 58.76 | 1 |
| Technology | 0.233650 | 23.37 | 2 |
| Market | 0.138925 | 13.89 | 3 |
| Human Resources | 0.062800 | 6.28 | 4 |

*(Source: Compiled by the Authors)*

The weight results indicate that financial risks are the most critical (weight: 0.587625), followed by technology risks (weight: 0.233650). Market risks rank third (weight: 0.138925), and human resource risks are the least significant (weight: 0.062800).

The study also calculated the largest eigenvalue by multiplying the weights with their respective column totals in the original matrix and dividing the result by the weights. Saaty (1980) explained that the largest eigenvalue (λmax) evaluates consistency in the matrix. If λmax = n, the matrix is fully consistent, meaning there are no inconsistencies in the pairwise comparisons. The results showed λmax = 4.0681, which is acceptable. The study's Consistency Index (CI) and Consistency Ratio (CR) values are as follows:

$$CI = \frac{\boldsymbol{\lambda max - n}}{\boldsymbol{n-1}} = \frac{4.0681 - 4}{3} = 0.0227$$

$$CR = \frac{CI}{RI} = \frac{0.0227}{0.90} = 0.0252$$

The Consistency Ratio (CR) is calculated using Saaty's formula (1980), where RI represents the random index. In this study, n = 4, so according to Saaty's random index values (1980), RI = 0.90. The result CR=0.0252 < 0.1 ensures that the matrix has high reliability, meeting the standards of the AHP method.

## 5. Discussion of Research Findings and Proposed Solutions

This study utilized the Analytic Hierarchy Process (AHP) to identify the weights of key risk factors in the sales activities of the tourism industry in Southeastern Vietnam. The results highlight that financial risk carries the highest weight (0.587625), making it the most critical risk encountered by businesses, including those in the tourism sector. Within this category, accounts receivable stands out as a significant factor (0.5455). Tourism enterprises should pay close attention to customers' payment capacity during service delivery. Additionally, cost control is essential to prevent financial risks, and ensuring liquidity for businesses is strongly recommended by experts to support sustainable sales processes. Most tourism businesses in the Southeastern region of Vietnam are small and medium-sized enterprises. Effective financial management during the sales process remains challenging. Therefore, to mitigate risks related to this factor, businesses need to establish clear procedures for control and transaction handling, as well as regularly update changes in financial operations. Training sessions and short courses for staff in charge of managing sales revenue and expenditures, as well as preparing reports, are essential activities that require attention.

Technology risk, with a relatively high weight (0.233650), emerges due to the rapid pace of global technological development and digitalization. For this risk, tourism businesses in the region should develop a roadmap for integrating technology into sales operations that aligns with their organizational capabilities. Data leakage (0.6333) is identified as the most critical factor within this category. Strengthening data security, particularly for customer-related and operational data, should be prioritized. To enhance the adaptability of tourism businesses in the Southeastern region of Vietnam, the adoption of digital technology is essential. Businesses can implement gradual steps to increase their adaptability. The application of artificial intelligence and new software solutions can help optimize sales efficiency. Additionally, data backup is crucial to ensure the security and safety of the business. The study also underscores the importance of market risks (0.138925) in tourism sales activities in the region. Rapidly changing customer demands and the unique characteristics of the industry, such as its reliance on international customers, highlight the need for businesses to understand relevant legal issues to avoid potential legal risks. Market research, particularly regarding the needs of domestic and international tourists, provides tourism businesses in the region with valuable insights. This enables businesses to better meet customer demands.The growing competition, driven by an increasing number of tourism enterprises and more discerning customers, adds further pressure.

Human resource risks are another critical area in tourism sales, although they carry a lower weight (0.062800). These risks stem from factors such as employee performance, workforce engagement, and management efficiency. However, these risks are often interconnected with other categories identified in the study. Therefore, addressing human resource challenges can improve sales effectiveness or, conversely, hinder business development. Appropriate salary, bonus, and commission policies will help motivate the sales team and improve employee performance. Additionally, as tourism is a unique industry, developing employees' emotional intelligence enables them to build stronger relationships with customers and enhance their work efficiency. Tourism businesses should establish a cohesive corporate culture that focuses on caring for and encouraging employees, thereby increasing their engagement and loyalty to the company. Enhancing workforce quality, implementing appropriate policies, and increasing employee engagement, productivity, and management efficiency are essential for boosting the effectiveness of tourism enterprises.

Identifying these risks helps tourism businesses in the region prevent and mitigate their occurrence during the sales process, ensuring stable and sustainable development.

## 6. Conclusion

The research findings highlight the key risk factors affecting the sales activities of the tourism industry in Southeastern Vietnam. Additionally, several solutions have been proposed to mitigate risks and enhance the efficiency of the tourism sector in the region. This holds great significance for tourism businesses in the region, as sales activities are the lifeblood of these enterprises. Identifying and preventing potential risks enables businesses to be more proactive

in management and to develop strategies that align with their specific business circumstances. Future research directions include expanding the study to other regions and industries, involving a more diverse group of experts to ensure greater objectivity in the results.

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# ENHANCING SUSTAINABILITY IN THE DIGITAL ERA: INNOVATION, DIGITAL TRANSFORMATION, AND COLLABORATIVE STRATEGIES

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**ABSTRACT**

This study examines how innovation, digital transformation, and collaborative strategies synergize to enhance sustainability performance. Through a systematic literature review, it explores the impacts of green innovation, advanced digital technologies, and cross-sector collaboration on environmental, social, and economic outcomes. Findings demonstrate that green innovation drives eco-friendly practices, digital tools optimize resource efficiency, and partnerships enable collective problem-solving. The research provides actionable insights for managers, policymakers, and researchers, offering a roadmap to integrate these elements into sustainability strategies and align with global Sustainable Development Goals (SDGs).

*Keywords*: "Collaboration", "Digitalization", "Innovation", "Organizational Innovation", "Sustainability Performance"

## I. INTRODUCTION

Sustainability has emerged as a cornerstone of modern organizational strategies, driven by global challenges such as climate change, resource depletion, and social inequality. These challenges have underscored the importance of aligning business practices with the United Nations' Sustainable Development Goals (SDGs). While sustainability research often emphasizes individual elements such as innovation or digital transformation, the potential of these elements to interact synergistically with collaborative strategies remains underexplored, particularly in the context of emerging markets or small enterprises (Lee & Raschke, 2020). Addressing this gap is crucial as organizations strive to transition from profit-focused models to frameworks prioritizing sustainable development.

Innovation is pivotal in fostering eco-friendly products and processes that minimize environmental harm while enhancing competitiveness. Digital transformation further amplifies this potential by leveraging artificial intelligence and blockchain technologies to optimize resource use, enhance supply chain transparency, and reduce operational costs (Gariba, Mensah, & Osei, 2024; Setiadi, 2024). Collaboration bridges these efforts, enabling knowledge-sharing and resource pooling to tackle complex sustainability challenges. However, cultural differences, regulatory challenges, and varying levels of technological access often hinder the realization of global collaboration's full potential (Umar et al., 2021).

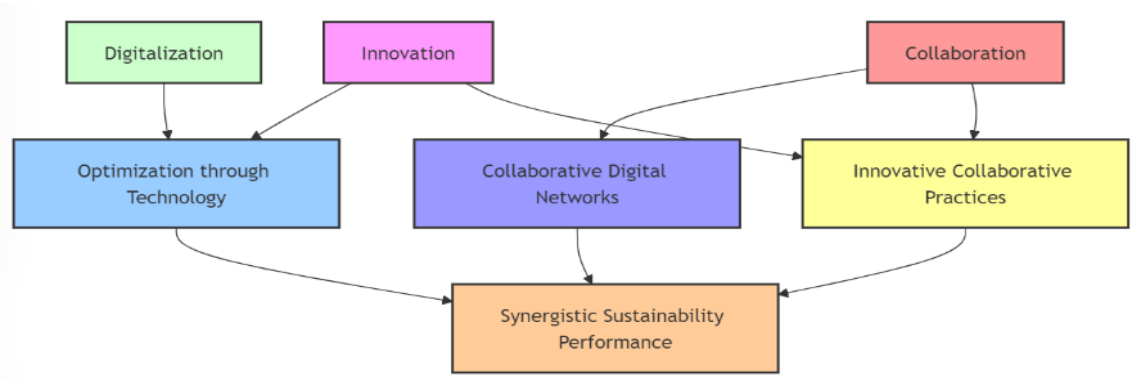



**Fig 1. Interconnection of Innovation, Digitalization, and Collaboration**

This paper investigates the interconnected roles of innovation, digital transformation, and collaboration in driving sustainability performance. By examining the synergistic impact of these elements, the study provides actionable insights for managers, policymakers, and researchers to embed sustainability into organizational strategies. Such an

integrated approach can address pressing environmental, social, and economic challenges while aligning with the global sustainability agenda. Through a comprehensive review of recent research, this study highlights transformative practices and strategic frameworks essential for organizations navigating the digital era.

This diagram illustrates the overlapping roles of innovation, digital transformation, and collaboration in achieving synergistic sustainability performance. It emphasizes their interconnected impact on technology optimization, network collaboration, and innovative practices.

## II. LITERATURE REVIEW

The integration of innovation, digital transformation, and collaboration is crucial for advancing sustainability performance. Existing literature highlights the individual roles of green innovation, advanced digital technologies, and collaborative strategies in addressing environmental, social, and economic challenges. However, there is a need for a more holistic understanding of how these elements interact synergistically. This section reviews key findings from recent studies, focusing on their contributions to sustainable practices and identifying gaps for future exploration.

### Innovation and Sustainability

Innovation is pivotal for advancing sustainable practices. Green innovation focuses on developing eco-friendly products, processes, and technologies, promoting resource efficiency and reducing environmental impact while enhancing competitiveness. Emerging concepts like regenerative innovation emphasize ecosystem and natural resource restoration (Sioen et al., 2024). Renewable energy technologies exemplify innovation's transformative potential in combating climate change. For instance, solar and wind power reduce carbon emissions, foster energy independence, and create new markets (Dhyanasaridewi et al., 2024). Social innovation integrates social goals with entrepreneurial practices, addressing systemic issues like poverty and healthcare access (Oliveira, 2024). Green innovation's application in renewable energy adoption significantly reduces carbon footprints while lowering energy costs (Ramaswami, Tong, & Fang, 2021). In the automotive industry, Tesla's integration of AI-driven battery systems has resulted in a 20% reduction in energy consumption across its production lines, supporting both environmental and economic sustainability goals (Li et al., 2023).

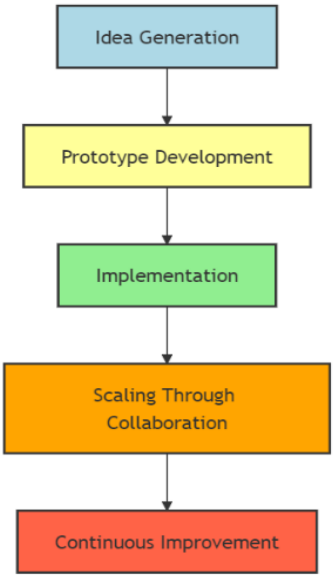



**Fig 2. Lifecycle of Green Innovation**

This diagram depicts the lifecycle of green innovation, starting from idea generation and progressing through prototyping, implementation, scaling via collaboration, and continuous improvement. Circular economy principles—like remanufacturing and recycling in the automotive industry—enable resource reutilization, minimizing environmental degradation and contributing to sustainability (Patel & Singh, 2022). For example, in the automotive industry, the transition to electric vehicles (EVs) has been propelled by both innovation and digitalization, leveraging AI-driven battery management systems and IoT connectivity for optimizing energy use and vehicle performance. Tesla's advanced integration of these technologies has not only led to significant environmental benefits but also

created a competitive edge in an increasingly green-conscious market (Li et al., 2023). In the agriculture sector, IoT-based smart irrigation systems have enabled farmers to reduce water usage by up to 30%, while simultaneously cutting energy consumption (García et al., 2020).

**Digitalization and Sustainability**

Digitalization transforms organizations' approaches to sustainability challenges. Technologies such as blockchain and artificial intelligence (AI) are crucial in enhancing sustainability by enabling real-time monitoring and verification of sustainable practices. For example, blockchain has been applied in the supply chain management of agricultural products, ensuring that consumers can track the origin of their food, thus supporting ethical sourcing and reducing food waste (Köhler & Zhang, 2020). In the energy sector, AI is being used to predict and optimize energy usage in real-time, reducing carbon footprints and operational costs in smart cities (Hosseini Moghaddam et al., 2021). Technologies such as blockchain and artificial intelligence (AI) are crucial in enhancing sustainability by enabling real-time monitoring and verification of sustainable practices. For example, blockchain has been applied in the supply chain management of agricultural products, ensuring that consumers can track the origin of their food, thus supporting ethical sourcing and reducing food waste (Cai et al., 2020). In the energy sector, AI is being used to predict and optimize energy usage in real-time, reducing carbon footprints and operational costs in smart cities (Zhang & Liu, 2021). Digital tools such as data analytics, blockchain, and artificial intelligence provide insights into environmental and social footprints, optimize resource use, and foster supply chain transparency.

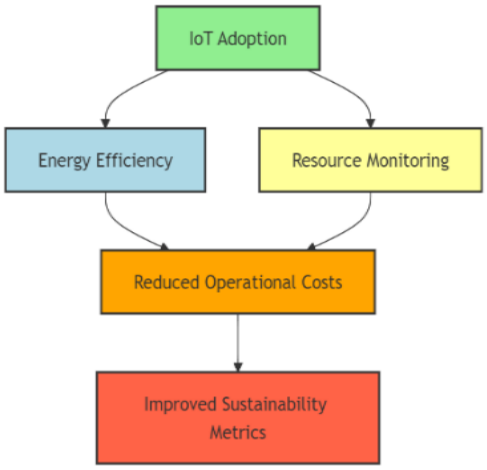



**Fig 3. Technology Adoption for Sustainability**

This flowchart shows how technologies like IoT contribute to sustainability by enabling energy efficiency, resource monitoring, and reducing operational costs, leading to enhanced sustainability metrics.

**Table 1: Industry-Specific Applications of Digital Tools for Sustainability**

| Industry | Digital Tools Used | Sustainability Outcomes | Key Examples |
|---|---|---|---|
| Automative | Blockchain, IoT | Reduced waste, increased recycling | Circular economy in manufacturing |
| Agriculture | AI, IoT | Optimized resource use | Smart irrigation systems |
| Retail | Blockchain, AI | Supply chain transparency | Ethical sourcing initiatives |
| Healthcare | AI-based diagnostic tools, IoT-enabled devices, blockchain | Reduced resource wastage, improved patient care, and ethical data management | AI-based diagnostic systems streamline patient triage, reducing unnecessary tests (e.g., Babylon Health); IoT devices monitor real-time health metrics, optimizing resource use in hospitals; blockchain ensures ethical management of clinical trial data. |
| Waste Management | IoT-enabled tracking systems, | Enhanced recycling rates, optimized waste collection, | IoT systems like smart bins provide real-time waste tracking for efficient collection (e.g., BigBelly |

| | | | |
|---|---|---|---|
| | AI-powered sorting, blockchain | and transparency in waste disposal | bins); AI-powered recycling plants improve material recovery rates; blockchain tracks hazardous waste disposal to ensure compliance with environmental standards. |

As shown in Table 1, digital tools are applied across diverse industries to achieve tailored sustainability outcomes, such as supply chain transparency in retail or resource optimization in agriculture.

Public sector digitalization in regions like the EU promotes sustainable development significantly (Gariba et al., 2024). IoT devices and smart grids optimize energy distribution and support renewable energy adoption (Setiadi, 2024). Blockchain ensures supply chain traceability, empowering consumers to verify ethical sourcing claims and align preferences with sustainability efforts. Tailored applications across industries further underscore digitalization's versatility.

**Collaboration and Sustainability**

Collaboration among businesses, governments, and communities is critical for addressing multifaceted sustainability issues. Public-private partnerships deploy renewable energy technologies and advance sustainable urban planning (Dhyanasaridewi et al., 2024). Collaborative networks enhance knowledge-sharing and co-creation, enabling innovative solutions to shared challenges. For instance, the National Industrial Symbiosis Program (NISP) in the UK demonstrates significant resource-sharing benefits (Chertow, 2020). Partnerships with NGOs ensure inclusivity and address local needs effectively (Garza-Reyes et al., 2019).

The literature underscores the transformative potential of innovation, digital tools, and collaboration in achieving sustainability goals. While green innovation reduces environmental footprints and digital transformation enhances efficiency, collaboration fosters collective problem-solving. Despite significant progress, research gaps remain in understanding their combined impact, particularly across diverse industries and regions. These insights lay the groundwork for advancing integrated strategies in sustainability research and practice.

## III. METHODOLOGY

This study employs a systematic literature review, combining qualitative and quantitative approaches to ensure a comprehensive understanding of the interrelated roles of innovation, digitalization, and collaboration in sustainability performance.

**Data Collection**

The research process began with the selection of reputable databases such as Scopus, Web of Science, and ScienceDirect to access high-quality, peer-reviewed studies. The study focuses on peer-reviewed articles from high-impact journals in sustainability, and only those studies published in the last decade were included to ensure relevancy. Keywords including "sustainability performance," "green innovation," "digital transformation," and "collaborative strategies" guided the search. Only articles published within the last decade were considered to ensure the relevance of the findings. This method ensures a robust base for understanding recent trends and practical applications of sustainability practices (Yadav & Yadav, 2024). While the methodology provides valuable insights through a systematic literature review, it is limited in its ability to capture real-world complexities. Future research should incorporate empirical studies, such as field experiments or stakeholder interviews, to validate the proposed framework and address potential gaps in its applicability across diverse contexts.

**Inclusion and Exclusion Criteria**

Inclusion criteria were defined to select studies providing empirical or theoretical insights into the interplay between innovation, digitalization, and collaboration. Studies focusing solely on isolated aspects without demonstrating interconnected impacts were excluded. This ensured a holistic analysis of the themes. Articles were also cross-referenced with industry reports to validate their applicability in real-world scenarios (Setiadi, 2024).

**Thematic Analysis**

Thematic analysis was employed to identify patterns and relationships across the selected studies. This involved coding qualitative data into recurring themes such as "technology-enabled sustainability" and "cross-sector

partnerships." Quantitative metrics, such as reductions in carbon emissions or cost savings, were extracted to substantiate findings. Such themes were critically evaluated to ensure their alignment with the overarching research questions (Gariba et al., 2024).

**Table 2: Metrics for Evaluating Sustainability Performance**

| Metric | Measurement Tool | Applicability | Example |
|---|---|---|---|
| Carbon Footprint | Lifecycle Assessment (LCA) | Emission-intensive industries | Automotive sector |
| Resource Efficiency | IoT-enabled Monitoring | All industries | Manufacturing |
| Social Equity Impact | Community Surveys | Community-driven projects | Renewable microgrids |

Table 2 outlines the key metrics used to evaluate sustainability performance, showcasing their relevance and measurement approaches across industries

**Cross-validation and Quality Assurance**

To mitigate bias and enhance reliability, cross-validation was conducted by independent reviewers. This study's reliance on a systematic literature review, while providing comprehensive insights, limits its ability to capture real-time challenges and outcomes. Future empirical studies, such as longitudinal case studies or multi-regional surveys, are necessary to validate and refine the proposed framework. Discrepancies in thematic categorization were resolved through consensus. Triangulation with secondary data sources, including industry reports and case studies, further validated the findings. This multi-layered approach ensures the reliability and depth of insights (Kurniadi et al., 2024).

**Synthesis and Interpretation**

The insights from the thematic analysis were synthesized to map out interdependencies among innovation, digitalization, and collaboration. This synthesis provided a robust foundation for formulating actionable recommendations for managers, policymakers, and researchers. Patterns were linked to specific industries to highlight variations and adaptability of sustainability strategies (Gariba et al., 2024).

## IV. FINDINGS AND DISCUSSIONS

Innovation, digitalization, and collaboration dynamically interact to amplify sustainability performance.

**Table 3: Comparative Analysis of Sustainability Strategies**

| Strategy | Benefits | Challenges | Examples |
|---|---|---|---|
| Green Innovation | Reduces emissions, saves costs | High R&D costs | Solar and wind energy adoption |
| Digitalization | Enhances efficiency, traceability | Initial implementation costs | Blockchain for supply chain tracking |
| Collaboration | Resource sharing, knowledge pool | Coordination among stakeholders | Public-private partnerships (PPP) |
| Green Innovation | Reduces environmental footprint. Promotes resource efficiency and cost savings. | High research and development (R&D) costs. Regulatory hurdles and market acceptance. | Tesla’s AI-driven battery systems reducing energy consumption. Solar and wind energy adoption reducing carbon emissions. |
| Digitalization | Enhances operational efficiency and supply chain transparency. Enables real-time monitoring and predictive analytics. | High initial implementation costs. Data privacy and cybersecurity concerns. | Walmart’s blockchain for food traceability. IBM Watson Health for optimizing patient care. |
| Collaboration | Facilitates knowledge-sharing and resource pooling. Amplifies collective problem-solving capabilities. | Coordination challenges among diverse stakeholders. Trust and cultural barriers in cross-sector partnerships. | Ellen MacArthur Foundation's circular economy initiatives. Public-private partnerships in renewable energy projects. |

Table 3 provides a comparative overview of the three primary sustainability strategies, highlighting their unique

benefits, challenges, and applications in real-world contexts. Innovation creates eco-friendly solutions aligning with environmental goals. Digitalization optimizes these efforts with tools enabling resource tracking and supply chain transparency. Collaboration magnifies these impacts through shared knowledge and resources.

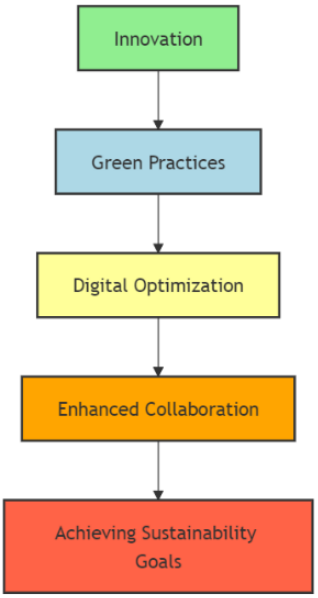



**Fig 4. Framework for Sustainability Performance**

This flowchart outlines the sequential framework for achieving sustainability goals. Starting with innovation, it proceeds through green practices, digital optimization, and enhanced collaboration, culminating in sustainable outcomes.

**The Role of Innovation**

Innovation emerges as a critical enabler of sustainability, allowing organizations to develop new products, processes, and technologies that reduce environmental impact. For example, renewable energy solutions like solar and wind power not only minimize carbon emissions but also enhance energy independence (Dhyanasaridewi et al., 2024). Additionally, the adoption of green innovation in industrial processes has been shown to improve cost efficiency while addressing regulatory compliance (Sioen et al., 2024). Additional case studies provide further context for the framework's application. For example, Unilever's use of blockchain for ensuring sustainable palm oil sourcing demonstrates digital transformation's potential for supply chain transparency. Similarly, India's Smart Cities Mission leverages IoT technologies to optimize energy consumption and waste management, showcasing innovation and collaboration at the national scale. In addition to Unilever's blockchain integration, another example is Walmart's use of blockchain to enhance food traceability, which reduces food waste and improves consumer trust (Kouhizadeh, Saberi, & Sarkis, 2021). Likewise, in the healthcare sector, IBM's Watson Health utilizes AI to optimize patient care and resource allocation, showcasing the transformative potential of digital tools in both developed and developing regions (Chen & Decary, 2020).

**Digitalization's Transformative Potential**

Digitalization amplifies the effectiveness of innovative practices by providing data-driven tools for optimization. Advanced analytics facilitate real-time monitoring of energy consumption and waste reduction. Blockchain technology enhances supply chain transparency, building consumer trust in sustainability claims (Gariba et al., 2024). Moreover, IoT devices integrated into industrial systems enable predictive maintenance, reducing operational downtime and conserving resources (Setiadi, 2024).

**Collaboration as a Catalyst**

Collaboration bridges the gap between innovation and digitalization, fostering collective efforts to address systemic sustainability challenges. Cultural differences, regulatory challenges, and varying technological access often prevent global collaborations from realizing their full potential in addressing sustainability issues. Collaboration bridges the gap

between innovation and digitalization, fostering collective efforts to address systemic sustainability challenges. However, the effectiveness of such collaboration is often hindered by cultural differences, lack of trust, and unequal access to technology across sectors. For instance, small and medium-sized enterprises (SMEs) in developing countries face challenges in participating in global sustainability networks due to limited digital infrastructure and knowledge gaps. Overcoming these barriers requires a strategic approach to building inclusive platforms where knowledge sharing can occur equitably across all stakeholders. Public-private partnerships have proven instrumental in deploying large-scale renewable energy projects and urban planning initiatives (Dhyanasaridewi et al., 2024). Collaborative platforms enable cross-sector knowledge-sharing, which accelerates the adoption of best practices and innovative solutions. Collaborative platforms like the Ellen MacArthur Foundation have successfully demonstrated the potential of cross-sector partnerships in promoting circular economy principles. For example, the foundation's collaboration with leading corporations like Danone and Google has accelerated the development of sustainable packaging solutions and AI-driven resource monitoring systems. Such initiatives underscore the importance of structured frameworks to facilitate knowledge-sharing and resource pooling.

**Regional and Industry-Specific Insights**

Variations in regional and industry contexts influence the implementation of sustainability strategies. Regional contexts play a pivotal role in shaping sustainability strategies. The scalability of the proposed sustainability framework holds significant potential for small and medium-sized enterprises (SMEs) in developing economies. SMEs often face unique challenges such as limited access to funding, insufficient technological infrastructure, and lack of skilled personnel. Adapting the framework for these contexts requires emphasizing affordable, low-barrier solutions such as IoT-enabled tools for resource optimization and blockchain for supply chain transparency. Additionally, regional collaboration through public-private partnerships can bridge resource gaps, offering SMEs access to shared technological infrastructure and knowledge networks. Training programs tailored to local needs, combined with government subsidies or micro-financing initiatives, can further facilitate the adoption of sustainability practices. This adaptive approach ensures that the framework aligns with the financial and operational realities of SMEs, enabling them to contribute meaningfully to sustainability goals while maintaining economic viability.

For instance, in Asian markets, the collectivist cultural norms often drive community-based initiatives such as cooperative renewable energy projects, whereas Western economies, with their focus on individualism, prioritize cutting-edge innovation and private-sector-led sustainability efforts. Similarly, economic development levels influence the adoption of digital tools, with advanced economies leveraging AI and blockchain at scale while emerging markets focus on accessible, cost-effective technologies like IoT for resource optimization. Furthermore, regional disparities in technological infrastructure significantly influence the adoption of digital tools. Developed economies, with their advanced internet penetration and AI capabilities, readily integrate blockchain and IoT solutions into sustainability initiatives. In contrast, emerging economies often face challenges such as lack of digital literacy, limited internet access, and insufficient funding. Addressing these barriers requires region-specific strategies, such as government-subsidized IoT adoption and localized training programs to enhance technical skills. Developed economies often leverage advanced digital tools and innovation, while emerging markets focus on resource-sharing and community-based initiatives. For instance, the automotive industry's adoption of circular economy principles, such as recycling and remanufacturing, showcases how industry-specific applications can drive both economic and environmental benefits (Patel & Singh, 2022).

**Leadership and Organizational Culture**

Leadership commitment and a strong organizational culture of corporate social responsibility (CSR) amplify the synergies among innovation, digitalization, and collaboration. Organizations with proactive CSR initiatives are more likely to embed sustainability into their strategic frameworks, ensuring long-term success (Kurniadi et al., 2024).

In summary, the findings affirm that sustainability performance is maximized when innovation, digitalization, and collaboration are leveraged in a synergistic manner. The interplay among these elements creates transformative solutions that address environmental, social, and economic challenges effectively.

## V. CONCLUSION AND RECOMMENDATIONS

Achieving sustainability goals necessitates integrating innovation, digital transformation, and collaboration into organizational strategies. Findings reveal that green innovation fosters environmentally friendly practices, digital tools enhance operational efficiency and transparency, and partnerships amplify collective impact. These elements, when leveraged synergistically, provide a comprehensive framework for addressing global sustainability challenges while aligning with the SDGs.

For Organizations: Organizations must prioritize fostering a culture of sustainability and innovation. This involves encouraging creative problem-solving, investing in research and development for eco-friendly technologies, and aligning strategic objectives with environmental and social goals. Leveraging digital tools like blockchain for supply chain transparency and IoT for operational efficiency can enhance resource optimization. Collaborations across sectors can further amplify sustainability efforts by pooling expertise and resources to address systemic challenges effectively.

For Policymakers: Policymakers can foster cross-sector collaboration by implementing regulatory frameworks that promote data sharing and transparency across industries. The European Union's Green Deal exemplifies this approach, offering financial incentives and subsidies to businesses adopting renewable energy technologies, thereby aligning public and private sectors in advancing sustainability objectives (European Commission, 2020). Establishing funding mechanisms for small and medium enterprises (SMEs) to adopt sustainable practices and supporting public-private partnerships can accelerate the transition toward sustainability. Additionally, fostering partnerships with NGOs and local communities through tailored policies can ensure inclusivity and greater social impact in sustainability initiatives. Policymakers should also invest in education and capacity-building programs to improve digital literacy and technical skills in underserved communities. Establishing innovation hubs in developing regions can further bridge the gap between resource availability and sustainability outcomes.

For Researchers: Researchers should delve deeper into exploring the synergies between emerging technologies and sustainability, assessing long-term impacts and industry-specific applications. Future research can focus on developing metrics to measure the effectiveness of collaborative initiatives and the scalability of pilot projects. Future research could also explore the interplay between sustainability strategies and cultural dimensions, such as how collectivist versus individualist societies influence collaboration models. Additionally, investigating the role of public-private partnerships in scaling green technologies in underserved regions could provide actionable insights for policymakers. Exploration of underrepresented industries, such as waste management or healthcare in developing economies, could offer valuable insights. These sectors often face unique challenges that test the scalability and adaptability of sustainability strategies. Additionally, longitudinal studies examining the integration of digital tools and collaboration in these contexts would strengthen the evidence base for the proposed framework. Longitudinal studies examining the interplay between innovation, digitalization, and collaboration can provide robust evidence to guide policy and organizational decisions.

Broader Implications: The findings underline the global implications of aligning sustainability efforts with innovation and digital transformation. Developed economies should focus on scaling technological solutions, while emerging markets can emphasize resource-sharing and inclusive collaboration models to address local challenges. By adopting holistic and adaptive approaches, organizations can not only address immediate challenges but also contribute to a resilient and sustainable future for all stakeholders.

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# DIGITAL TRANSFORMATION IN VIETNAMESE SMALL AND MEDIUM ENTERPRISES: PERCEPTION FROM THE TOP MANAGEMENT

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**ABSTRACT**

This research explores how the top management of Vietnamese small and medium enterprises perceives the effectiveness of digital transformation in their businesses. The qualitative method was employed in this study, and 17 senior managers participated in the in-depth interviews. The results provide insights for organizations adjusting to the emerging perception of digital transformation in Vietnam. Ongoing transformation is essential as firms adapt to market dynamics. The findings suggest that cultivating a culture of innovative and flexible leadership is critical to ensure sustainable digital advancement and a competitive edge. In addition, the involvement of top management strengthens the resource-based perspective by illustrating leadership's contribution to successful digital transformation. This study substantially contributes to leadership, business strategy, and organizational development by pinpointing potential opportunities and challenges in implementing digital transformation in Vietnam.

*Keywords: "*digital transformation", "innovation", "organizational performance", "SME"

## I. INTRODUCTION

### 1.1. Background of the study

Digital transformation is a global trend that redefines society and business, compelling organizations to adapt to compete in the digital era. Digitalization has positively impacted businesses during the pandemic, with expectations for its ongoing significance in facilitating recovery after COVID-19 (Le, 2023). The fourth industrial revolution, or Industry 4.0 (I4.0), presents opportunities and challenges for developing economies regarding global value chains and industrial advancement (Lee, 2020). Global investment in digital transformation is projected to reach $3.9 trillion by 2027 (Statista, 2024).

Small and medium enterprises (SMEs) represent over 90% of businesses, mainly micro firms with under 10 employees. In comparison, own-account workers and micro- and small-sized enterprises account for 70% of global employment (International Labor Organization, 2019). Digital infrastructure significantly impacts SMEs' sustained financial growth and resilience. A recent survey by the General Statistical Office (2023) indicates that SMEs in Vietnam comprise over 97% of businesses, employing around 36% of the workforce and generating approximately 26% of the sector's net income (General Statistics Office of Vietnam, 2023). According to the Ministry of Information and Communications (MIC), Vietnam had over 64,000 digital technology firms employing over a million individuals by 2021 (VietnamPlus, 2022). The COVID-19 pandemic expedited the transition to a contactless economy, promoting digital transformation and expanding the digital business environment. Following a successful 2021 initiative that supported 16,000 firms in digital transformation, MIC extended the program in 2022 to assist 30,000 businesses (Tuoi Tre Online, 2022).

While a global shift towards digital transformation is recognized, the advancement of digital transformation in Vietnam remains inadequate. A survey by the Vietnam Chamber of Commerce and Industry of more than 400 businesses revealed that 51% of enterprises engaged in digitalization pre-COVID-19, with 25.7% initiating it as a pandemic response, and 17.5% showed interest without implementing technology (VietnamPlus, 2021). Up to 70% of Vietnamese SMEs are outside the digital economy, and only 20% are learning about it (VietNamNet News, 2022). The 2021 Enterprise Digital Transformation Annual Report identifies leadership's lack of confidence and knowledge as a significant barrier, representing 32.1% of transformation challenges. The 2022 US Agency for International Development and the Ministry of Planning and Investment report indicated that almost 50% of businesses that began digital transformation subsequently ceased their initiatives. However, understanding the challenges of digital

transformation in Vietnam is very limited. In particular, almost no study systematically discovered the hidden reasons from the SMEs' perspective. Therefore, we conduct this research to examine the perceptions of Vietnamese SMEs' top management of digital transformation and its impact on the Vietnamese business.

### 1.2. Research questions and objectives

To fill this gap, the research aims to discover how the top management in Vietnamese SMEs perceive and experience digital transformation processes. There are three objectives of the research:

– RO1: To explore top management's perception of digital transformation in Vietnamese SMEs

– RO2: To identify the relationship between management perspectives and the implementation of digital transformation in their businesses

– RO3: To offer suggestions for aligning digital transformation initiatives with organizational objectives.

– To accomplish the objectives mentioned above, the following questions will be addressed in our study:

– RQ1: How does the top management in Vietnamese SMEs perceive digital transformation?

– RQ2: Is there a relationship between the top management perspective and the implementation of digital transformation in their organizations?

– RQ3: What are the key lessons to aligning digital transformation initiatives with organizational objectives?

## II. MATERIAL AND METHOD

This section reviews the resource-based view theory, the digital business transformation stages, and the role of top management in digital transformation implementation. This part offers a foundation to explore the top management's perception of digital transformation in Vietnamese SMEs.

### 2.1. Conceptual foundation

#### 2.1.1. The resource-based view

Barney (1991) proposed the resource-based view (RBV), which posits that sustainable competitive advantage is achieved through unique internal resources. This model prioritizes internal competencies over external market factors (Assensoh-Kodua, 2019). Both tangible and intangible resources are considered crucial in RBV discourse. While both types of IT resources are essential, an emphasis on intangible resources is critical for long-term competitive advantage (Makhloufi *et al.,* 2018). Intangible IT resources are characterized as non-physical assets that bolster a firm's competitive position. These include IT governance, IT relationship resources, and IT knowledge resources (Makhloufi *et al.,* 2018). Their strategic significance stems from their replicative difficulty for competitors, potentially fostering sustainable competitive advantages when aligned with valuable, rare, inimitable, and non-substitutable (VRIN) (Makhloufi *et al.,* 2018). Resource acquisition and competitive advantage maintenance are heavily impacted by intangible capabilities like intellectual capital, financial literacy, and business experience (Ying *et al.*, 2019).

Recent studies on digital transformation through the lens of the RBV highlight the critical role of digital resources in achieving competitive advantage. The RBV framework emphasizes the importance of leveraging unique resources, such as human capital and technological capabilities, to drive successful digital transformation. Effective management of digital talent is essential, as skilled employees drive innovation and adaptability in digital environments (Willie, 2024). Organizations must integrate advanced technologies to enhance operational efficiency and customer engagement (Hsiao, 2024). Leveraging data analytics can inform strategic decisions and foster a culture of continuous improvement (Willie, 2024). Moreover, engaging in corporate social responsibility initiatives can bolster a firm's resource base, particularly in human and technological aspects, thereby facilitating digital transformation (Nie et al., 2024). A strong digital orientation is linked to improved performance, particularly in SMEs, where a U-shaped relationship indicates that initial investments in digital capabilities may yield setbacks before achieving success (Barragan & Becker, 2024).

Digital transformation in SMEs in developing countries is shaped by the RBV, focusing on unique resources for competitive advantage. This transformation is vital for enhancing financial and operational performance, supported by studies from various regions. A recent study on Malaysian SMEs shows that digital transformation boosts profitability and revenue growth, underlining the need for strategic digital adoption (Yang & Ming, 2024). In Pakistan, technology

adoption strongly correlates with improved business performance, highlighting the importance of digital infrastructure investment (Mushtaq et al., 2024). Managerial education, internationalization, and firm size are the key factors influencing digital adoption in Spanish SMEs, indicating that knowledge is crucial for overcoming challenges (Clemente-Almendros et al., 2024). While the RBV offers insights into digital transformation advantages, SMEs in developing countries may need tailored strategies addressing local contexts. Developing countries typically adopt basic information systems, as advanced technologies are hindered by socioeconomic issues ((Díaz-Arancibia et al., 2024)). Besides, digital skills gaps and infrastructure issues present significant challenges for SMEs in their transformation efforts (Yang & Ming, 2024). Common hurdles include limited financial resources, a shortage of skilled workers, and concerns over data security (Yusuf et al., 2024). In Vietnam, the application of the RBV in exploring digital transformation is still limited. Thus, we adopt this theory to discover the top management's perception of Vietnamese SMEs toward digital transformation. Findings from this study can enhance our understanding of digital transformation in developing countries.

### 2.1.2. The digital business transformation stages

Strohmeier (2020) proposed a typology comprising four ideal types denoting different organizational digitalization levels. These types exist on a continuum, with minimal and maximal digitalization extremes, alongside two intermediate types indicating escalating digitalization intensity. Figure 2.1 presents the typology below.

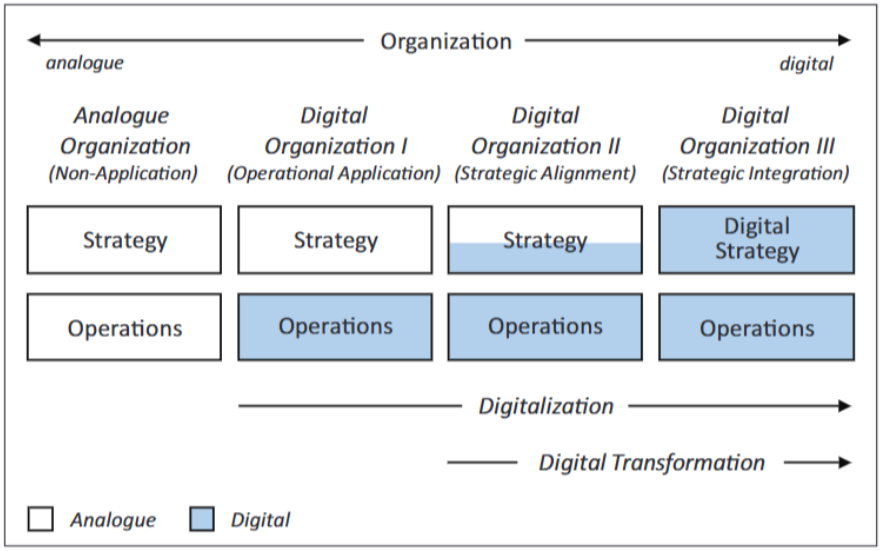



**Figure 2.1 - Typology of digital organizations (Strohmeier, 2020)**

Furthermore, there are five key phases of digital transformation (Mutlu *et al.*, 2022). Each phase of the digital transformation process is characterized as the following:

– Digital Passive: Organizations exhibit minimal digital engagement, reflecting a passive approach to transformation.

– Digitization: Organizations convert analog information into digital formats without significant business model changes.

– Digitalization: Utilization of digital technologies enhances operations and customer interactions, integrating tools for improved efficiency.

– Digital Transition: A significant shift occurs as organizations adapt their processes and strategies to digital advancements.

– Digital Transformation: The final phase entails comprehensively rethinking business models, culture, and processes to leverage digital capabilities for innovation and growth fully.

### 2.1.3. The pivotal role of top management in the transformation to digitalization

Top management teams are essential in establishing organizations' digital transformation vision. They must embrace change and take risks to enable corporate digital transformation (Zhang & Yang, 2023). Task-related faultlines positively influence corporate digital transformation, suggesting that differing task perspectives within the top

management can enhance digital initiatives; conversely, bio-demographic faultlines hinder digital transformation, as demographic differences within the top management may impede digital progress (Peng & Jia, 2023). Furthermore, top management heterogeneity influences the interplay between digital transformation and corporate innovation (Zhang & Yang, 2023). An increase in diversity within the top management teams amplifies the beneficial effects of digital transformation on innovation. Establishing priorities and commitments in digitalization is essential for executive leadership. Management dedicates resources to comprehending digitalization and facilitating organizational change (Figure 2.2) (Wrede *et al.*, 2020). Effective leadership can enhance employee engagement in digital transformation, improving job performance (Nguyen *et al.*, 2023).

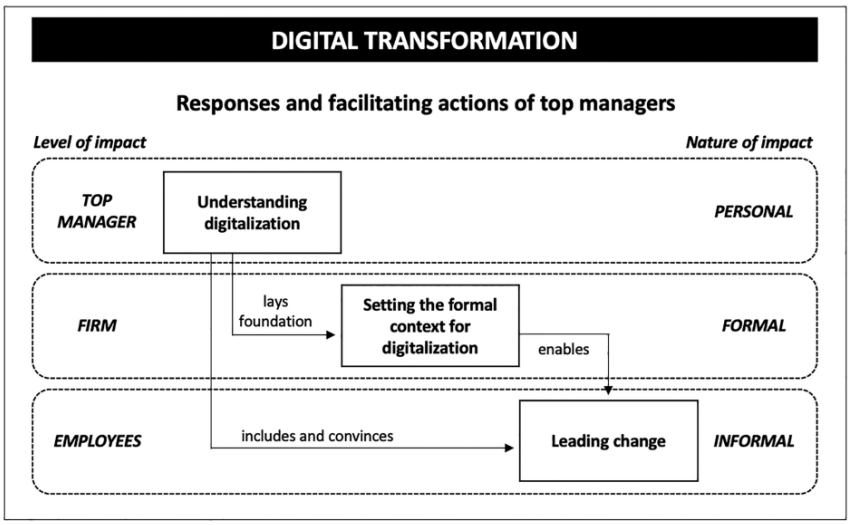



**Figure 2.2 - Top-level managers' actions to encourage digital transformation (Wrede et al., 2020)**

### 2.1.4. Digital readiness

Five elements—market, organization, people, strategy, and technology—were covered by the multidimensional construct developed by Trischler and Li- Ying (2022). The digital transformation outcomes for small businesses were positively influenced by technological and strategic elements of digital readiness (Trischler & Li-Ying, 2022). In the same research, strategic planning, goal alignment, and the ability to adjust strategies in response to digital disruptions are all vital elements for successful digital transformation. The technology dimension comprises the technological infrastructure, digital tools and capabilities, and technology integration into different business processes. These elements are essential for effectively leveraging technology throughout digital transformations.

## 2.2. Research method

The qualitative method was employed in this study since it enables researchers to explore complex phenomena in depth rather than through quantitative measures (Zou & Xu, 2023). Given the complicated nature of economic forecasting problems and management, qualitative research is becoming progressively more relevant (Radović-Marković, 2023). The qualitative data from semi-structured interviews will yield reliable insights into top managers' perspectives on digital transformation, enhancing understanding of its business relevance. Utilizing Conversation Analysis proves interview dynamics, offering richer insights into participants' views and surpassing conventional qualitative analysis techniques (Junnier, 2024).

The author identifies specific respondent categories for data donation relevant to the study (Bougie & Sekaran, 2016). The study involves top managers of Vietnamese SMEs invited for qualitative research. Participants must have at least one year of management experience in Vietnamese SMEs across various sectors. Thus, respondents have adequate expertise to link their management practices with their perceptions of digital transformation in Vietnamese SMEs. They include Vietnamese SMEs' founders, CEOs, directors, and senior managers. Saturation in qualitative research is essential for determining sample size and ensuring rigor, noting that homogeneous populations often reach saturation with few interviews (9–17) or focus groups (4–8) (Hennink & Kaiser, 2022). The author ceased interviews after 17, as responses indicated alignment and no novel information emerged, confirming the information saturation. The duration

of the in-depth interviews varied from 30 to 97 minutes, successfully offering rich data and insights from the informants.

## III. RESULT AND DISCUSSION

### 3.1. Informants' profiles and analysis procedure

Seventeen experienced SME managers agreed to participate in this research. The semi-structured interview was employed to explore the perception of digital transformation, tailoring to the interviewees' willingness to share their experiences. Table 3.1 presents the main interview questions, and Table 3.2 below summarizes the study participants.

**Table 3.1 - Interview Questions**

| No | Interview Questions |
|---|---|
| 1 | How do you perceive digital transformation? |
| 2 | How do you perceive the readiness of an organization for digital transformation? |
| 3 | What guidance, lessons learned, or best practices would you provide other SMEs starting their digital transformation, based on your experience? |

*Source: The authors' work*

**Table 3. 2 - The Participants' Profiles**

| No | Status | Companies types | Industry | The interview's duration |
|---|---|---|---|---|
| 1 | Founder | SMEs | Commerce | 40 minutes |
| 2 | Director | SMEs | Retail | 46 minutes |
| 3 | CEO | SMEs | Fintech in Healthcare | 30 minutes |
| 4 | Director | SMEs | Textile and Garment | 52 minutes |
| 5 | Co-Founder | SMEs | Blockchain services | 43 minutes |
| 6 | CEO | SMEs | IT Services & IT Consulting | 40 minutes |
| 7 | Co-Founder/ CTO | SMEs | Financial services | 58 minutes |
| 8 | Chairman/ COO | SMEs | IT Services & IT Consulting | 68 minutes |
| 9 | Co-Founder | SMEs | IT Services | 97 minutes |
| 10 | Founder/ CTO | SMEs | Software Products | 60 minutes |
| 11 | Director | SMEs | Insurance | 40 minutes |
| 12 | Director | SMEs | Manufacturing | 44 minutes |
| 13 | Sale Director | SMEs | Engineering Technology | 38 minutes |
| 14 | CFO | SMEs | Food & Beverage Manufacturing | 34 minutes |
| 15 | Director | SMEs | Tourism | 60 minutes |
| 16 | Founder | SMEs | Software Development | 72 minutes |
| 17 | Founder/ CEO | SMEs | IT Outsourcing | 30 minutes |

*Source: The authors' work*

### 3.2. Findings and Interpretation

Seven core themes are delineated: (1) prevalent trend and global mindset; (2) business model; (3) enterprise-scale operating processes; (4) transparency; (5) generation; (6) risk; (7) culture. These classifications emerged from the qualitative content analysis. Furthermore, the research investigates Vietnamese SME leadership's views on digital transformation, observing alignment in viewpoints despite narrative and managerial inconsistencies.

#### 3.2.1. Prevalent trend and global mindset

Regarding SMEs, participants unanimously acknowledged digital transformation as a global trend fostering positive business developments worldwide. The subsequent quotations from participants illustrate this: *"While technology becomes more prevalent, the world is changing in terms of incorporating technological applications into the operational management of a business"* (Interviewee 10); *"Regarding the trend, digital transformation is inevitable for every business in a world of digital competition, now called the digital world"* (Interviewee 6); "*Actually, follow the worldwide trend and make business growth more convenient"* (Interviewee 4).

While some considered digital transformation merely a trend, it became evident that it challenges business strategies, engagement, and commitment. For example, several interviewees observed that: *"When discussing digital transformation, we are mainly racing by keywords [...] Few companies have managed to accomplish everything; the majority of existing companies only perform certain things "on the surface"* (Interviewee 2); *"When discussing digital transformation, it is frequently reduced to software acquisition and training. However, this viewpoint neglects the complexity of the process, as its success depends on the specific traits of the organization involved"* (Interviewee 10).

The research indicated that most SME leaders acknowledged the necessity of adopting a digital transformation mindset, a recurring theme in top management interviews. A global mindset enables the recognition and exploitation of emerging opportunities. The interviewees, for example, expressed: *"Instead of only offering instruction on how to utilize certain tools and technologies, the organization has to reframe its mindset and rationale for this demand as the first step"* (Interviewee 3); *"The adaptability of individuals to new and evolving technologies during the transformation phase holds significance. Once individuals have transitioned digitally and acquired the necessary technological competencies, they can effortlessly adapt to updates and changes"* (Interviewee 7); *"Cognitive processes represent the most crucial element of digital transformation, followed by competencies and resources"* (Interviewee 16).

**3.2.2. Business models**

*"On the market, it has two forms: one is ready-made software, and the other is custom software"* (Interviewee 8). Most participants expressed concern regarding their business models amid digital transformation efforts. SME leaders noted that software development necessitates recruitment or structural changes, yet independent systems or funding often remain lacking (Interviewee 2); assumptions surrounding modernization through digital transformation frequently misalign with practical realities (Interviewee 10).

Digital transformation notably impacts business models, especially for long-standing SMEs in Vietnam. Some interviewees remarked on the challenges faced by companies with extensive operational histories, highlighting the complications arising from outdated data and misaligned accounting practices (Interviewee 7); addressing contemporary issues via digital transformation requires identifying weaknesses in traditional business models and recognizing manual inefficiencies (Interviewee 6). While the advantages of digital transformation are evident, its integration into the business models of long-standing SMEs presents significant challenges. The unique business models of SMEs will undergo modifications due to digital transformation, and reliance on generic software may not suit all enterprises. Moreover, several participants maintained an optimistic perspective regarding the applicability of digital transformation for enterprises over developing proprietary software: *"We envision ourselves as benefiting from established systems rather than creating our own, as the latter proves to be labor-intensive and inefficient"* (Interviewee 5); by adopting existing technologies, such as software as a Service (SaaS), professionals can enhance their efficiency through available solutions (Interviewee 3).

**3.2.3. Enterprise-scale operating processes**

Most participants recognized the link between digital transformation and SMEs' operational processes. For instance, the participants mentioned that: *"Implementing a pre-built solution requires staff training on its use, altering business operations"* (Interviewee 10); *"Understanding the importance of structured processes and strategies is crucial for successful digital transformation"* (Interviewee 8); *"Digital transformation leverages technology to resolve process-related challenges"* (Interviewee 7).

Digital transformation relates to both operational processes and business scale. Participants' quotes illustrate this: *"Post-digital transformation, people management improved, business scale increased, and costs decreased"* (Interviewee 2). An enterprise's operational processes expand with its scale. Several respondents discussed the appropriateness of enterprise-scale for digital transformation and its integration into operations. Furthermore, specific staffing needs vary across businesses. A comprehensive assessment of organizational goals, resources, and technology requirements is recommended to determine the optimal employee count and skill level for effective digital transformation. Participants noted, for example, that: *"The provided software may include numerous processes that are not entirely relevant to one's organization"* (Interviewee 7); *"Digital transformation necessitates operational integration across departments, representing its most advanced form; smaller businesses may only utilize select*

*functionalities of management software"* (Interviewee 10); *"Most Vietnamese companies are small or medium-sized, while software needs are tailored to businesses with 50 to 100 employees, raising concerns about the necessity of hiring additional staff for software implementation in SMEs"*(Interviewee 2).

Furthermore, the analysis indicated that numerous SMEs are selectively implementing elements of transformation, resulting in disunity among the software utilized in their operations. Interviewee 7 expressed that digital transformation constitutes a multifaceted yet self-contained procedure; without cohesive departmental involvement, the term "digital transformation" is rendered meaningless. Interviewee 10 confirmed this, emphasizing that successful digital transformation necessitates professional coherence and interdepartmental synergy for effective business operations. Additionally, a system for integrating diverse software applications is crucial for organizations utilizing multiple tools. Interviewee 10 emphasized that partial conversion complicates the connection of distinct software, requiring the restoration of data links. Interviewee 17 pointed out a growing trend in the industry towards software integration, culminating in unified solutions like SaaS. Interviewee 16 addressed the practicality of software integration via public APIs, which enable software communication and offer a cost-effective alternative to custom-made development.

Implementing digital transformation in SMEs is an innovative strategy that can enhance scalability without increasing workforce size. Participant quotes illustrate this: *"Growth can occur digitally, not necessarily geographically, with enhanced digital presence driving revenue and customer base expansion. Tools for customer segmentation and product promotion are crucial"* (Interviewee 6); *"Some million-dollar companies function with a minimal staff of 10, 20, or 50"* (Interviewee 16). While digital transformation goals may be universal, the strategies and considerations for effective implementation differ depending on company size, objectives, and capabilities.

### 3.2.4. Transparency

"Clean," "transparent," "data," and "process" are identified as essential transparency attributes in digital transformation. Interviewee 8 noted that consistent data enhances transparency in financial transactions. Other participants agreed, stating that digital transformation fosters emotional detachment, transparency, and customer rights (Interviewee 9) and that technological advancements benefit individuals and businesses (Interviewee 16). By integrating transparency into their digital transformation strategies, businesses can build trust, enhance engagement, and create a conducive environment for effective change and sustainable growth.

Most participants recognize that digital transformation enhances organizational transparency across all dimensions. This understanding contributes to the reluctance of some companies to engage in digital transformation, which can conflict with ethical business practices. The following quotes from the participants illustrate this: *"Digital transformation necessitates strict adherence to protocols; some organizations face challenges due to mistakes and insufficient transparency"* (Interviewee 1); *"Certain individuals or family enterprises resist digital transformation out of fear of losing established practices"* (Interviewee 9); *"Entities dependent on traditional paper processes are more vulnerable to corruption"* (Interviewee 11).

Advancement in digital transformation is anticipated to enhance transparency. This evolution is also propelled by initiatives from authorities encouraging a commitment to digital transformation. SME leaders substantiated this: *"Electronic tax systems have been upgraded for all small businesses"* (Interviewee 1); *"I observe the government transitioning to digital services for taxation and invoices, indicating a significant progression"* (Interviewee 14).

### 3.2.5. Generation

Participants discussed "generation" and "age" during interviews. Most believe older adults are ill-suited for digital transformation. However, many elderly individuals manage their businesses. For example, participants indicated, *"Despite Vietnamese enterprises acquiring system software, it is only in English, with no Vietnamese version. Is there assurance regarding the linguistic capabilities of business owners born in Vietnam between 1960 and 1970 today? [...] Concerns are raised as individuals over 40, 45, or 50 often prefer stability, resist change, and avoid transitions"* (Interviewee 13).

Interviewees highlighted the younger generation's significance in digital transformation. The next generation will engage in ongoing learning and adaptability. Participants noted, for instance, *"Young people must understand digital transformation. It is the youth who will realize it; older generations will not"* (Interviewee 7); *"Leadership that fails to*

*acknowledge outdated practices or lacks successors will obstruct adaptation to evolving paradigms. Leaders must exhibit the bravery to transition their roles to enable capable successors"* (Interviewee 3).

### 3.2.6. Risk

The concept of "transformation" compels new routines. Adaptability alone is inadequate. The disruption of norms calls into question new strategies' effectiveness. Insights from senior managers suggest that digital transformation implementation requires organizational restructuring, which is perceived as risky for established firms. Participants indicated that: *"Digital transformation offers benefits; however, resource investment varies, and results differ by initiative"* (Interviewee 2); *"Companies stick to established models, adapting for survival, making it unrealistic to expect theory-based abandonment"* (Interviewee 10). Another manager recapped this perspective: *"Operational efficiency fosters change resistance, arising from an incomplete understanding of actions, prevalent in various sectors, including technology […] Challenges arise in distinguishing areas needing improvement from those succeeding, often resulting in a preference for new infrastructure and personnel shifts over enhancement of existing systems"* (Interviewee 3).

### 3.2.7. Culture

To maintain efficiency and relevance in a dynamic digital environment, cultural institutions must adapt to implement digital transformation and utilize digital tools effectively. Executives emphasize organizational culture: "Digital transformations have impacted corporate culture" (Interviewee 8). Furthermore, one participant noted: *"Adopting a specific tool necessitates an extensive corporate culture reform, requiring both top-down leadership and bottom-up employee engagement. Despite leaders' enthusiasm for change, employee resistance may arise from established routines. Thus, both management and employees must comprehend their respective roles."* (Interviewee 3). Another leader corroborated this sentiment: *"The method adopted is contingent on the organization's culture. Larger firms typically employ a top-down strategy, where decisions originate at the top, as observed in state-owned enterprises. [...] Conversely, the bottom-up method promotes a collective understanding among all members"* (Interviewee 6). He acknowledged the relevance of digital transformation in corporate culture: *"A digital transformation committee should include representatives from various departments, tasked with critical elements such as strategy, process modifications, implementation methods, and performance assessments, proceeding to execution, evaluation, and monitoring"* (Interviewee 6).

## IV. CONCLUSION

All participants who consented to interviews exhibited varying levels of understanding regarding digital transformation. Conversely, some individuals, despite their use of specific technologies, declined interviews due to perceived inadequacies in their knowledge of digital transformation. This finding aligns with the study's focus, indicating that 32.1% of challenges in digital transformation arise from insufficient commitment and knowledge among corporate leaders. Concerning management's perception of digital transformation, all interviewees acknowledged its significant benefits. However, various challenges complicate effective implementation, particularly for SMEs in Vietnam. Factors such as organizational culture, business environment, and the firm's characteristics often impede the success of digital transformation initiatives. Organizations, especially those with established histories, must change their practices and operations considerably. Many companies, however, lack a coherent strategy to navigate the complexities of digital transformation.

The study indicates that Vietnamese SMEs exhibit a relatively low readiness for digital transformation. As discussed about the digital transformation stages, some firms merely utilize digital technologies without engaging in a thorough digital transformation process. These organizations are integrating technology into parts of their business model rather than adopting a comprehensive digitalization strategy. The scale of SMEs necessitates careful consideration when implementing software systems, as existing processes may not align with SME-specific needs. Acknowledging that the costs and risks associated with digital transformation significantly affect top management's decision-making is crucial. Thus, a thorough assessment of potential impacts on operational efficiency and finances is essential before initiating any digital transformation efforts. SMEs must evaluate the consequences of adopting new software systems to ensure effective integration that meets their operational requirements and objectives.

Although qualitative studies provide deep insights into real-life complexities, their findings may lack generalizability. The generalizability and replicability of qualitative research may pose challenges. Despite rigorous methodological protections, uncertainties remain. Future studies are thus advised to explore various contexts for industry and geographical comparisons. Future researchers should focus on the specific sectors where SMEs function. Besides, investigating digital transformation within a certain industry is essential, particularly in Vietnam's diverse business landscape. Additionally, researchers should undertake comprehensive studies on the interactions among governmental bodies, academic institutions, and businesses to elucidate effective digital transformation strategies. Such efforts are expected to enhance enterprises' integration and adaptation of digital innovations.

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# STUDY OF INTENTION TO USE GREEN HOTELS IN HO CHI MINH CITY: APPLYING THE THEORY OF PLANNED BEHAVIOR

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**ABSTRACT**

In the context of increasing environmental concerns and the shift towards sustainable tourism, understanding tourist behavior has become essential for the hospitality industry. This study focuses on the intention to use green hotels in Ho Chi Minh City, employing the extended Theory of Planned Behavior (TPB) model, combined with a multidimensional green perceived value framework. The survey was conducted with 257 participants using both indirect and direct methods, and the data were analyzed using Structural Equation Modeling (SEM). The results indicate that Functional Value has the most significant impact on tourists' likelihood of selecting green hotels. Additionally, Emotional Value, Attitude, and Subjective Norm Positively influence Visit Intention. However, Social Value has almost no effect on Attitude or Visit Intention. These findings provide insights and strategic recommendations for managers and remaining in the green hotel industry. Furthermore, the study contributes a theoretical basis for awareness-raising education programs and serves as a reference for further scientific research .

*Keywords*: "Multidimensional green perceived value", "Sustainable tourism", "Theory of Planned Behavior", "Vietnamese tourists", "Green hotel".

## I. INTRODUCTION

### 1.1 Background of the study

The continuous advancement of technology improves human experiences but also accelerates environmental pollution. The restaurant and hotel industry, a key component of tourism, significantly contributes to economic growth while posing environmental challenges.By 2023, the global tourism industry accounted for 9.1% of GDP and nearly 10% of global employment (WTTC). Vietnam's tourism sector has also seen strong recovery, welcoming 8.8 million international visitors in the first half of 2024 (+58.4% YoY). Ho Chi Minh City alone generated VND 92,643 billion in tourism revenue, marking a 14.6% increase from 2023.

Despite these economic benefits, tourism has severe environmental consequences. The accommodation sector contributes to 75% of the industry's greenhouse gas emissions (Aboelmaged & Mohamed, 2018). A four-star hotel with 200 rooms may consume 300,000 single-use plastic products per month (Eco-Business). In Vietnam, plastic waste from tourism reached 116,000 tons in 2019 and could triple by 2030.To counteract these impacts, Vietnam has promoted green tourism since 2012, setting emission reduction targets for 2030 and 2050. A 2024 survey by Booking.com found that 78% of Vietnamese travelers value sustainable tourism, yet only 53% consider it when booking hotels. However, the green hotel sector is still underdeveloped, with only 41 ASEAN-certified Green Hotels out of 38,000 accommodations in 2023.

Given this emerging trend, the study "Research on the Intention to Use Green Hotels in Ho Chi Minh City" investigates key factors influencing tourists' choices. Using quantitative surveys and SMART-PLS analysis, the research offers insights for hotel managers to implement sustainable strategies and promote the green hotel movement in Vietnam.

### 1.2 Research Questions and objectives

The study investigates the influence of observed variables on awake on emotions , social prestige, quality of facilities, attitudes, social norms to intention to use green hotels of Vietnamese tourists.

Corresponding to the 04 specific objectives, the report raises 04 research questions as follows:

- Question 1: What theoretical basis is related to Perception? awake about emotions, Social reputation, Comfort

quality, Attitude, Social norms and Usage intention at green hotels and the relationship between them?

– Question 2: What factors have a direct impact? next on Green Hotel Usage Intentions, and their Impact Level?

– Question 3 : What factors have indirect influence? next on Green Hotel Usage Intentions, and their Impact Level?

– Question 4 : What implications and suggestions are given to stimulate and increase the intention to use green hotels, thereby reducing environmental pollution?

## II. MATERIAL AND METHODOLOGY

The research consists of two phases: preliminary and main implementation. Quantitative methods, surveys, and data analysis using SMART-PLS are employed to assess reliability (Cronbach's Alpha) and structure (SEM-PLS). The Bootstrapping method is applied to ensure the accuracy and significance of the research findings.

### 2.1. Conceptual Foundation

Sustainable tourism, introduced at the 1992 United Nations Conference in Rio de Janeiro, prioritizes fulfilling present tourism demands while safeguarding resources for future generations. Green hotels, integral to this framework, implement eco-friendly practices to minimize their environmental impact, with certifications such as Green Lotus and ASEAN Green Hotel ensuring compliance with sustainability standards.

Green perceived value significantly influences consumer choices, encompassing four key dimensions: Social Value, enhancing environmental responsibility perception; Emotional Value, fostering positive sentiments through Eco-conscious actions; Functional Value, balancing quality and cost despite potential price barriers; and Attitude, reflecting pro-environmental beliefs and commitment. Additionally, Subjective Norms shape decision-making through societal expectations, while Usage Intention remains a strong predictor of green hotel adoption. These factors collectively underscore the necessity of sustainability-driven engagement in the hospitality sector.

### 2.2 Research method

Hypotheses Development based on Past Studies

This study examines the relationships between key factors influencing customer behavior toward green hotels, focusing on attitude, social norms, emotional awareness, social reputation, and comfort quality.

Attitude, Social Norms, and Usage Intention

Attitude and social norms significantly impact the intention to use green hotels, as shown in studies by Han et al. (2010) and Paul et al. (2016). Positive attitudes toward environmental protection enhance customers' likelihood of choosing green hotels, while perceived social support or pressure encourages environmentally friendly behavior. This leads to the hypotheses:

H1: Attitude positively influences usage intention.

H2: Social norms positively influence usage intention.

Comfort Quality's Impact

The balance between price and quality, particularly in green hotels, influences both attitudes and intentions. High-quality amenities at reasonable prices promote positive attitudes and increase the likelihood of choosing green hotels. Supporting studies (Chen et al., 2012; Wu et al., 2024) highlight the importance of comfort quality in green hotel adoption, leading to:

H3: Comfort quality positively influences attitude.

H4: Comfort quality positively influences usage intention.

Emotional Perception

Emotional perception plays a crucial role in forming attitudes and intentions. Positive emotions from supporting green initiatives enhance customer engagement and loyalty. Studies (Tan & Ling Ling, 2023) confirm emotional cognition's impact, leading to:

H5: Emotional perception positively influences attitude.

H6: Emotional perception positively influences usage intention.

Social Reputation

Social reputation, driven by societal recognition and respect, motivates customers to choose green products. Studies (Griskevicius et al., 2010; Hartmann et al., 2006) show its strong influence on attitudes and intentions, resulting in:

H7: Social reputation positively influences attitude.

H8: Social reputation positively influences usage intention.

Mediating Role of Attitude

Attitude mediates the relationship between comfort quality, emotional perception, social reputation, and usage intention. Customers' positive attitudes, shaped by these factors, significantly boost their intention to use green hotels. Thus:

H9a: Comfort quality impacts intention via attitude.

H9b: Emotional perception impacts intention via attitude.

H9c: Social reputation impacts intention via attitude.

These hypotheses establish a comprehensive model to understand green hotel adoption.

**2.3. Research model**

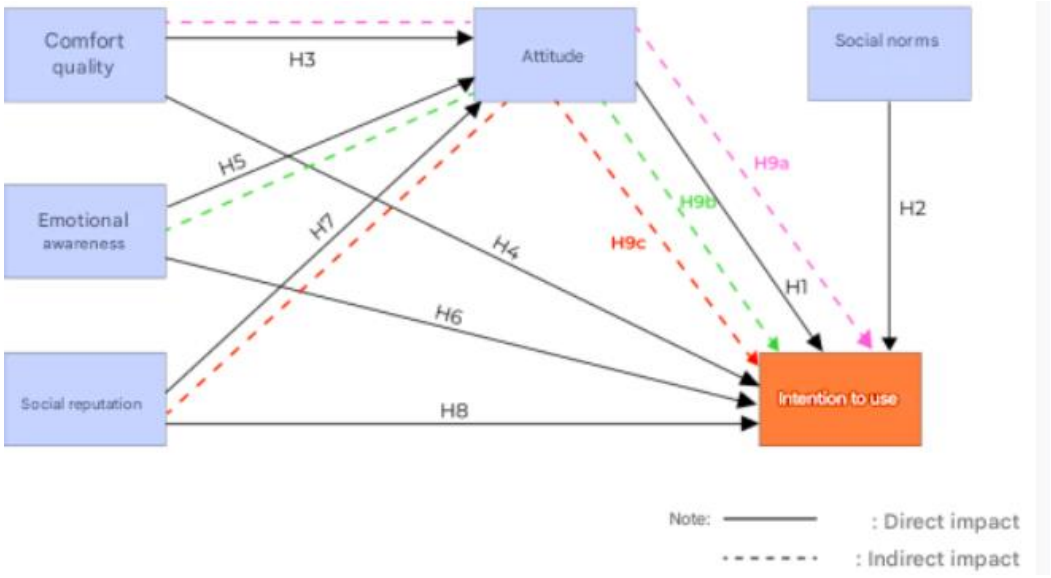



**Fig. 0.1 Proposed Conceptual Model**

The following are the hypotheses that the study proposes:

H1. Attitude positively influences Intention to Use.

H2. Social norms positively influence Intention to use.

H3. Comfort quality positively affects Attitude .

H4. Comfort quality positively affects Intention to use.

H5. Emotional awareness positively influences Attitude .

H6. Emotional awareness positively affects Intention to use.

H7. Social prestige positively affects Attitude .

H8. Social reputation positively affects Intention to use.

H9a: Comfort quality positively affects Intention to use under the mediating role of Attitude .

H9b: Emotional awareness positively affects Intention to use under the mediation of Attitude .

H9c: Social reputation positively affects Intention to use under the mediating role of Attitude

**III. RESULT AND DISCUSSION**

**3.1 Research subjects**

The study collected 257 valid responses after screening. Key demographic findings include: The final dataset consists of 257 valid responses. The demographic profile indicates 51% female and 49% male respondents. The majority (51%) are aged 18-25, followed by 31-40 years (23%). Education levels show that 66.1% hold university degrees. The income distribution reveals that 40.1% earn under 10 million VND/month, with 22.6% earning between 10-20 million VND.

### 3.2. Model results

**Table 3. 1 - Hypothesis testing results**

| Hypothesis | Relationship | | | Coefficient | P-Value | Decision |
|---|---|---|---|---|---|---|
| H1 | TD | ---> | YDSD | 0 . 236 | 0 . 000 | Accept |
| H2 | Socialism | ---> | YDSD | 0 . 285 | 0 . 000 | Accept |
| H3 | CLTN | ---> | TD | 0 . 515 | 0 . 000 | Accept |
| H 4 | CLTN | ---> | YDSD | 0 . 331 | 0 . 000 | Accept |
| H5 | NTCX | ---> | TD | 0 . 320 | 0 . 000 | Accept |
| H 6 | NTCX | ---> | YDSD | 0 . 222 | 0 . 000 | Accept |
| H 7 | Social Security | ---> | TD | -0 . 094 | 0 .199 | Rejected |
| H 8 | Social Security | ---> | YDSD | -0 . 109 | 0 . 0 91 | Rejected |
| H 9a | CLTN ---> TD ---> YDSD | | | 0.121 | 0 . 00 1 | Accept |
| H9b | NTCX ---> TD ---> YDSD | | | 0 . 076 | 0 . 00 6 | Accept |
| H9c | Social Security ---> Health ---> Social Security | | | -0 . 022 | 0 . 242 | Rejected |

**Table 0 Summary of hypothesis testing results**

| Hypothesis | Content | Decision |
|---|---|---|
| **H1** | **Attitude positively influences Intention to use** | **Accept.** |
| H2 | Social norms positively influence Intention to Use . | Accept. |
| H3 | of amenities positively affects Attitude . | Accept . |
| H4 | Comfort quality positively affects Intention to use . | Accept . |
| H5 | Emotional awareness positively influences Attitude . | Accept . |
| H6 | Emotional awareness positively influences Intention to use . | Accept . |
| H7 | prestige positively influences Attitude . | Rejected. |
| H8 | Social reputation positively affects Intention to use . | Rejected. |
| H9a | Comfort quality positively affects Intention to use under the mediating role of Attitude . | Accept . |
| H9b | Emotional cognition positively influences Usage intention under the mediation of Attitude . | Accept. |
| H9c | Social reputation positively affects Intention to use under the mediating role of Attitude . | Rejected . |

The study evaluated several hypotheses about green hotel usage, with most hypotheses accepted, but some rejected due to low significance levels or opposing results.

Explained Rejections: Green hotels remain unfamiliar to many Vietnamese consumers, with only 13.5% of establishments certified as "green" or "sustainable." Social reputation in Vietnam is often tied to luxury and exclusivity, conflicting with the perception of sustainability. Pressure from social norms can create discomfort, reducing motivation to choose green hotels, as some view it as forced compliance rather than voluntary behavior. These findings highlight that while comfort quality, emotional awareness, and attitudes play critical roles in driving green hotel adoption, the impact of social reputation remains minimal or even counterproductive in the Vietnamese context.The findings highlight that Comfort Quality has the strongest effect, followed by Emotional Awareness and Social Norms. Social Reputation has an insignificant or negative impact, suggesting that sustainable choices in Vietnam are not yet widely associated with social prestige.

## IV. CONCLUSION

The study investigates the intention to use green hotels in Vietnam, where green practices are not yet widespread, particularly in Ho Chi Minh City, a key economic hub. This research aims to contribute theoretical insights and practical solutions to promote green hotel adoption.The adjusted R-square values showed that 44.2% of attitude variability and 65.4% of intention variability were explained by the model. Comfort quality had the strongest impact, followed by emotional awareness and social norms. The findings highlight the importance of comfort quality and emotional value in promoting green hotel adoption while identifying limitations in the influence of social reputation in the Vietnamese context.

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# FACTORS AFFECTING THE CAPACITY TO APPLY TECHNOLOGY IN TRAINING HUMAN RESOURCES AT ECONOMIC UNIVERSITIES IN HO CHI MINH CITY

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**ABSTRACT**

The objective of this study is to measure the extent to which various factors influence the capacity for applying information technology (IT) in training at several economic universities in the Ho Chi Minh City area. Based on the theoretical framework of training activities and IT application in training, the author identified four factors affecting the capacity for IT application in training at some universities in the Ho Chi Minh City area, including teaching staff, facilities, the integration of training, and government policies. Using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method, the research results demonstrated that these factors have a positive and statistically significant impact on the capacity for IT application in training.

*Keywords: "university", "training", "application capacity"," information technology".*

## I. INTRODUCTION

Human resource demand became stricter and more complicated in the context of the Fourth Industrial Revolution and deepening international integration. The proliferation of IT, artificial intelligence, and automation has revolutionized the world of work and the global economy. In contrast, the global workforce is left needing to acquire and possess specialized knowledge, innovate, adapt to new technologies, and be able to work in collaboration with others from different backgrounds and cultures. According to modern-day businesses, interdisciplinary, problem-solving, and teamwork are essential employability skills (Schwab, 2016). To meet these demands, universities should adopt innovative pedagogies, implement state-of-the-art technologies, and create a holistic training paradigm to equip students with their capacity for the global labor market (Zahidi et al., 2020). This is the key to cultivating high-quality human resources and contributing to sustainable economic and social development in the digital age.

In response, Universities have adopted the flexible admission policies, and introduced new disciplines for training, and stronger partnerships to develop human resources. In particular, the formation of an information development ecosystem in education has a significant impact on the development of education in the world, considering the growing challenges of educational institutions. The integration of technology to teach and learn has thus become a necessary paradigm shift towards improving educational quality and meeting global workforce requirements. Education is an essential driver of sustainable development (Sarker et al., 2019) and needs advanced techniques alongside innovative practices to meet such challenges, preparing universities to significantly address cultural, social and economic development in the ever-changing global context.

Information technology (IT) plays a crucial role in the modern economy. In this context, social media has become widespread, helping family members and friends maintain regular communication. At the same time, the robust development of information and communication technology (ICT) is a major driving force behind global economic growth. The integration of IT into education and learning has become an inevitable trend in the rapidly changing technological world. Leveraging technology is a core element in all forms of learning. However, the major challenge for researchers and educators is finding ways to optimize the impact of digital technology on learners' academic performance and research outcomes (Sarker et al., 2019).

Besides, (Napal et al., 2020) argue that, in the context of the digital age, integrating digital tools into the teaching process enhances the effectiveness of knowledge transmission and encourages learners to develop critical thinking skills on sustainability issues. Information technology supports instructors in creating rich lectures and facilitates better

student interaction with content through online learning platforms, simulation tools, and learning support applications. This increases student engagement and improves their ability to absorb and apply knowledge in practice. The article also emphasizes the necessity of enhancing the digital skills of both instructors and students to ensure the effective use of information technology in education, contributing to creating a positive and innovative learning environment.

Additionally, previous studies on the application of IT in teaching at universities have primarily focused on two aspects: first, individual factors that influence faculty's acceptance and use of technology (Ashrafzadeh & Sayadian, 2015; Ocak, 2011); and second, the implementation of the university's vision and strategy for technology-supported teaching and learning (Graham et al., 2013; Porter & Graham, 2016). However, there are still relatively few studies that focus on the factors affecting the ability to apply IT in education at universities. For these reasons, the authors have studied the topic as the main objective of the paper: "Factors affecting the capacity to apply technology in training human resources at economic universities in Ho Chi Minh City".

## II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### 2.1. Literature review

#### 2.1.1. Training

Training is understood as a systematic learning process aimed at equipping learners with essential competencies such as knowledge, skills, and abilities (Gowan et al., 2022; Milhem et al., 2014). It is not merely the transmission of information but also a process of skill enhancement, compliance with regulations, and the development of professional attitudes, helping learners to grow comprehensively (Berber & Lekovic, 2018). Training in education plays a crucial role in improving work performance and ensuring that learners can meet the requirements of employers after graduation.

More critically, training initiatives transcend their role as short-term solutions for immediate demands, serving instead as integral components of a comprehensive, long-term strategy for societal human resource development. By fostering training programs, future human capital is not only equipped with enhanced skills but also cultivated in terms of attitudes and essential attributes, enabling them to adapt to and thrive within professional organizations.

#### 2.1.2. Application of information technology in education and training

In the field of training, the application of information technology (IT) has been examined and conceptualized through diverse perspectives. Scholars often define IT applications by underscoring their pivotal role in enhancing the effectiveness of teaching and learning processes. Rather than being limited to content delivery, the integration of IT in training involves a spectrum of technological methodologies designed to facilitate and enrich the learning experience.

A study (Wheeler, 2012) shows that these methodologies impact on the assessment of students, instructional advice, and teaching different strategies, effectively improving learners' engagement and accomplishments. Furthermore, IT is fundamental for managing and processing information. It is a unified set of methods, programs, and equipment designed to gather, process, store, and distribute data (Leshchenko et al., 2021).

Several research studies have been conducted on educational technology to assess the efficacy of using information technology (IT) in the comprehensive mix of teaching and learning environments. According to (Chen & Liu, 2018; Hwang et al., 2015), the use of IT in the training process not only improves and extends the traditional teaching and learning methods but also creates cooperation and interaction between learners and instructors. With the usage of technology, the learning environments have become more interactive, and this encourages both creativity and a desire to learn. IT has introduced new features to education, name distance learning, and online evaluation and blended learning. Additionally, technology facilitates the process of personalization of the learning experience by offering endless online activities to enrich and broaden the knowledge of learners. This subsequently improves learners' autonomy, self-directed learning, and creativity (Nguyen & Nguyen, 2024).

Technology-enhanced education significantly revolutionizes the conventional delivery mechanism of knowledge, focusing on higher interactivity, personalization, and flexibility. Multimedia tools are outstanding for different types of learners, as they combine visual, auditory, and kinesthetic components, allowing people to interact with content in the way that suits them best. Discussion forums, real-time collaborative chat tools (like Slack), and online whiteboards (like

Miro) enable students to collaborate, share ideas, and provide peer feedback, helping transcend time and location constraints. Innovations like simulations or gamified platforms create interactive learning environments that allow for hands-on experiences and provide more opportunities for practice and application than traditional forms of education do, fostering engagement, critical thinking, and active participation. Furthermore, these tools provide access to a wealth of resources and expertise, enabling learners to control their learning and prepare for the challenges of a constantly evolving world.

#### 2.1.3. The capacity to apply IT

According to Iftikhar et al. (2019), "capacity" is defined as the ability of respondents to use information technologies (e-mail, text messages, video conferencing) for communicating with healthcare providers. If respondents had the capacity but were unwilling to use these technologies, the reasons for their unwillingness were explored through open-ended questions. Moreover, the benefits of using IT training are that IT not only provides access to online learning modules, webinars, and virtual training sessions; it also achieves the learner's high potential to train anywhere. In education, IT engages and makes the learning process more attractive by incorporating interactivity and multimedia components with different formats (Zhao, 2023). As a result, the practice of IT in remote learning maximizes resources. It allows more study, eliminates geographical barriers, makes training systems efficient, and improves access.

### 2.2. Hypothesis development on factors affecting the ability to apply technology in human resource training

#### 2.2.1. Teaching staff

The world of education and training is being transformed into myriad ways, powered by technology (advanced artificial intelligence (AIs), the Internet of Things (IOT), and Big Data) revolutionizing all other aspects of economic/social life virtually (Van Hong et al., 2018). This fast-paced progress necessitates incorporating technology in the teaching sphere so that efficiency can be maximized and education can be kept up with the needs of the digital world. In the era of advancing digital technology, educators are becoming increasingly responsible for enhancing their IT competencies for teaching and research purposes (Mishra & Koehler, 2006), such as well-known frameworks that explore the adjustment of concept understanding and the pedagogic approach, which is also resulting in IT competent educators.

Educators play a crucial role in adopting technology (Shirase et al., 2023). Digital tools, such as personal computers provided to teachers, significantly enhance teaching staff's confidence and positive perceptions toward educational ICT (Balanskat et al., 2006; Timotheou et al., 2023), thereby improving teaching effectiveness and learning outcomes.

From the above arguments, the authors proposed the hypothesis:

*Hypothesis 1: Teaching staff positively influences IT application capacity in training at economics-focused universities in Ho Chi Minh City.*

#### 2.2.2. Facilities

Iftikhar et al. (2019) emphasized that intangible assets, such as IT tools like internet access and mobile phones, are crucial for enhancing communication efficiency and fostering technological capabilities. These assets play a significant role in building both individual and organizational competencies, ultimately creating competitive advantages. Gómez and Vargas (2012) further highlight the complexity of integrating appropriate resources with new technologies to achieve these advantages. While intangible assets, such as R&D, are vital for innovation and competitiveness, they are often challenging to measure and manage due to their abstract nature (Kaplan et al., 2001; Winter, 2009).

Tangible assets are crucial in advancing IT applications in training. These fundamentals are especially useful for facilitating e-learning, promoting innovative courses, and improving the quality of delivery services (Jawed & Siddiqui, 2019; Mugizi & Rwothumio, 2024). Enhancing the use of these resources not only elevates the quality of education but also augments the competitive standing of institutions amidst an evolving technological landscape. In the context of Vietnam, (Do, 2013) highlights the significant role of physical (including IT systems and customized software) and virtual (connection to global university systems and remote access to the catalog of digital resources) infrastructures of the university library. This infrastructure improves access to learning materials and supports academic research and

innovation, thus positively contributing to the quality of education and training.

*Hypothesis 2: The facilities of universities positively impact the capacity of applying technology in human resource training at economics-focused universities in Ho Chi Minh City.*

**2.2.3. Connectivity in Training**

Reynolds (2020) indicated that the element of connectivity in training is reflected through a well-coordinated training activity whereby an effective environment for training is created in which the learners interact, share ideas, and grow their knowledge together. Expertise supplies its providers and IT to improve connections for employees, teams, and businesses via new digital technologies and is obtainable expertise supplies knowledge through technology-based systems. Training connectivity is vital to IT application capacity improvement, IT training efficiency improvement, and high-quality human resource development.

*Hypothesis 3: Connectivity in training at universities positively impacts the capacity of applying technology in human resource training at economics-focused universities in Ho Chi Minh City.*

**2.2.4. Government policies**

Government policies on the application of technology in human resource training play a crucial role in enhancing the effective use of technology in education. In Vietnam, the government issued Decision No. 117/QĐ-TTg in 2017, approving the project titled "Strengthening the Application of IT in Management and Support of Teaching, Learning, and Scientific Research Activities to Improve the Quality of Education and Training for the Period 2016–2020, with Orientation Toward 2025."

According to Mai (2020) pointed out that government policies on IT application have been comprehensively analyzed, particularly focusing on strategies for developing high-quality human resources. The author emphasizes that these policies are pivotal in promoting IT integration in education, thereby improving the quality of human resource training to meet the demands of national development and integration during the digital transformation of the economy.

*Hypothesis 4: Government policies positively influence the capacity of applying technology in human resource training at economics-focused universities in Ho Chi Minh City.*

**III. METHODOLOGY**

**3.1. Research samples**

Data was collected from April 2024- August 2024. Out of the 350 questionnaires that were issued, a total of 331 responses were recorded, resulting in the data of 312 valid responses, which is 89.14% of desirable questionnaires. This meets the conditions of the size and composition of the sample. Thus, the size of sample 312 observations is considered acceptable for analysis.

A 5-point Likert scale was used to measure the observed variables. The observed variables were assessed using this scale, where a value of 1 corresponds to "strongly disagree," 2 corresponds to "disagree," 3 corresponds to "neutral," 4 corresponds to "agree," and 5 corresponds to "strongly agree".

**3.1.2. Research model**

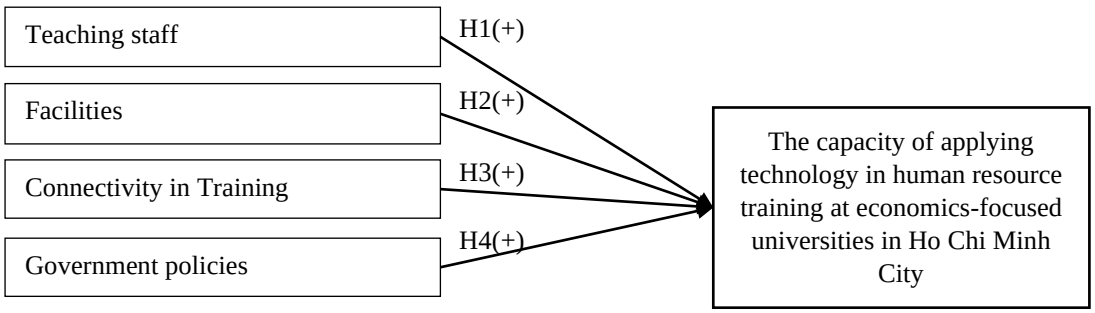



**Figure 3. Research model**

**3.1.3. Research method**

The article employs a quantitative research method using the PLS-SEM model (Partial Least Squares Structural

Equation Modeling) to test and evaluate the structure of the research model. The process includes the following steps: first, assessing the measurement models for construct validity, reliability, and discriminant validity; next, conducting multicollinearity analysis; then analyzing the structural model and evaluating the fit of the regression model; and finally, reporting the results of the PLS-SEM analysis.

## IV. RESEARCH RESULTS AND DISCUSSIONS

### 4.1. Descriptive Statistics and Tests

**Table 2. Composite reliability**

| | Cronbach's alpha | Composite reliability (CR) | Average variance extracted (AVE) |
|---|---|---|---|
| **CCCS** | 0,963 | 0,973 | 0,900 |
| **CSVC** | 0,910 | 0,937 | 0,789 |
| **GV** | 0,901 | 0,931 | 0,771 |
| **NLUD** | 0,895 | 0,927 | 0,761 |
| **TLK** | 0,949 | 0,963 | 0,866 |

The Cronbach's alpha and composite reliability (CR) for each latent construct shown in Table 1 to evaluate the reliability of the scales. For all constructs, the calculated Cronbach's alpha values exceeded 0.7 indicating an acceptable level of internal consistency (Taber, 2018). Also, (Hair et al., 2017) note that the CR value should be more than 0.7 and the Average Variance Extracted (AVE) should be more than 0.5 that will ensure reliability and convergent validity.

**Table 3. Discriminant validity**

| | CCCS | CSVC | GV | NLUD | TLK |
|---|---|---|---|---|---|
| **CCCS** | | | | | |
| **CSVC** | 0,378 | | | | |
| **GV** | 0,309 | 0,642 | | | |
| **NLUD** | 0,450 | 0,660 | 0,610 | | |
| **TLK** | 0,497 | 0,567 | 0,493 | 0,612 | |

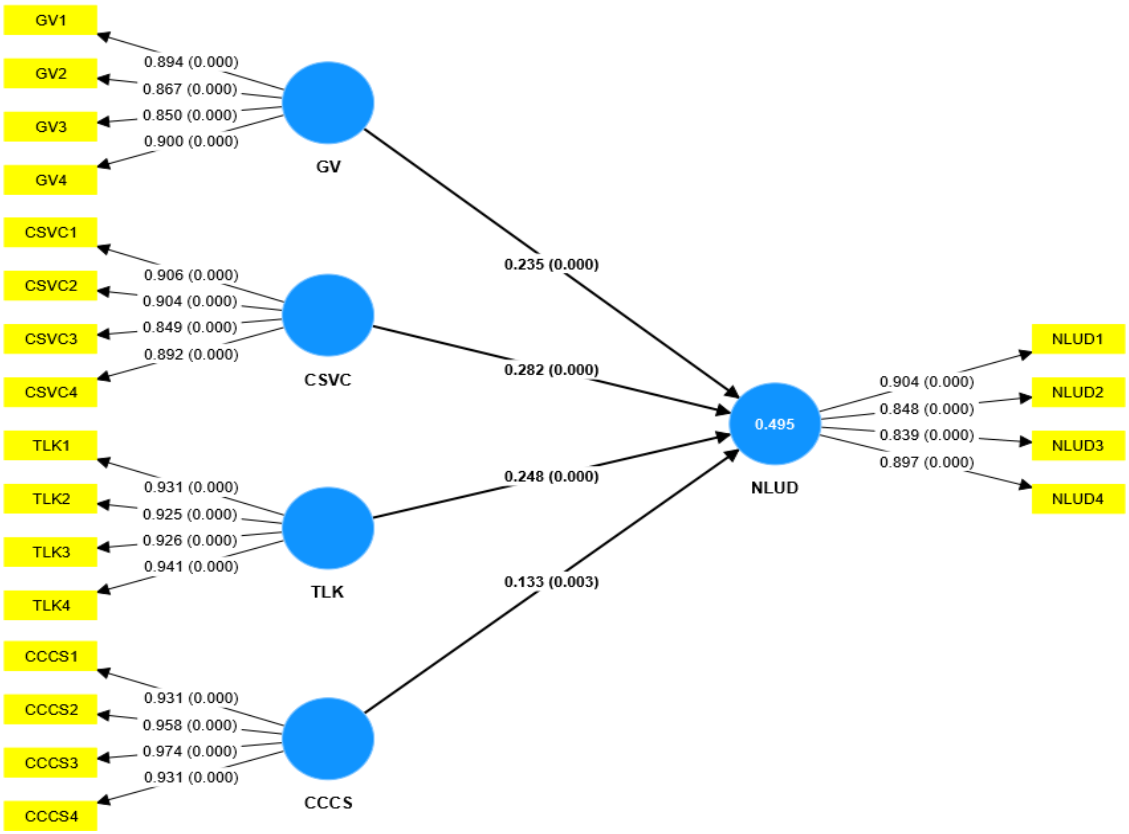



**Figure 4. Structural equation modeling (PLS- SEM)**

According to Henseler et al. (2015), the Heterotrait–Monotrait (HTMT) correlation values to evaluate the discriminant validity (PLS method) must be less than 0,900. All the values represented in this table are below 0.85, thus confirming the discriminant validity of the constructs. These findings demonstrate the reliability and validity of the scales, thus confirming the validity of the research model. Furthermore, the model's predictive capability and the causal relationships between the constructs are statistically significant (Figure 2).

Figure 2 below illustrates an R-squared value of 0.495 for the estimated equation, indicating statistical significance at the 1% threshold. Furthermore, the adjusted R-squared value suggests that 49.5% of the variation in IT application capacity in training can be explained by factors such as faculty, infrastructure, connectivity in training, and policy mechanisms.

Figure 2 presents the comprehensive results from applying the bootstrapping method to test the hypotheses. This method evaluates the significance of the relationships between variables by performing a bootstrapping process with 5,000 resamples, conducted using the Smart PLS software. Besides, the presented PLS-SEM model examines the factors influencing IT application capacity in training (NLUD), with Faculty (GV), Infrastructure (CSVC), Connectivity in Training (TLK), and Policy Mechanisms (CCCS) as independent variables. The R-squared ($R^2$) value of 0.495 indicates that 49.5% of the variance in IT application capacity is explained by these factors. Each latent variable is measured by observed variables with strong factor loadings above 0.8, confirming the reliability of the measurement model.

Among the variables, Facilities (CSVC) have the strongest impact (0.282, p = 0.000), followed by Connectivity in Training (TLK) (0.248, p = 0.000) and Teaching staff (GV) (0.235, p = 0.000). Government policies (CCCS) also have a positive but smaller effect (0.133, p = 0.003). These results highlight the critical role of infrastructure, collaboration, and faculty development in fostering IT application capacity, with policy mechanisms providing a supportive framework.

**Table 4. Inner VIF values**

| | NLUD |
|---|---|
| CCCS | 1,320 |
| CSVC | 1,768 |
| GV | 1,600 |
| TLK | 1,659 |

Table 3 presents the results of evaluating the inner VIF coefficients to detect multicollinearity. According to Hair và cộng sự (2013), multicollinearity occurs in the model when VIF values exceed 4.0. In Table 3, all VIF values are below this threshold, indicating no presence of multicollinearity in the model.

### 4.2. Research results and discussions

**Table 5. Hypothesis testing results**

| Hypotheses | Path | β | P Values | Accept/ Reject |
|---|---|---|---|---|
| $H_1$ | GV -> NLUD | 0.235 | 0.000 | Accept |
| $H_2$ | CSVC -> NLUD | 0.282 | 0.000 | Accept |
| $H_3$ | TLK -> NLUD | 0.248 | 0.000 | Accept |
| $H_4$ | CCCS -> NLUD | 0.133 | 0.003 | Accept |

The results in Table 4 indicate that all four hypotheses are accepted because the p-values are less than 5%. Additionally, the regression coefficients are greater than 0, indicating that factors such as faculty members, infrastructure, integration in training, and policies all have a positive impact on the ability to apply IT in training at certain universities in Ho Chi Minh City. Specifically:

First, the path coefficient from Teaching staff (GV) to IT application capability (NLUD) is 0.235, which is greater than 0, and the p-value is 0.000, less than 5%. This indicates that the factor of faculty members has a positive and statistically significant impact on the ability to apply IT in training. The research results are consistent with Van Hong

et al., (2018); Balanskat et al., (2006); Shirase et al., (2023); Mishra & Koehler (2006). Teaching staff play a critical role in facilitating IT adoption and integration in educational settings. Their skills, motivation, and readiness to embrace IT can directly influence how effectively technology is applied in training. The findings underscore the need for continuous professional development programs for faculty members. Equipping them with IT-related skills and knowledge can further enhance their ability to integrate IT into teaching and learning processes.

Second, the path coefficient of Facilities on IT application capability is 0.282 > 0, and p-value = 0.000 < 5%. Thus, the Facilities factor positively influences IT application capability in the training process, which is statistically important. The empirical findings are coherent with the works of (Do, 2013; Gómez & Vargas, 2012; Iftikhar et al., 2019; Jawed & Siddiqui, 2019; Kaplan et al., 2001; Mugizi & Rwothumio, 2024; Phung, 2020; Winter, 2009). Infrastructure is represented as physical facilities, including concept-based classrooms with advanced technology, reliable internet, access to software and computers required for IT applications during training.

Third, it can be seen that the path coefficient corresponding to the effect of the training connectivity factor on the capacity of applying IT in providers' human resource training is 0.248, which is greater than zero, while the p-value is 0.000, lower than 5%. This suggests that the connectivity factor of training positively contributes to the proficiency of applying IT in training and is statistically significant. For other universities, accounting is suitable for economics-focused universities in Ho Chi Minh City. It shows that improved connection in training opens opportunities for IT application, and human resource training can be integrated appropriately. With a greater degree of interconnectedness, it is easier to align objectives, establish better communication channels, and provide access to shared resources, all of which are fundamental to adopting IT solutions.

Finally, the path coefficient of the government policy factor for the capacity of applying IT in human resource training is 0.133 > 0, and the value is 0.003 < 5%. It means that state/government policies have a positive effect and are statistically significant on the capacity of applying IT in training. These findings correspond with what Reynolds (2020) found. IT has been increasingly used in human resource training in the context of economics universities in Ho Chi Minh City, and government policies are a decisive factor in the application of IT in training activities.

## V. CONCLUSION AND LIMITATION

Based on theories related to training activities and the application of IT in education, the authors have identified four main factors influencing the capability of applying IT in training at universities in the Ho Chi Minh City area: faculty, infrastructure, training connectivity, and government policies. Using the PLS-SEM model, the research findings show that these factors have a positive and statistically significant impact on the IT application capability in training.

Additional, based on these results, the article provides several policy recommendations to enhance the IT application capability in training at universities in the Ho Chi Minh City area, focusing on faculty, infrastructure, training connectivity, and government policies. Despite achieving certain results, the article has the following limitations such as the survey sample limiting to the Ho Chi Minh City area; therefore, the results are only valid with a certain level of reliability. As a result, future studies could expand the survey scope nationwide rather than just in the Ho Chi Minh City area.

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# THE IMPACT OF BLOCKCHAIN TECHNOLOGY ON RECRUITMENT PERSONNEL BRAND: THE MEDIATING ROLE OF CANDIDATE EXPERIENCE AND TRANSPARENCY IN THE HIRING PROCESS

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**ABSTRACT**

This study explores the role of blockchain technology in employer brand building, with a particular focus on the intermediary role of applicant experience and transparency in the recruitment process of Vietnamese financial enterprises. Utilizing data collected from 438 valid responses, this study employs quantitative methods and a SmartPLS structural model to analyze the relationships among the study variables. The findings indicate that BC not only exerts a direct impact on the employer brand but also demonstrates an indirect effect by enhancing the candidate experience and increasing transparency in the recruitment process. Candidate experience and transparency are significant mediators that contribute to improving trust, satisfaction, and brand recognition of organizations in the labor market. This study also provides practical recommendations, including the implementation of BC to ensure transparency, data security, and automation of the recruitment process, thereby enhancing the candidate's overall experience and strengthening the employer's brand value. The results of this research not only complement the existing literature but also present a comprehensive model that elucidates the complex interrelationships between BC, candidate experience, transparency, and Recruitment personnel brand

*Keywords*: "Blockchain", "Candidate Experience", "Recruitment personnel brand", "transparency during the recruitment process".

## I. INTRODUCTION

In an increasingly competitive labor environment, the development and maintenance of an employer brand has become a paramount priority for organizations. A robust employer brand not only facilitates the attraction and retention of talent but also enhances the organization's image as a professional, trustworthy, and desirable entity (Ambler & Barrow, 1996). However, previous studies have predominantly focused on traditional factors such as remuneration policies, organizational culture, and career development opportunities, while the potential of technology, particularly BC technology, has not been fully explored (Kaur et al., 2020; Kumar et al., 2022).

BC technology, characterized by its transparency, security, and process optimization capabilities, has engendered significant transformations in various domains, including human resource management and recruitment. BC provides an immutable data-storage system that ensures transparency, mitigates bias factors, and enhances the reliability of the recruitment process (Ta'Amnha et al., 2021). Concurrently, this technology enhances candidate experience through process automation and minimization of processing time, resulting in increased candidate satisfaction (Sule & Wani, 2024). These benefits not only improve operational efficiency but also contribute significantly to the development and reinforcement of employer brands.

The role of BC in employer branding is further emphasized through its ability to build trust and credibility. Organizations leveraging BC for recruitment can assure candidates of a fair and unbiased selection process because BC eliminates manipulation and fraud in credentials (Kurek, 2021). Additionally, BC facilitates secure and seamless data sharing between recruiters and job applicants, reducing administrative burdens and increasing efficiency (Kişi 2022). This technological advancement aligns with the growing preference for digital trust mechanisms in workforce management, reinforcing employers' commitment to innovation and fairness.

Numerous studies have examined the impact of BC on recruitment personnel brands, including Kumar et al. (2022), Kurek (2021), Kişi (2022), Chunmian et al. (2022), Ingold (2021), and Sule & Wani (2024). However, a research gap persists regarding the mediating role of candidate experience and transparency in the recruitment process

regarding the relationship between BC and employer brands. Previous studies, such as those by Sule and Wani (2024) and Kumar et al. (2022), have primarily focused on how BC enhances transparency or candidate experience but have not thoroughly investigated the interconnection and impact of these factors on employer brands. To provide a more comprehensive understanding of BC's role of BC in employer branding, this study incorporates various industry case studies in which organizations successfully implement BC to enhance recruitment efficiency and employer brand perception. For example, companies in the fintech sector such as IBM and JPMorgan have adopted BC to secure credential verification, reduce hiring risks, and ensure data integrity (Chunmian et al., 2022). Similarly, multinational corporations such as Accenture have integrated BC into HR analytics to enhance hiring precision and talent management (Ingold, 2021). These real-world applications exemplify BC's potential to transform traditional recruitment models while reinforcing an employer's reputation as a technologically adept and forward-thinking organization. In this context, this study explores the mediating role of candidate experience and transparency in the hiring process, elucidating how these factors interact and influence an organization's brand identity. Furthermore, the research incorporates BC within the context of the recruitment personnel brand, presenting a contemporary approach aligned with evolving technological trends. Through the integration of modern technology and management elements, this study offers practical recommendations to assist organizations in improving their recruitment processes, thereby fostering a more robust employer brand.

## II. MATERIAL AND METHOD

### 2.1. The influence of Blockchain technology on Recruitment personnel brand

BC technology is increasingly being applied in human resource management, particularly in the development and enhancement of employer brands. BC not only optimizes the management process but also creates significant value for employer brands through four key aspects: transparency, security, efficiency, and competitive advantage.

*Transparency in the recruitment process*: BC enhances transparency by immutably recording all data and transactions, thereby eliminating opacity in recruitment (Ta'Amnha et al., 2021; Kumar et al., 2022). This not only increases candidate confidence in the process, but also establishes the organization's image as fair and trustworthy. Sule and Wani (2024) emphasize that transparency is a crucial factor in improving employer brand reputation. A clear and transparent recruitment process for evaluating applications and making decisions enables candidates to feel valued, which in turn significantly enhances an organization's reputation.

*Security and trust*: Owing to its distributed data storage mechanism, BC provides a high level of security, ensuring the protection of sensitive candidate information from personal records to assessment results (Kumar et al., 2022). Effective data protection not only prevents fraud and information leaks but also builds trust among candidates. An organization capable of protecting candidate privacy will strengthen its employer brand image, while fostering long-term trust between candidates and current employees (Ta'Amnha et al., 2021).

*Efficiency and candidate experience*: BC automates the profile verification process, minimizing processing time, and increasing recruitment efficiency (Sule & Wani, 2024). This not only improves the candidate's experience, but also encourages them to share positive reviews about the organization, thereby enhancing the employer brand (Kaur et al., 2020). Candidates typically express higher satisfaction when they receive prompt and clear feedback, which can be readily facilitated by BC.

*Competitive advantage in the labor market*: The application of BC in recruitment enables organizations to distinguish themselves in the labor market through a transparent, efficient, and fair process. This is a critical factor that assists organizations in attracting and retaining talent (Kaur et al., 2020). Kumar et al. (2022) assert that BC not only enhances reputation but also improves the competitiveness of organizations in building Recruitment personnel brand. An organization that implements this technology not only demonstrates modernity and professionalism but also establishes an image as a reliable workplace.

Thus, BC has been exerting evident positive impacts on recruitment personnel brands through three primary factors: transparency, security, and optimization of the candidate experience. This technology not only improves the efficiency of the recruitment process but also enhances the reputation and brand value of the organization in terms of the perception of candidates and the labor community.

### 2.2. Research hypotheses

#### 2.2.1. The relationship of Blockchain (BC) and Recruitment personnel brand (RBP)

BC technology enhances transparency, security, and efficiency in human resource management processes, particularly in verifying candidate information and improving labor experience (Ta'Amnha et al., 2021; Sule & Wani, 2024). This capability not only minimizes recruitment costs but also fosters trust and engagement from employees and candidates. According to Ambler and Barrow (1996), recruitment personnel brands comprise the synthesis of the economic, psychological, and functional values that businesses provide to employees, thereby creating attractiveness for both current and potential employees. Studies show that these values play a significant role in increasing employee engagement and performance (Bhasin et al. 2019). Moreover, BC, with its capacity to increase transparency in the recruitment process, enhances trust from candidates and employees and establishes the company's image as a trustworthy working environment (Sule & Wani, 2024). This technology also enables businesses to manage HR data more accurately, personalizing the experiences of candidates and employees, thereby enhancing satisfaction and loyalty (Ta'Amnha et al., 2021). Furthermore, BC assists businesses in gaining a competitive advantage by attracting talent by demonstrating commitment to fairness and transparency in the recruitment process (Kumar et al., 2022). Based on this foundation, the following hypothesis is proposed.

*H1: Blockchain has a positive effect on Recruitment personnel brand (RBP)*

#### 2.2.2. The relationship of Blockchain and Candidate Experience

BC technology introduces significant improvements to HR processes by ensuring transparency, security, and the ability to minimize the time required to verify candidate information. These characteristics facilitate enhanced, expedited, and equitable experiences for candidates throughout the recruitment journey (Ta'Amnha et al., 2021; Sule & Wani, 2024). Candidate experiences encompass their perceptions and evaluations of business interactions throughout the hiring process, from application and interviews to the final decision. A positive experience not only supports businesses in attracting talent, but also contributes to establishing a strong employer brand image (Kaur et al., 2020; Kumar et al., 2022). Additionally, BC plays a crucial role in enhancing transparency and accuracy in information verification, helping minimize waiting times and improve candidate satisfaction (Sule & Wani, 2024). This technology also promotes fairness through its capacity to transparently store and retrieve data, instilling a sense of trust and assurance in candidates (Kumar et al., 2022). Furthermore, BC optimizes the processing time of administrative tasks, rendering the recruitment process more efficient and expeditious (Ta'Amnha et al. 2021). Given these benefits, this study proposes the following hypotheses:

*H2: BC has a positive impact on Candidate Experience.*

#### 2.2.3. The relationship of BC and Transparency in the Recruitment Process

The BC technology is distinguished by its capacity to store information in a transparent, immutable, and readily verifiable manner. Transactions and data stored in the BC are unalterable, which enhances the reliability and transparency of the recruitment process (Sule & Wani, 2024). A transparent recruitment process engenders a greater sense of security and fairness for candidates, particularly when all aspects from profile verification to the evaluation process are publicly accessible (Ta'Amnha et al., 2021). Furthermore, BC not only facilitates accurate storage and retrieval of candidate data but also minimizes errors or fraudulent recruitment activities, ensuring that all information is verified and publicly transparent (Kumar et al., 2022). With the capability to track and render every step of the recruitment process transparent, BC mitigates the impact of bias factors, thereby ensuring enhanced fairness and objectivity (Sule & Wani, 2024). Consequently, BC fosters trust between candidates and employers, and improves the efficiency and integrity of the recruitment process (Ta'Amnha et al., 2021). Based on these benefits, the following hypothesis is proposed.

*H3: BC has a positive impact on Transparency in the recruitment process*

#### 2.2.4. The relationship of Transparency in the Recruitment Process and Candidate Experience

Transparency in the recruitment process is manifested through the provision of clear, accurate, and readily accessible information on the recruitment steps, requirements, and progress. This facilitates the candidates'

comprehension of the process in which they are involved, thereby engendering a sense of security and fairness (Sule and Wani 2024). The candidate experience encompasses all their perceptions and evaluations throughout their interaction with the organization, from application submission to the receipt of the hiring decision. A positive experience not only enables organizations to attract talent but also contributes to enhancing the employer's brand image (Kaur et al., 2020; Kumar et al., 2022). Transparency in recruitment engenders trust, reduces anxiety for candidates, and consequently, increases their satisfaction levels (Ta'Amnha et al., 2021). When information is clearly disseminated, transparency aids in eliminating elements of bias and ensuring the equitable treatment of all candidates, thereby fostering a more positive experience (Sule & Wani, 2024). Moreover, providing timely feedback engenders a sense of respect in candidates, reinforcing a positive impression of the organization (Kumar et al., 2022). Kaur et al. (2020) assert that transparency in the recruitment process significantly enhances candidates' perceptions of fairness and professionalism. Sule and Wani (2024) emphasized that the public disclosure of recruitment processes and criteria enhances the candidate experience through increased clarity and comprehensibility. According to Ta'Amnha et al. (2021), transparency not only augments trust, but also reduces ambiguity, facilitating a more favorable experience for candidates. Therefore, this study proposes the following hypothesis:

*H4: Transparency in the hiring process positively affects Candidate Experience.*

**2.2.5. The relationship of Transparency in the Recruitment Process and Recruitment personnel brand**

Transparency in the recruitment process not only enhances candidates' sense of security but also ensures fairness and strengthens trust in the organization (Sule & Wani, 2024). Furthermore, transparency plays a crucial role in fostering trust and respect among current candidates and employees, thereby improving the overall organizational image (Ta'Amnha et al., 2021). Additionally, a strong brand not only enables the organization to distinguish itself in the labor market but also establishes a professional and reliable organizational image (Ambler & Barrow, 1996). When the hiring process is transparent, candidates and current employees perceive fairness, thus reinforcing trust and enhancing the credibility of the organization (Kumar et al., 2022). Transparency also demonstrates an organization's commitment to integrity and professionalism, thereby enhancing its reputation and brand recognition (Sule & Wani, 2024). When candidates are satisfied with the transparency of the recruitment process, they are inclined to share positive impressions, which contribute to the development of a strong employer brand (Kaur et al., 2020). According to Ta'Amnha et al. (2021), transparency serves as the foundation for organizations to build a trusted employer brand. Sule and Wani (2024) emphasized that transparency demonstrates a commitment to fairness and integrity, contributing to enhanced credibility. Kumar et al. (2022) demonstrate that transparency improves the candidate experience, thereby enhancing reputation and brand recognition. Based on this, we propose the following hypothesis:

*H5: Transparency in the recruitment process positively affects the Recruitment personnel brand*

**2.2.6. The relationship of Candidate Experience and Recruitment personnel brand**

A positive experience not only enables organizations to attract talent but also establishes a professional and strong brand image (Kaur et al., 2020). According to Ambler and Barrow (1996), employer brands are formed from the economic, psychological, and functional values provided by organizations to attract and retain talent. A strong brand enables organizations to enhance their competitiveness in the labor market and strengthen their reputation among candidates and the community. A candidate's positive experience increases the likelihood of sharing favorable impressions of the organization, thereby enhancing the employer's brand recognition and reputation (Sule & Wani, 2024). Concurrently, a fair, transparent, and amicable hiring process not only builds trust but also highlights the core values and culture of the organization (Kumar et al., 2022). Notably, even if candidates are not selected, they may still provide positive reviews, creating conditions for organizations to attract more qualified candidates in the future (Kaur et al., 2020). Sule and Wani (2024) affirmed that positive experiences not only improve candidate satisfaction, but also disseminate a positive image of the organization within the labor community. Therefore, this study proposes the following hypothesis:

*H6: Candidate experience positively influences Recruitment personnel brand*

**2.2.7. The Intermediary role of Candidate Experience (CE) and Transparency in the Recruitment Process (TRP)**

BC significantly enhances transparency, security, and efficiency in the recruitment process, particularly by

reducing the time required to verify candidate information and improving satisfaction (Ta'Amnha et al., 2021; Sule & Wani, 2024). This technology facilitates a clear, accurate, and equitable hiring process, enabling candidates to have favorable and positive experiences. This positive experience not only fosters candidate appreciation for the organization but also disseminates positive impressions, contributing to the enhancement of the employer's reputation and brand value (Kaur et al., 2020). Furthermore, BC ensures transparency in the recruitment process through its capacity to store and retrieve data in an immutable manner, thereby eliminating opacity and enhancing trust (Kumar et al. 2022). Transparency not only engenders trust from candidates, but also strengthens the employer's image and brand reputation (Sule & Wani, 2024). Sule and Wani (2024) emphasized that BC facilitates a positive candidate experience, which leads to a significant improvement in branding. Similarly, Kaur et al. (2020) assert that candidate experience plays a crucial role in increasing brand value. Kumar et al. (2022) also indicate that transparency in the hiring process, enabled by BC, not only enhances trust but also improves an organization's reputation. According to Ta'Amnha et al. (2021), transparency is a fundamental factor in improving brand identity and value. Based on these theoretical foundations, this study proposes the following hypotheses:

*H7: Candidate experience acts as an intermediary between BC and Recruitment personnel brand*

*H8: Transparency in the recruitment process acts as an intermediary between the BC and Recruitment personnel brand*

### 2.3. Proposed research model

Based on related hypotheses and theories, the author hypothesizes the following.

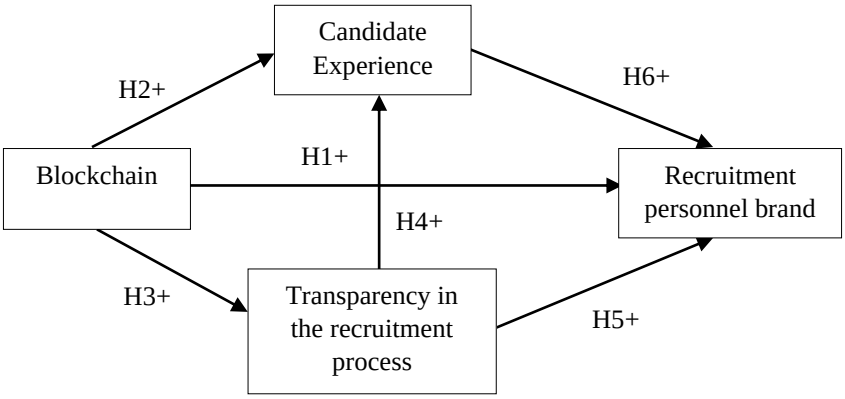



**Fig.1. Proposed research model**

## III. RESEARCH METHODS

To examine the relationships in the hypothetical model, this study employed quantitative methodology using data collected from employees and potential candidates in the recruitment process of Vietnamese financial enterprises. The survey was conducted between October and November 2024 using a structured questionnaire. Prior to implementing the official survey, a qualitative approach was applied through in-depth interviews to gather opinions and feedback from ten experts in the fields of human resources, BC technology, and corporate governance. The results of these interviews were used to adjust and refine the questionnaire, ensuring clarity, relevance, and comprehensibility of the survey content.

Data collection was performed using convenience sampling, with 450 responses received, of which 438 responses were deemed valid. The sampling technique was justified on the basis of its ability to reach a diverse set of respondents within a limited timeframe. Given the study's focus on understanding the impact of BC on employer branding, a non-probability sampling method was considered appropriate for targeting relevant participants actively engaged in recruitment processes. Data analysis was conducted in several phases using the SmartPLS software, including measurement model testing and structural modeling. SmartPLS was chosen because of its advantages in handling complex models with latent variables, small to medium sample sizes, and ability to assess both direct and indirect effects within the model. The Partial Least Squares Structural Equation Modeling (PLS-SEM) approach was applied to validate the proposed hypotheses as it enables efficient estimation of causal relationships while minimizing

multicollinearity issues. To ensure accuracy and reliability, the scale was evaluated using convergent validity, discriminant validity, and composite reliability (CR). The Cronbach's alpha coefficient was calculated to assess the internal consistency of the measurement variables. Factor loadings above 0.70, AVE values above 0.50, and CR values above 0.70 were used as the criteria for scale reliability and validity. The study strictly adhered to ethical principles, including obtaining informed consent from participants through survey consent forms and ensuring complete data confidentiality and anonymity. Participants were informed of their right to withdraw at any time if they experienced discomfort.

## IV. RESULT AND DISCUSSION

### 4.1. Common Method Variance Bias Test (CMB)

The author examines the variance inflation coefficient (VIF) values, as recommended by Kock (2015). The VIF values reported for the structures ranged from 1 to 1,661 (Table 1), which is well below the recommended limit of 5, confirming the absence of CMB.

**Table 1. Inner VIF Value**

| | BC | CD | PRB | TRP |
|---|---|---|---|---|
| **BC** | | 1.317 | 1.537 | 1.000 |
| **CD** | | | 1.565 | |
| **RPB** | | | | |
| **TRP** | | 1.317 | 1.547 | |

***Note:*** *Blockchain – BC; Candidate Experience – CD; Transparency in the recruitment process – TRP; Recruitment personnel brand -RPB*

*Source: Quote from PLS*

### 4.2. Reliability Measurement

The partial least squared structure equation model (PLSSEM) was employed to analyze the data. The factor-loading values (Table 2) were examined to assess convergent reliability. All factor loading values exceeded the recommended threshold of 0.7 (Hair et al. 2019). Furthermore, the Cronbach's Alpha values were all above the minimum threshold of 0.7 and below 0.95 (Hair et al., 2019), confirming the internal consistency reliability of the constructs (Table 3). These findings indicate that the model demonstrates high reliability and can be used for subsequent analysis.

**Table 2. Factor Load Factor**

| Element | Question | Factor loading | VIF |
|---|---|---|---|
| **Blockchain BC** | BC1: BC technology enhances transparency in the recruitment process. | 0.811 | 1.700 |
| | BC2: BC reduces the time to process and verify candidate information. | 0.838 | 1.876 |
| | BC3: BC improves accuracy and minimizes errors in the recruitment process. | 0.786 | 1.686 |
| | BC4: BC helps store candidate information in a secure and reliable way. | 0.807 | 1.815 |
| **Candidate Experience CD** | CD1: I feel satisfied with the recruitment experience at this business. | 0.818 | 1.561 |
| | CD2: The business facilitates me to understand the steps in the recruitment process. | 0.846 | 1.802 |
| | CD3: I feel respected and fair throughout the hiring process | 0.861 | 1.757 |
| **Transparency in the recruitment process TRP** | TRP1: The recruitment process of businesses is carried out in a transparent and clear way | 0.785 | 1.931 |
| | TRP2: The enterprise provides full information about the steps and evaluation criteria in recruitment. | 0.832 | 1.732 |
| | TRP3: I feel that the recruitment process of this business is fair | 0.850 | 2.524 |
| | TRP4: Clear and timely feedback from businesses throughout the recruitment process | 0.841 | 2.231 |

| | | | |
|---|---|---|---|
| **Recruitment personnel brand RPB** | RPB1: This business has a professional and reliable feel. | 0.785 | 1.788 |
| | RPB2: I would recommend this business as an attractive place to work. | 0.832 | 1.974 |
| | RPB3: Transparent recruitment process helps improve the brand image of the business | 0.850 | 2.041 |
| | RPB4: This business made a positive impression on me through the recruitment process | 0.841 | 1.938 |

*Source: Quote from PLS*

The aggregate reliability value exceeded the recommended threshold of 0.7 (Hair et al. 2019). Furthermore, the interpreted mean variance value (AVE) also surpassed the threshold of 0.5 (Hair et al., 2019). The criteria of Fornell and Larcker (1981) were applied to establish the discriminant validity (Table 3). Additionally, heterotrait-monotrait (HTMT) analysis was conducted to assess discriminant validity. As presented in Table 4, all the HTMT values were below the threshold of 0.9, as recommended by Henseler et al. (2015).

**Table 3. Reliability and value**

| | CA | CR | AVE | BC | CD | PRB | TRP |
|---|---|---|---|---|---|---|---|
| **BC** | 0.823 | 0.885 | 0.657 | 0.811 | | | |
| **CD** | 0.795 | 0.880 | 0.709 | 0.832 | 0.842 | | |
| **RPB** | 0.847 | 0.879 | 0.685 | 0.692 | 0.689 | 0.827 | |
| **TRP** | 0.811 | 0.875 | 0.637 | 0.491 | 0.505 | 0.594 | 0.798 |

***Note:*** *CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted*

*Source: Extracted from PLS*

**Table 4. Heterotraite - Monotraite (HTMT) Analysis**

| | BC | CD | PRB | TRP |
|---|---|---|---|---|
| **BC** | | | | |
| **CD** | 0.650 | | | |
| **RPB** | 0.822 | 0.838 | | |
| **TRP** | 0.589 | 0.624 | 0.700 | |

**Note:** *Blockchain – BC; Candidate Experience – CD; Transparency in the recruitment process – TRP; Recruitment personnel brand -RPB*

*Source: Extracted from PLS*

### 4.3. Hypothesis testing

**Table 5. Hypothesis test results**

| Hypothesis | Relationship | Original Sample (O) | Standard deviation (STDEV) | *t-value* | *p-Value* | Supported |
|---|---|---|---|---|---|---|
| H1 | BC→ RPB | 0.629 | 0.029 | 24.045 | 0.000 | Yes |
| H2 | BC → CD | 0.532 | 0.045 | 11.742 | 0.000 | Yes |
| H3 | BC → TRP | 0.491 | 0.505 | 9.735 | 0.000 | Yes |
| H4 | TRP → CD | 0.321 | 0.061 | 5.274 | 0.000 | Yes |
| H5 | CD → RPB | 0.389 | 0.041 | 9.477 | 0.000 | Yes |
| H6 | TRP → RPB | 0.335 | 0.042 | 8.067 | 0.000 | Yes |

*Source: Extracted from PLS*

Table 5 presents the results of the hypothesis validation, with all hypotheses (H1–H6) accepted at a high significance level (p = 0.000). This result indicates a positive and statistically significant relationship between the variables in the study model. H1: Blockchain (BC) → recruitment personnel brand (RPB), coefficient: 0.629, t-value: 24.045. Bottom Line: Blockchain has a direct positive impact on the recruitment personnel brand. H2: Blockchain (BC) → Candidate Experience (CD), coefficient: 0.532, t-value: 11.742. Conclusion: Blockchain has a positive impact on candidate experience. H3: Blockchain (BC) → Transparency in Recruitment Process (TRP), Coefficient: 0.491,t-value:

9.735. Conclusion: Blockchain improves transparency in the hiring process. H4: Transparency in Recruitment Process (TRP) → Candidate Experience (CD), coefficient: 0.321, t-value: 5.274. Bottom Line: Transparency in the hiring process positively affects candidate experiences. H5: Candidate Experience (CD) → recruitment personnel brand (RPB), coefficient: 0.389, t-value: 9.477. Bottom Line: Candidate experience has a positive impact on the recruitment personnel brand. H6: Transparency in Recruitment Process (TRP) → recruitment personnel brand (RPB) coefficient: 0.335, t-value: 8.067. Bottom Line: Transparency in the recruitment process has a positive impact on employer brands. Thus, the results in Table 5 emphasize that blockchain technology not only has a direct impact on the employer brand but also indirectly through improving the candidate experience and enhancing transparency in the recruitment process. This is an important basis for businesses to invest in BC applications to optimize the recruitment process and improve brand value. The findings presented in Table 5 show that all hypotheses (H1–H6) were accepted with a high degree of significance (p = 0.000), indicating a positive and significant relationship between the study variables.

### 4.4. Intermediary Role Analysis

**Table 6. Intermediary Role Analysis**

| Relationship | Original Sample (O) | Standard deviation (STDEV) | *t-value* | *p-Value* |
|---|---|---|---|---|
| BC → CD | 0.374 | 0.054 | 6.874 | 0.000 |
| BC→ RPB | 0.382 | 0.041 | 9.410 | 0.000 |
| BC → TRP | 0.491 | 0.050 | 9.735 | 0.000 |
| CD → RPB | 0.389 | 0.041 | 9.477 | 0.000 |
| TRP → CD | 0.321 | 0.061 | 5.274 | 0.000 |
| TRP → RPB | 0.210 | 0.036 | 5.904 | 0.000 |
| BC → CD→ RPB | 0.146 | 0.027 | 5.352 | 0.000 |
| BC → TRP→ RPB | 0.103 | 0.020 | 5.204 | 0.000 |

*Source: Extracted from PLS*

Table 6 demonstrates that candidate experience and transparency in the recruitment process both serve as significant mediators between BC technology and recruitment personnel brand. The t-value and p-value both indicate statistical significance, supporting the hypothesis that BC not only directly influences employer brands but also indirectly by enhancing the candidate experience and increasing transparency in the hiring process. Specifically, the mediating role of candidate experience: Bootstrapping values indicate that candidate experience is a significant intermediary factor between BC and Recruitment personnel brands. This aligns with the findings of Kaur et al. (2020), in which candidate experience is identified as a core factor that contributes to brand value. The mediating role of transparency: Transparency in the recruitment process has also been confirmed as a mediating factor, contributing to increased trust from candidates and enhancing the reputation of the organization, consistent with studies by Ta'Amnha et al. (2021) and Kumar et al. (2022). The results in Table 6 emphasize that these mediating factors are not only independent but also interact with each other, creating a comprehensive and complex relationship between BC and employer brands. This provides a foundation for organizations to focus on implementing BC and optimizing candidate experiences and transparency factors to enhance their brand image.

## V. CONCLUSION

### 5.1. Conclusion

This study investigates the role of BC technology in recruitment personnel brands with a specific focus on the mediating role of candidate experience and transparency in the recruitment process. The research findings indicate that BC not only directly impacts employer brands but also indirectly influences them through two significant intermediary factors: candidate experience and transparency. These results provide a more comprehensive understanding of how BC can enhance HR management efficiency, while simultaneously strengthening an organization's image and brand value. In comparison to previous research, this study offers novel contributions and elucidates complex relationships: (1) Direct Impact of BC: BC is identified as having a direct positive impact on employer brands, aligning with the findings of Kumar et al. (2022) and Sule & Wani (2024), where BC is considered a crucial tool for increasing transparency and

efficiency in recruitment; (2) The mediating role of candidate experience: The study confirms that candidate experience serves as an intermediary factor between BC and Recruitment personnel brand, complementing the conclusion of Kaur et al. (2020), in which candidate experience is regarded as a core factor in enhancing brand value; (3) transparency in the recruitment process, which corroborates the findings of Ta'Amnha et al. (2021) and Kumar et al. (2022), emphasizing that transparency not only engenders trust from candidates but also plays a significant role in constructing a robust employer brand. While previous studies, such as Sule and Wani (2024), have primarily focused on individual factors, such as transparency or candidate experience, this study integrates both factors into a comprehensive analytical model. This integration elucidates their intermediary role in connecting BC to employer brands. This study provides practical recommendations for organizations to implement BC technology to enhance the recruitment process, thereby constructing a stronger, more contemporary, and more credible employer brand.

### 5.2. Administrative implications

Based on the research findings, the following managerial implications are proposed to assist organizations in optimizing recruitment personnel brands through the integration of BC technology and enhancing candidate experience:

Integrating BC into the recruitment process: Organizations should implement BC to ensure transparency in the recruitment process, from storing and retrieving candidate data to clearly delineating evaluation criteria. This approach not only enhances trust among candidates but also reinforces the organization's image as a fair and professional entity. Concurrently, BC should be used to manage and safeguard sensitive data, thereby demonstrating a commitment to privacy protection and fostering long-term trust among candidates.

Enhance candidate experience: Organizations need to provide clear information and timely feedback throughout the recruitment process, from application submission to result notification. BC can automate these processes, ensuring that candidates receive prompt and accurate responses. Reducing processing time and increasing fairness in the assessment will create a positive experience for candidates, even for those who are not selected. These favorable experiences encourage candidates to disseminate positive impressions of the organization, contributing to the enhancement of the employer's brand value.

Leverage BC to increase competitive advantage: Applying BC to the recruitment process not only helps organizations improve efficiency but also establishes an image as a modern, innovative, and technologically pioneering entity. A strong employer brand, supported by transparent and fair processes, will assist organizations in attracting talent, particularly in industries with high requirements for skills and credibility.

Training personnel to deploy BC effectively: Organizations need to invest in training personnel in BC technology to ensure that the integration of technology proceeds smoothly and yields maximum value. BC should be flexibly integrated with traditional elements, such as organizational culture and compensation policies, to optimize the overall experience of candidates.

Evaluation and Measurement of Effectiveness: Organizations need to establish specific key performance indicators (KPIs) to assess the effectiveness of BC in improving candidate experience and ensuring transparency in the recruitment process. Regularly monitoring and reviewing the impact of BC on employer branding and talent attraction will enable organizations to adjust their strategies in a timely and effective manner.

While BC offers significant advantages, organizations may face challenges in their implementation. These include high initial costs, resistance to technological change, and regulatory uncertainties. To overcome these challenges, organizations should adopt a phased approach to BC implementation, starting with pilot projects before full-scale deployment. Collaborate with industry regulators to ensure compliance with legal and ethical standards in data security and privacy and develop internal expertise by training HR personnel in BC-related applications to enhance efficiency and integration. Utilize industry benchmarks and best practices from sectors such as fintech and healthcare, where BC has been successfully implemented in recruitment and data verification. By addressing these challenges proactively and following best practices, organizations can maximize the benefits of BC in recruitment, ensuring a sustainable, transparent, and candidate-friendly hiring process. These efforts will ultimately contribute to a stronger employer brand and improve organizational performance.

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# STUDENTS FREELANCING TRENDS: HO CHI MINH CITY IN THE DIGITAL ERA

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**ABSTRACT**

In the digital era, freelancing has emerged as a prevalent career choice, particularly among the younger generation. This study investigates the factors influencing students' decisions to pursue freelance work in Ho Chi Minh City, Vietnam. The research specifically addresses the question: What are the key determinants driving students toward freelancing? Using a quantitative approach, data was collected through a convenience sampling method, surveying 135 students from various universities in Ho Chi Minh City. The study assessed five key factors: professional skills, financial independence, social influence, employment opportunities, and time management skills. The findings indicate that professional skills, financial independence, and employment opportunities significantly impact students' inclination toward freelancing, with professional skills being the most critical determinant. Conversely, social influence and time management skills did not have a substantial effect. These insights suggest that students should prioritize skill development and financial preparedness while leveraging digital platforms to maximize employment opportunities. Additionally, the study provides valuable implications for educators, policymakers, and career advisors in supporting students' transition into the evolving freelance economy.

*Keywords*: "Freelance working trends", "professional skills", "financial independence", "employment opportunities", "Ho Chi Minh City students".

## I. INTRODUCTION

The 21st century marks a revolutionary shift in the labor market, as digital technology and the digital era are changing every corner of life and the way of working. In this context, the trend of freelancing is becoming a promising way of working, attracting more and more people, especially young people. Digital platforms such as Upwork, Fiverr, or Freelancer not only provide flexible connection opportunities between service providers and customers, but also facilitate a new way of living and working – financial independence, time flexibility, and no geographical constraints. This trend has really crept into every aspect of the global economy.

In Ho Chi Minh City, the largest economic and educational center in the country, students are playing a pioneering role in embracing the freelance trend. With flexibility in the way of working, freelancing helps students both accumulate professional experience and achieve financial independence while still in school. However, students' decision to join this trend not only depends on personal desires, but is also influenced by many different factors. These factors not only shape the motivation to work freelancing, but also affect students' ability to adapt to the increasingly volatile digital labor market.

However, research on freelancing trends in Vietnam is still in its infancy. Most previous studies have focused on economics and technology, but have not fully considered factors for the student class – a group that is likely to become a significant freelance workforce in the future. In addition, while international studies have made great progress, they have largely focused on the context of developed countries, leaving a large gap in understanding the unique characteristics and needs of developing countries such as Vietnam.

Stemming from the above needs and urgency, the author chooses the topic "Factors affecting the trend of freelancing of students in Ho Chi Minh City in the digital era" for research and analysis. Through this study, we aim to explore and analyze the main factors affecting the decision of students in Ho Chi Minh City to work freelancing thereby proposing reasonable orientations for students, schools and policy managers in the context of the current digital economy.

## II. MATERIAL AND METHOD

### 2.1. Conceptual Foundation

#### 2.1.1 Social influence

Social influence refers to the alteration of an individual's thoughts, emotions, attitudes, or behaviors as a result of interactions with others, either individually or within a group context. It is important to distinguish social influence from related concepts such as conformity, power, and authority. Specifically, conformity involves an individual adopting certain opinions or behaviors not because they genuinely hold those beliefs or perceive the behaviors as appropriate, but rather to align with the expectations of others or to fit into a particular social context (French & Raven, 1959). Thus, while conformity is one form of social influence, it represents a specific case where external pressures shape individual actions without a change in internal beliefs.

The terms persuasion and social influence are often used interchangeably when explaining how someone's behavior or attitudes are changed by the influence of other people (Stibe, 2015) . Further, Stibe et al., (2019) have explained that, in contract to traditional tactics of persuasion, social influence can serve as much stronger catalyst for achieving sustainable changes, i.e. transformation.

Acording to Venkatesh et al., (2003) social influence is defined as the degree to which an individual perceives that those around them believe they should use a particular service. This research concept represents subjective norms (Ajzen, 1991). In the context of an increasing number of students tending to participate in freelance work, social influence means the degree to which the subject perceives that those around them believe that they should accept the use of technology information applied to their freelance work (Venkatesh et al., 2012).

#### 2.1.2 Personal skills

A key demand from employers is the ability of graduates to engage in lateral thinking, a crucial aspect of problem-solving (Holmes, 1995a). This necessitates a problem-based approach, fostering the development of creative and original solutions applicable in the workplace. Personal and interpersonal skills encompass a broad spectrum, encompassing both communication proficiency and effective teamwork dynamics. Consequently, employers prioritize graduates who excel as both team players and leaders (Holmes, 1995b). The capacity to function effectively both independently and as part of a group is an essential component of the desired graduate skillset (Rozien & Jepson, 1985). Graduates are expected to possess a nuanced understanding of social appropriateness in their interactions and task execution. Employers seek individuals who are "self-confident yet cognizant of their limitations" (Harvey & Bowes, 1988). A survey of small and medium-sized enterprises conducted by Harvey & Bowes (1988) highlighted the expectation that new hires demonstrate immediate value and contribute meaningfully from the outset. This ability to assume responsibility and exhibit leadership potential is highly valued across various sectors.

Harvey & Bowes (1998), findings further emphasized the preference for individuals with demonstrated leadership potential in a professional context. Prior effective leadership experiences often signify strong teamwork, effective listening, and motivational skills, while also demonstrating an individual's capacity to earn the respect of their peers. Organizational abilities, such as time management, effective planning, and strategic thinking, are indispensable in today's competitive graduate job market. These "meta-skills," alongside foreign language proficiency and Information and Communications Technology (ICT) competencies, are frequently identified as areas of skill deficiency within the contemporary graduate profile (Barnett, 1990).

McKenzie's (2024), research on freelancer training programs in El Salvador, Haiti, and Bangladesh reveals that while training helps individuals access online platforms, achieving long-term success remains a significant challenge. Low course completion rates, unstable income, and the rise of AI replacing low-skilled jobs highlight the need for students not only to access digital platforms but also to continuously enhance their expertise and adapt to technology to stay competitive in the global market.

#### 2.1.3 Financial independence

Countries with large economies require additional efforts from stakeholders to improve students' money management behaviours as there is a large communication gap (Kassim et al., 2022). However, it is evident from previous studies that personal income, financial attitude, and knowledge significantly influence Generation Z's financial behaviour (Pamikatsih et al., 2022). Nevertheless, there is a substantial relationship between financial literacy, self-

control, and peer influence on saving behaviour (Faisal et al., 2023). Another study among Gen Z reiterated the correlation between financial management and parental income, attitude, and knowledge (Fietroh & Mandasari, 2022). Parental influence led Gen Z to focus on generating money at a very young age (Mazzatto, 2022), thus pushing them to freelance while studying at university.

Financial independence encompasses a multifaceted set of behaviors that govern an individual's resource management and financial decision-making processes (FINRA Investor Education Foundation, 2009, p. 9). The President's Advisory Council on Financial Capabilities (2012) posits that individuals with higher financial capabilities are characterized by their ability to "make informed and effective decisions about the use and management of money through the knowledge, skills, and access to tools to manage their finances effectively for long-term well-being," distinguishing them from those with lower financial capabilities. Shim and Serido (2011) further elaborate on this concept, proposing that financial capabilities develop through a hierarchical process that integrates cognitive, psychological, and behavioral decision-making dimensions.

#### 2.1.4. Employment opportunities

Gangl (2003) defines “employment opportunities” as the opportunity for individuals to find employment after completing formal education or after a period of unemployment. Employment opportunities constitute a foundational concept within the field of entrepreneurship, defining its boundaries and exchange conditions (Busenitz et al., 2003). Alternatively, some scholars view opportunity identification as a more gradual and iterative process, involving the synthesis of ideas over time (Dimov, 2007a). Furthermore, definitions of opportunity vary in scope: some emphasize the introduction of novel goods, services, or processes (Gaglio, 2004), while others primarily focus on the role of opportunities in facilitating the creation of new ventures (Ozgen & Baron, 2008).

Regarding worker behaviors, whether by choice or necessity, more people today are self-employed or engaged in project-based work that, while allowing more flexible work schedules, lack the long-term employment security of traditional jobs. Self employment and working independently are more common today than at any time in the past (Torpey & Hogan, 2016). Employment opportunities are made more complex by these trends, requiring simultaneous collaboration among many functional specialties and professions. To respond to this complexity, the basic template for organizing work has shifted from functional specialization and fulltime employment toward project teams and contingent assignments (Guile & Lahiff, 2017).

#### 2.1.5. Time management

The term "time management" is arguably a misnomer. Time itself is an immutable constant and, therefore, not subject to direct control. However, the term accurately reflects the focus on individual strategies for effectively utilizing the available time. In essence, time management encompasses the cognitive and behavioral processes involved in monitoring and controlling one's interaction with time (Eilam & Aharon, 2003).

The daily routine of students changed drastically in the last two decades with the advancement of technology. Students pursuing higher education in urban and metropolitan cities tend to multitask. They freelance in the evenings and during leisure time while pursuing their UG or post-graduate studies (Kaur & Kaur, 2022). This can be due to multiple reasons: (1) they might wish to be more independent as adults (Bandaranayake et al., 2020), (2) they are away from their parents and stay mostly in PG accommodations, hostels, rented independent houses, or in shared accommodations, (3) their lifestyles demand more pocket money, (4) they harbour anxiety about their future lives, and (5) they have easy access to online freelancing job opportunities (Kathuria et al., 2017). In an ethnically diverse country like India, students come from varied socioeconomic backgrounds. They differ with respect to their family culture, family business, family size, family pressure, peer pressure, financial bearings, and requirements. Withstanding these pressures while studying at university pushes them to work online, offline, or take up small-scale freelance jobs to meet their day-to-day demands (Singhal & Prakash, 2024).

#### 2.1.6. Freelancing trend

The concept of independent work predates the contemporary term "freelancer." The term "Boundaryless Worker," coined in the 1970s, described individuals who operate outside traditional employment structures, working without geographical or organizational constraints (Kazi et al., 2014). While the terminology has evolved, the underlying

concept of independent work remains relevant.

The freelance career model has become a global trend in the 21st century, gaining popularity especially among the younger generation. Freelancing involves working independently as a self-employed individual, often referred to as an independent contractor, being hired by various clients on a part-time or short-term basis with differing compensation and commitment levels compared to full-time employees (Dosunmu et al., 2022). Unlike traditional employees, freelancers frequently move between different projects and employers, offering their services through online platforms, advertisements, or personal connections (Opait et al., 2019).

Gig workers, a prominent subset of the freelance workforce, are defined as self-employed individuals who provide services or products to clients on a contract or project basis (Kuhn & Maleki, 2017). This arrangement offers workers a degree of autonomy, allowing them to control their work schedules and prioritize personal commitments. This perceived increase in work-life balance and flexibility is a significant driver for many individuals transitioning to freelance work (Wood et al., 2018).

The term "platform workers" has been used interchangeably with "gig workers" to describe individuals who utilize online platforms to connect with clients and secure work (De Stefano, 2015). These platforms empower workers with greater control over their project selection and enable them to more effectively integrate work responsibilities with their personal lives (Donovan et al., 2016).

**2.2. Research Methodology**

In this study, the author uses qualitative research methods combined with quantitative research methods in the process of analyzing and discussing research: (1) Qualitative research by building and developing conceptual systems/scales and observation variables and correcting observed variables in accordance with reality; (2) Quantitative research: Using the Cronbach's Alpha confidence factor to test the degree of rigor in the correlation scale; EFA discovery factor analysis is used to validate influencing factors and identify factors that are considered appropriate; at the same time, multivariate linear regression analysis was used to determine the factors and the impact of each factor on the freelance tendency of Ho Chi Minh City students.

According to Tabachnick & Fidel (1996), the best regression analysis when the sample size needed to be ensured is: $n \geq 8m + 50$. Where: n is the sample size, m is the independent variable of the model. When using exploratory factor analysis (EFA) always requires a minimum sample size that is much larger than the multiple regression model in the same study. Therefore, in this study, it is only necessary to determine the minimum sample size for exploratory factor analysis (EFA), and will ensure the right number of samples for the regression model.

Through a brief review of previous research documents, the author identified 5 factors with 25 observed variables that are believed to have an impact on the freelance work trend of students in Ho Chi Minh City. The author sent 150 survey votes and the results received 139 survey votes, of which 4 votes were rejected due to invalidity. Therefore, the remaining number of observed variables to be included in the analysis is 135 votes, satisfying the minimum condition of 90 votes.

Convenient sample selection is a non-probabilistic method in which researchers select participants based on accessibility. While this approach offers flexibility and ease of implementation, it may also impact the generalizability of the study due to limitations in sample scope and lack of randomness. In this study, with a sample of 135 university students in Ho Chi Minh City, the findings may not fully capture the diversity of a broader population. This raises considerations about sample representativeness and the extent to which conclusions can be generalized. Therefore, future research could consider expanding the sample size and employing more diverse sampling methods to enhance the reliability and applicability of the results.

Based on the research overview, the groups of factors affecting the trend of freelancing of students in Ho Chi Minh City in the digital era was selected by the author to include in the research model, including: Professional skills; Financial independence; Time management; Social influence; Employment opportunities.

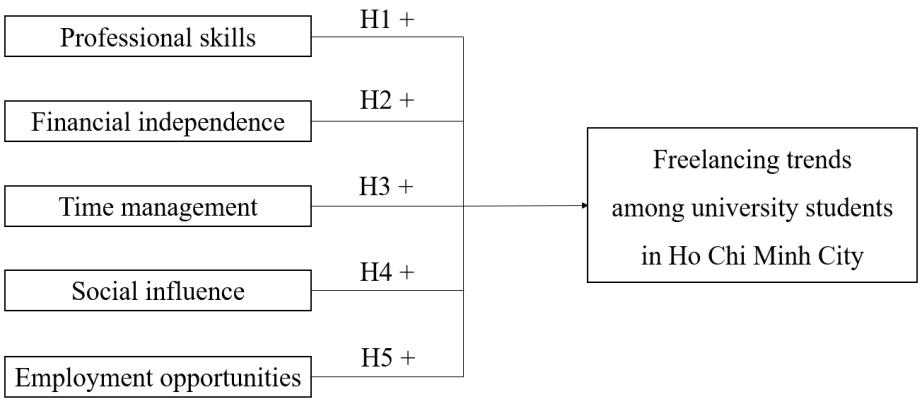



**Fig 2.1 - Research model**

With the hypothesis posed:

Hypothesis H1: Professional skills have a positive impact on the tendency of students in Ho Chi Minh City to choose a freelance career;

Hypothesis H2: Financial independence has a positive impact on the tendency of students in Ho Chi Minh City to choose a freelance career;

Hypothesis H3: Time management has a positive impact on the tendency of students in Ho Chi Minh City to choose a freelance career;

Hypothesis H4: Social influence has a positive impact on the tendency of students in Ho Chi Minh City to choose a freelance career;

Hypothesis H5: Employment opportunities have a positive impact on the tendency of students in Ho Chi Minh City to choose a freelance career.

## III. RESULT AND DISCUSSION

### 3.1. Scale Reliability Testing (Cronbach's Alpha)

**Table 3.1 – Results of scale quality analysis**

| N.O | Scale | Number of Observed Variables | Cronbach's Alpha | Smallest total variable correlation coefficient | Notes |
|---|---|---|---|---|---|
| **1** | **Professional skills (PS)** | 5 | 0.840 | 0.546 | Accept |
| **2** | **Financial independence (FI)** | 5 | 0.870 | 0.658 | Accept |
| **3** | **Time management (TM)** | 5 | 0.787 | 0.470 | Accept |
| **4** | **Social influence (SI)** | 5 | 0.836 | 0.539 | Accept |
| **5** | **Employment opportunities (EO)** | 5 | 0.839 | 0.556 | Accept |
| **6** | **Freelancing trends (FT)** | 4 | 0.844 | 0.638 | Accept |

The results show that the scale in table 3.1 shows that all Cronbach's Alpha coefficients of the overall are greater than 0.6. Thus, the scale coefficient is built consisting of 5 independent variables and 1 dependent variable to ensure reliability with 25 observation variables of independent variables and 4 observation variables of dependent variables.

### 3.2. EFA exploratory factor analysis

**Table 3.2 – Results of EFA exploratory factor analysis**

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.865 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1589.734 |
| | df | 210 |
| | Sig. | 0.000 |

Barlett's test results show that there is a correlation between variables in the overall (Sig = 0.000 < 0.05, hypothesis accepted). At the same time, this coefficient of KMO = 0.865 greater than 0.5 proves that the factor analysis to group the variables together is appropriate and the data is suitable for conducting the analysis.

**Table 3.3 - Results of total variance explained**

| Total variance explained | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Initial eigenvalues | | | Extraction sums of squared loadings | | | Rotation sums of squared loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 8.674 | 41.307 | 41.307 | 8.674 | 41.307 | 41.307 | 3.358 | 15.991 | 15.991 |
| 2 | 1.771 | 8.432 | 49.739 | 1.771 | 8.432 | 49.739 | 3.157 | 15.031 | 31.022 |
| 3 | 1.668 | 7.944 | 57.683 | 1.668 | 7.944 | 57.683 | 2.986 | 14.220 | 45.242 |
| 4 | 1.138 | 5.421 | 63.104 | 1.138 | 5.421 | 63.104 | 2.755 | 13.120 | 58.362 |
| 5 | 1.052 | 5.010 | 68.114 | 1.052 | 5.010 | 68.114 | 2.048 | 9.752 | 68.114 |
| 6 | 0.797 | 3.796 | 71.910 | | | | | | |

From the results of Table 3 after running Fixed number of factors, we see that the deduction variance is 68.11% > 50% satisfactory. With the Principal component extraction method and the Varimax rotation, there are 5 factors drawn from 25 observed variables. This also shows that all five factors show the ability to explain 68.11% of the change in the dependent variable.

### 3.3 Multivariate regression analysis

In the study of running multivariate linear regression with the Enter method, we have the following results:

**Table 3.4 – Results of regression models**

| Coefficients[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | | Unstandardized coefficients | | Standardized coefficients | t | Sig. | Collinearity statistics | |
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | -0.665 | 0.268 | | -2.479 | 0.014 | | |
| | FI | 0.230 | 0.080 | 0.197 | 2.859 | 0.005 | 0.519 | 1.928 |
| | SI | 0.484 | 0.094 | 0.400 | 5.162 | 0.000 | 0.409 | 2.445 |
| | EO | 0.170 | 0.074 | 0.152 | 2.303 | 0.023 | 0.565 | 1.771 |
| | PS | 0.203 | 0.076 | 0.169 | 2.671 | 0.009 | 0.614 | 1.630 |

**a. Dependent Variable: FT**

Based on the data table, we see that there are 4 factors with a Sig < of 0.05 that are statistically significant. We write the polyploid regression equation expressed in the following form:

**FT = 0.400*SI + 0.197*FI + 0.169*PS + 0.152*EO**

The regression coefficients with positive signs show the factors in the model that positively affect the freelancing trend of students in Ho Chi Minh City

### 3.4. Evaluation of the suitability of the multivariate linear regression model

**Table 3.5 – Results of model summary**

| Model Summary[b] | | | | | |
|---|---|---|---|---|---|
| Model | R | R square | Adjusted R square | Std. Error of the estimate | Durbin-watson |
| 1 | 0.827[a] | 0.684 | 0.672 | 0.52203 | 1.782 |

**a. Predictors: (Constant) EO, PS, FI, SI**

**b. Dependent Variable: FT**

The result R2 = 0.672 (R2 with correction) shows that the model is statistically significant. Independent variables

account for 67.2% of the volatility of dependent variables. Factors in the model include: Employment opportunities; Professional skills; Financial independence and Social influence. To determine the impact of factors on the "Trend of students choosing freelance careers at universities in Ho Chi Minh City", we base on the order of the level of each factor depending on the absolute value of the normalized regression coefficient.

## IV. CONCLUSIONS AND RECOMMENDATIONS

### 4.1. Conclusion

The study has identified four main factors affecting the tendency of university students in Ho Chi Minh City to choose to work freelancing in order of decreasing impact as follows:

In which, the Social influence (SI) factor has the strongest impact with a normalized regression coefficient of 0.400. This shows that support from family, friends, and the community is the most important factor in motivating students to pursue a freelance career.

Next, the Financial independence (FI) factor with a coefficient of 0.197 reflects that the ability to control income and financial independence play a decisive role in students' choice of freelancing.

Professional skills (PS) have the third level of impact on students' tendency to choose freelancing with a coefficient of 0.169, which shows that professional competence is a necessary factor but not the biggest determinant.

Finally, the Employment Opportunity (EO) factor has the lowest dynamic waterfall with a coefficient of 0.152, emphasizing that access to the freelance labor market is a supportive condition but not a major determinant.

The regression model with a corrected R2 value of 67.2% shows that independent variables have largely explained the volatility of the tendency to choose to work freely. This result is quite similar to the research of Perry et al. (2019), which emphasizes the role of social influence in career decisions, as well as the work of Bennett et al. (2020), which affirms the importance of financial independence in freelance career choice.

### 4.2. Recommendations

**Strengthening the social influence factor (SI)**

With the strongest impact, the social influence factor needs to be focused on motivating and supporting students to choose a freelance career.

It is necessary to organize forums and seminars to share experiences between freelance professionals and students, to help students build trust and receive encouragement and guidance from pioneers in the field of freelancing.

In addition, it is necessary to build professional community groups at universities, where students can exchange, learn and strongly expand their networks.

Implement communication campaigns to raise family and social awareness of the potential and opportunities of freelancing, reduce prejudice about the instability of this job.

**Supporting students to improve their financial independence (FI)**

Financial independence is the second most important factor that needs to be focused on so that students are more confident when entering the freelance labor market.

Organize personal finance management courses for students, including budgeting, income management, and savings.

Build financial support funds or promote preferential loan programs for start-up students in the field of freelancing.

Assisting students in accessing digital financial platforms that help track and manage cash flow effectively.

**Professional skills development (PS)**

Although not the biggest determinant, professional skills are still the foundation for students to achieve success in freelance work, specifically:

Strengthen professional courses that combine practice at the university, especially in fields with a demand for self-employed workers such as information technology, graphic design, and digital marketing.

Universities need to implement online learning programs with leading experts and be granted international

certificates, helping students improve their capacity and increase their competitiveness in the freelance labor market.

Expand cooperation with businesses to organize practical projects and internship programs, helping students apply professional knowledge to the real world.

Strengthening connections to domestic and foreign employment opportunities (FI).

Despite having the lowest impact, increasing employment opportunities is still essential for students to have more opportunities to access the freelance labor market effectively.

Build online job platforms, similar to Upwork or Fiverr, specifically designed for students in Vietnam.

Host Freelance Job Fair sessions where students can connect with employers and learn about real-world job requirements.

Universities need to coordinate with businesses to provide suitable labor market information and freelance career orientation for students.

In summary, the study not only identifies and measures the impact of factors affecting the tendency of students to choose a freelance career in Ho Chi Minh City in the digital age but also provides practical solutions to promote the potential of students in the context of an increasingly flexible and digital labor market, motivating and motivating students to choose freelancing as a sustainable and promising direction.

However, this study has certain limitations. First, the use of the convenience sampling method may lead to bias in the results, as it does not fully reflect the overall trend among all university students in Ho Chi Minh City. Second, the sample size is limited to only 135 students, which may not be large enough to generalize the findings to the entire student population in this area. Therefore, future studies should expand the survey scope with a larger sample size and adopt a random sampling method to enhance representativeness. Additionally, future research could consider incorporating other factors such as field of study, work experience, or risk attitude to gain a more comprehensive understanding of students' decisions to pursue freelancing.

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# A NEW APPROACH OF SENTIMENT ANALYSIS AND TOPIC MODELING FOR USER-GENERATED CONTENT IN MOBILE BANKING APPLICATIONS

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**ABSTRACT**

As one of Southeast Asia's fastest-growing digital economies, Vietnam presents significant opportunities for mobile banking innovation. App store ratings and reviews reflecting user-generated content (UGC) are essential for evaluating mobile banking performance and user satisfaction. Prior studies have neglected to use app store reviews with limited sentiment analysis applications to address user concerns. Therefore, this study aims to analyze app store reviews to identify key drivers of dissatisfaction and demonstrate how sentiment analysis and topic modeling can inform user-centric improvements. The study applies sentiment classification using fastText, achieving a confidence score of 0.691 and Latent Dirichlet Allocation (LDA) in identifying seven topics and grouping them into three overarching themes. Findings reveal a predominance of very negative, negative, and neutral sentiments, highlighting recurring issues such as app performance. While reliance on app store reviews limits the generalizability of insights, this study underscores their value in uncovering actionable recommendations, including enhancing app performance, streamlining transactions, and improving error management. Further studies should expand the data sources while integrating advanced Natural Language Processing techniques like the BERT model. These findings contribute to data-driven strategies for businesses to improve customer satisfaction and strengthen the competitive positioning of mobile banking applications in Vietnam.

*Keywords: "customer satisfaction", "mobile banking", "sentiment analysis", "topic modeling", "user-generated content"*

## I. INTRODUCTION

The rapid advancement of digital technology in Vietnam has revolutionized the banking sector, positioning mobile banking applications as essential tools for financial transactions. Le et al. (2022) and Vo et al. (2024) emphasize that these apps enable users to manage their finances remotely, contributing to a steady increase in active mobile banking users across all generations in Vietnam. Simultaneously, the proliferation of mobile banking apps has empowered users to share their experiences through user-generated content (UGC), such as reviews, ratings, and feedback. This content offers banks valuable insights into customer satisfaction and areas for improvement. Consequently, analyzing this feedback has become critical for banks seeking to enhance services and effectively design more targeted marketing strategies.

Moreover, recent advancements in Natural Language Processing (NLP) have facilitated the use of text mining and machine learning approaches to analyze UGC. These tools enable banks to extract deep insights into customer sentiment and engagement, which, in turn, improve customer experience, personalize marketing campaigns, and refine product development (Handayani et al., 2020). However, several challenges persist. As users increasingly share feedback about their experiences, issues such as technical glitches and usability concerns remain prevalent, directly impacting customer satisfaction. Furthermore, the substantial volume of UGC makes manual analysis impractical. Techniques like sentiment analysis and topic modeling offer robust solutions for processing such unstructured data. For instance, sentiment analysis classifies content into positive, neutral, or negative categories, while topic modeling identifies recurring themes (Semary et al., 2024). Chen et al. (2020) and Nguyen and Le (2022) have demonstrated the effectiveness of these techniques in analyzing UGC to enhance customer satisfaction and develop campaigns tailored to specific user segments.

In this context, the current study examines customer sentiment through UGC related to the mobile banking application in Vietnam. Specifically, this research aims to identify the predominant sentiments expressed in user

reviews and extract key themes from the content to provide actionable recommendations for improving user satisfaction. Two research questions guide this study: (1) What are the primary themes associated with user dissatisfaction in mobile banking applications? (2) How can sentiment analysis and topic modeling inform strategies to enhance user satisfaction?

The dataset comprises reviews and ratings collected from Google Play and the App Store between January 2022 and June 2024. After translating the dataset into English, sentiment analysis is conducted using fastText, and Latent Dirichlet Allocation (LDA) is applied for topic modeling. The performance of the models is validated using evaluation metrics such as perplexity and coherence scores for LDA model and confidence score for fastText model.

Finally, the remainder of this paper is organized as follows. The Material and Method synthesizes existing research on sentiment analysis and topic modeling within the banking sector. This section also describes the data collection process and analytical techniques employed in the study. The Results and Discussion section presents significant findings and interprets their implications, while the Conclusion outlines the study's contributions, acknowledges its limitations, and offers recommendations for future research.

## II. MATERIALS AND METHODS

### 2.1 Literature Review

Mobile banking applications have rapidly emerged as indispensable tools for financial management, offering users real-time access to a wide range of banking services. User adoption of these apps is influenced by factors such as perceived ease of use, security, functionality, and trust (Nguyen, 2024; Venkatesh et al., 2016). However, Cheng et al. (2018) argue that sustaining user engagement in an increasingly competitive digital landscape requires more than adoption. It necessitates continual improvements based on user feedback to maintain satisfaction and foster loyalty, a view also supported by Cresswell et al. (2016) and Milne-Ives et al. (2023). In this context, UGC has become an invaluable resource for financial institutions, enabling them to understand user experiences, address dissatisfaction, and enhance their offerings. This section reviews the role of sentiment analysis and topic modeling in the banking sector, providing a foundation for the research methods and models used in this study.

#### 2.1.1. User-Generated Content in Mobile Banking

The proliferation of UGC has created significant opportunities for financial institutions to extract actionable insights from customer feedback. UGC provides a direct lens into user experiences, capturing frustrations, expectations, and preferences, thereby enabling banks to address recurring issues and improve customer satisfaction (Albashrawi et al., 2019; Mbama et al., 2018; Nguyen et al., 2021). In the context of mobile banking, where users demand seamless, efficient, and error-free services, UGC is particularly valuable for identifying pain points. For instance, recurring reviews highlighting app crashes, transaction delays, or inadequate customer support emphasize areas requiring immediate attention (Nguyen et al., 2021; Sampaio et al., 2017).

In emerging markets like Vietnam, UGC is even more significant due to rapid digital adoption and a demographically diverse user base. Studies by Choudrie et al. (2018) and Friemel (2014) reveal that younger, tech-savvy users often seek advanced features, such as real-time notifications, QR payment systems, and digital wallets, while older users tend to prioritize simplicity, security, and accessibility. UGC allows banks to uncover these generational differences and develop tailored solutions to meet diverse customer needs (Liang & Nguyen, 2017; Nguyen et al., 2021). Additionally, systemic issues—such as dissatisfaction with unclear error messages or poorly explained features—often emerge through UGC but may go unnoticed using traditional feedback mechanisms.

Despite its benefits, leveraging UGC effectively presents several challenges. The sheer volume of data makes manual analysis impractical and prone to errors. Moreover, Vietnam's linguistic diversity complicates UGC interpretation, as customer reviews frequently contain idiomatic expressions, tonal variations, and regional dialects. Informal phrases or mixed-language reviews (Vietnamese combined with English) often confuse generic analytical models, as highlighted by Liu et al. (2020), Phan and Starks (2019), and Verdon et al. (2016). While app store reviews serve as an excellent starting point, they represent only a fraction of the feedback spectrum (Genc-Nayebi & Abran, 2016; Palomba et al., 2017). Expanding data sources to include in-app surveys, social media comments, and customer service transcripts would provide a more comprehensive and representative understanding of user experiences.

### 2.1.2. Sentiment Analysis and Topic Modeling

Recent advancements in NLP have introduced robust methods for analyzing unstructured data, enabling the extraction of actionable insights from UGC (Abdullah & Ahmet, 2022; Tarnowska & Ras, 2021). Sentiment analysis, for instance, categorizes user feedback into positive, neutral, or negative sentiments, offering a high-level understanding of user satisfaction and dissatisfaction (Ahmed & Rodríguez-Díaz, 2020; Chandrasekaran et al., 2021; Kausar et al., 2019). Advanced sentiment analysis models, such as Bidirectional Encoder Representations from Transformers (BERT) (Gao et al., 2019) and ELECTRA (Zhang et al., 2021), further improve accuracy by accounting for contextual nuances and language-specific intricacies. These models are particularly beneficial in markets like Vietnam, where linguistic diversity and cultural nuances challenge traditional sentiment analysis techniques. For mobile banking applications, sentiment analysis can identify recurring dissatisfaction with specific features or detect spikes in negative sentiment following updates, enabling financial institutions to respond proactively (Jain et al., 2021; Leem & Eum, 2021).

Complementing sentiment analysis, topic modeling uncovers recurring themes within UGC, helping financial institutions identify areas requiring improvement (Zhang et al., 2017; Vayansky & Kumar, 2020). LDA, one of the most widely used topic modeling techniques, identifies hidden patterns in textual data, grouping user feedback into themes such as app performance, customer support, or security concerns (Blei et al., 2003). In mobile banking, topic modeling can highlight emerging trends, such as the increasing demand for biometric authentication or dissatisfaction with user onboarding processes (Baptista & Oliveira, 2016). Furthermore, dynamic topic modeling allows banks to track how user concerns evolve over time, enabling them to adjust services in response to shifting expectations.

Prior research has demonstrated the effectiveness of sentiment analysis and topic modeling across industries such as e-commerce, travel, and healthcare (Alexander et al., 2021; Ho et al., 2023; Permana et al., 2020). For example, in the e-commerce sector, topic modeling has been used to analyze customer reviews, uncovering issues like delayed deliveries and poor product quality, leading to targeted operational improvements (Adak et al., 2022). Similarly, sentiment analysis in the travel industry has provided insights into guest satisfaction, helping companies tailor services to meet user expectations (Ho et al., 2023). Despite these successes in other domains, sentiment analysis and topic modeling remain underutilized in mobile banking, particularly in emerging markets like Vietnam, where localized approaches are necessary due to linguistic and cultural diversity. Additionally, the mobile banking industry faces significant challenges, such as high churn rates, with approximately 70% of users discontinuing app usage shortly after their initial experience (J. C. Ho et al., 2020). This attrition often results from unresolved user complaints (Alizadeh et al., 2023), highlighting missed opportunities for banks to identify recurring themes and address pain points effectively. Implementing these techniques can provide banks with the insights needed to improve user satisfaction, reduce churn, and enhance customer loyalty.

### 2.1.3 Research Gaps

While sentiment analysis and topic modeling have been widely applied in industries such as e-commerce and travel, their use in mobile banking remains underexplored, particularly in Vietnam (J. C. Ho et al., 2020). Existing research often focuses on technical performance metrics or adoption factors like trust and usability, overlooking the actionable insights embedded in app store reviews. These reviews provide real-time feedback on user concerns, dissatisfaction, and evolving expectations, offering valuable data for improving service quality and retention. Despite their potential, limited studies have leveraged advanced techniques like sentiment analysis and topic modeling to systematically analyze app store reviews in the context of mobile banking (Çallı, 2022). Such tools can uncover patterns of dissatisfaction, identify user priorities, and guide service improvements, particularly in a competitive and rapidly growing market like Vietnam. This study seeks to address these gaps by applying sentiment analysis and topic modeling to the mobile banking application. Through a systematic analysis of UGC, this research contributes to the development of data-driven strategies for enhancing customer satisfaction and strengthening the competitive position in Vietnam's dynamic digital banking landscape.

## 2.2. Methodology

### 2.2.1. Research Design

The research framework is organized into four key phases: data collection, data preprocessing, modeling, and

evaluation with insights interpretation (Figure 2.1). UGC is collected from Google Play and the App Store to capture authentic user feedback. The preprocessing phase involves cleaning and standardizing the data to prepare it for analysis. The modeling phase consists of two parallel pipelines: the fastText model is employed for sentiment analysis, classifying user sentiments, while LDA is applied for topic modeling to uncover recurring topics in the reviews. Finally, the evaluation and insights interpretation phase assess the performance of both the fastText and LDA models while extracting actionable insights aimed at improving user satisfaction.

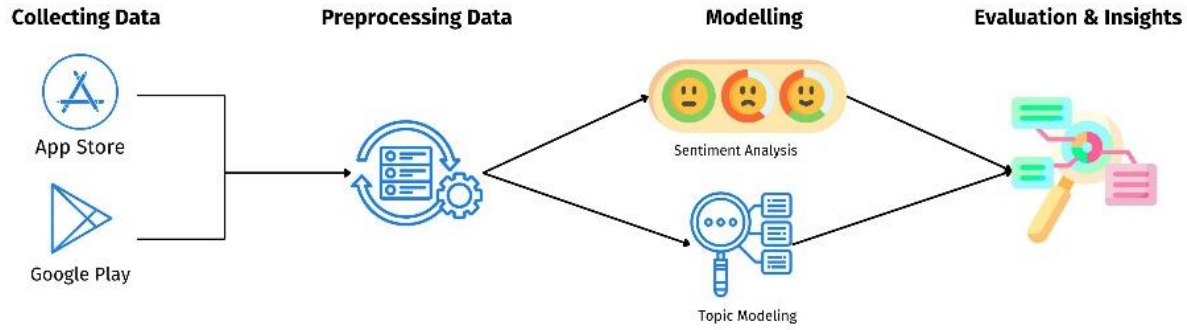



**Fig 2. 1 - Research Framework**

### 2.2.2. Data Collection

This study experiments on the case study of MyVIB app stores as its primary data source, providing access to Vietnamese users. The study employed Python and the Selenium library to gather the data of all available reviews for MyVIB. The dataset was then processed to handle missing values and translated into English for more overall meaning. The dataset comprises 6,794 user reviews on MyVIB application retrieved from Google Play and the App Store, spanning from January 2022 to June 2024. These reviews include textual feedback, ratings, and timestamps, representing a diverse range of user perspectives. Google Play contributed 5,014 reviews, while the App Store provided 1,780 reviews. This dataset forms the foundation for both sentiment analysis and topic modeling and sample reviews are shown in Figure 2.2.

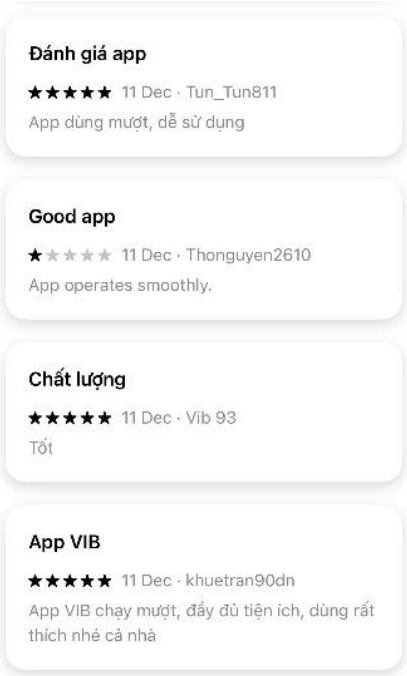



**Fig 2. 2 - Sample Reviews**

### 2.2.3. Data Preprocessing

After collecting all the data, the dataset was preprocessed, including translating non-English reviews into English to ensure integrity, removing duplicates, and filtering out irrelevant or incomplete reviews. Stop words, special characters,

and unnecessary spaces were also removed to improve the quality of the textual data. A word cloud is generated from the full text of the reviews, highlighting the most frequently mentioned terms. This visualization also provides a concise summary of the key themes discussed by the customers, as depicted in Figure 2.3.




**Fig 2. 3 - Word Cloud from MyVIB app reviews**

### 2.2.4. Modeling

**Topic Modeling**

LDA technique helps uncover hidden patterns in textual data, clustering reviews into distinct topics based on word frequency and co-occurrence. In preparing the data for applying LDA, creating bigrams (two-word combinations) and trigrams (three-word combinations) is conducted to help capture multi-word expressions prevalent in user reviews, such as "user interface" or "customer service." This allows the models to enhance the quality of the data, which is crucial for the subsequent steps, as depicted in Table 3.1. After generating bigrams and trigrams, a dictionary is created to assign unique numerical IDs to each token, including single words and multi-word phrases. Using this dictionary, a corpus is constructed in a bag-of-words format, capturing the frequency of each token across the dataset.

**Table 3. 1 - A Sample Bigrams of the model**

| No | Keywords per topic |
|---|---|
| 1 | ['rarely', 'rate', 'app', 'taking', 'moment', 'give', 'app', 'stars', 'using', 'many', 'banking', 'apps', 'stopped', 'myvib', 'ability', 'withstand', 'quick', 'operations', 'one', 'app', 'app', 'neat', 'focused'] |
| 2 | ['app', 'good', 'stars', 'would', 'rate', 'stars', 'ok', 'words', 'describe', 'good'] |
| 3 | ['myvib', 'minimalist', 'interface', 'compared', 'banking', 'apps', 'interface', 'makes', 'less', 'confused', 'however', 'vib', 'allows', 'money', 'transfer', 'button', 'accessible', 'right', 'main', 'screen'] |

The trained LDA model identifies the most probable keywords associated with each topic and groups them into 7 distinct topics. Each review is assigned a dominant topic based on its highest contribution percentage, reflecting its alignment with a specific topic. Table 3.2 below provides an example of the top keywords for each of the identified topics.

**Table 3. 2 - Top Keywords for Each Identified Topic**

| Topic No | Topic Name | Keywords |
|---|---|---|
| 1 | App Features | app, many, easy, feature, use, interface, application, need, user, convenient |
| 2 | Card Management | card, old, credit, lose, deposit, fix, quickly, long, code, available |
| 3 | Transaction Issues | difficult, find, section, open, allow, fee, online, saving, modern, hour |
| 4 | Money Transfer | money, transfer, account, log, receive, slow, notification, transaction, keep, version |
| 5 | Errors | error, bank, time, still, change, go, make, day, customer, smart |
| 6 | Payment Information | payment, information, transaction, show, well, operation, give, support, wrong, save |
| 7 | App Performance | bad, update, version, take, really, crash, long, month, step, screen |

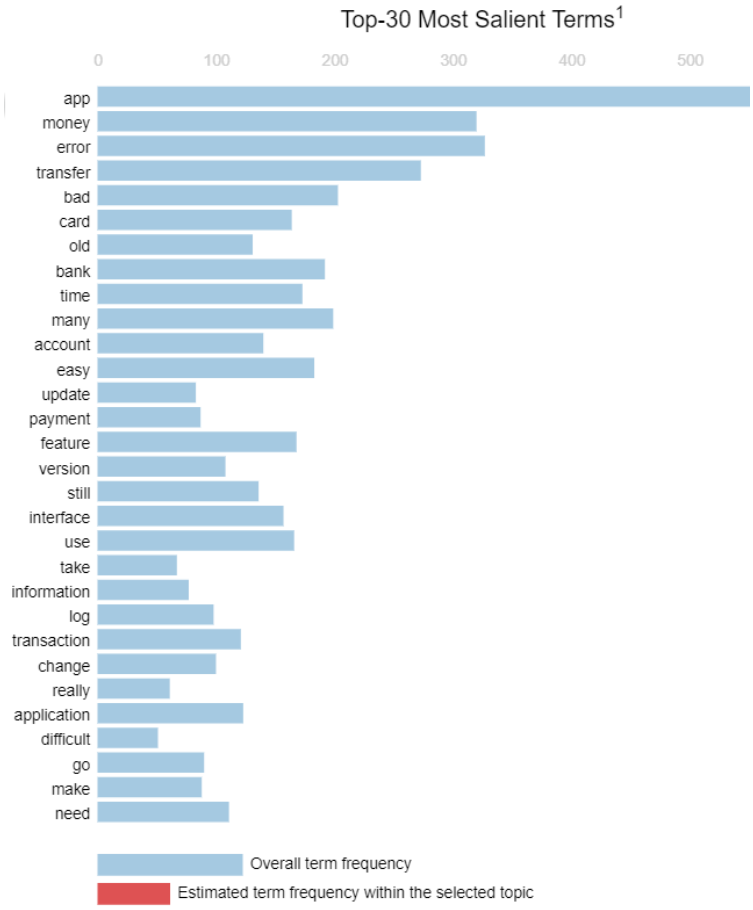



**Fig 2. 4 - Top 30 Most Salient Terms**

In evaluating the LDA model, perplexity and coherence scores are employed to ensure the quality of topic extraction, aiding in the selection of the optimal number of topics and fine-tuning the LDA model for robust performance (Baimakhanbetov, 2023; Kim et al., 2023; Rosales et al., 2023). Perplexity assesses the model's ability to predict words in a document, with lower scores indicating better statistical fit. Coherence, on the other hand, evaluates the semantic similarity of top words within a topic, ensuring interpretability and relevance. As a result, a perplexity score of -0.660 indicates the models' strong capability to generalize and predict unseen data, while a coherence score of 0.514 reflects the semantic consistency of the identified topics. Besides, the top 30 most salient terms (Figure 2.4) further demonstrate the relevance of the extracted topics and this visual interpretation, along with further analysis, enables the study to group these topics into 3 overarching themes:

**Theme 1:** App Usability (Topics 1,3): This theme focuses on the user interface, app design, ease of navigation, and feature availability, suggesting user challenges related to app accessibility and navigation.

**Theme 2:** Technical Performance (Topics 5,7): This theme captures user frustrations related to app stability, and performance issues, highlighting the key drivers leading to user dissatisfaction.

**Theme 3:** Transaction Operations (Topics 2,4,6): This theme revolves around financial functionalities, including card management, money transfers, and payment processing issues, indicating user concerns regarding operational efficiency.

**Sentiment Analysis**

Sentiment analysis was conducted using fastText, an efficient text classification tool developed by Facebook AI Research Lab. Reviews were classified into five sentiment categories: very positive, positive, neutral, negative, and very negative. Its utilization of subword embeddings is particularly effective for handling out-of-vocabulary words and utilizing subword information makes it particularly adept at processing the diverse linguistic patterns found in user reviews (Lin et al., 2020). While this model delivers computational efficiency and effective classification, it exhibits limitations in handling contextually complex and linguistically nuanced UGC. Specifically, it sometimes struggles with

understanding sarcasm, mixed sentiments or indirect emotional tones. A phrase such as, for instance, “The app is functional, but not great” may be misclassified due to a lack of in-depth contextual understanding. As a result, BERT can offer a promising alternative for future research, in which its ability to process text bi-directionally makes it easy to capture the context of words more effectively than fastText, particularly adept at analyzing domain-specific language or idiomatic expressions in UGC (Gunduz, 2024). However, the potential benefits of BERT are also considered as it requires higher computational requirements and longer training times, making it unsuitable for the scope of the current study (Prottasha et al., 2022).

The fastText model is evaluated using confidence scores, which represents the model's estimated probability that a given input text belongs to a predicted label to indicate the level of certainty in its classification. A higher confidence score reflects greater certainty and reliability in classifying sentiments accurately (Table 2.3).

**Table 2. 3 - Example of Sentiment Predictions with Confidence Scores**

| Review Text | Predicted Sentiment | Confidence Score |
|---|---|---|
| I rarely rate an app, but now I'm taking a mom... | Positive | 0.568 |
| The app is so good, if there were 1000 stars, ... | Very Negative | 0.419 |
| MyVIB has a minimalist interface compared to o... | Positive | 0.615 |
| Good app that integrates many applications and... | Very Positive | 0.751 |
| The first impression is that the app is chosen... | Neutral | 0.477 |

## III. RESULT AND DISCUSSION

### 3.1 Experimental Results

**Table 3. 1 - Sentiment Classification Results with Confidence Scores**

| Prediction | Confidence Score |
|---|---|
| Negative | 0.589 |
| Neutral | 0.733 |
| Positive | 0.677 |
| Very Negative | 0.709 |
| Very Positive | 0.621 |
| Grand Total | 0.691 |

As can be seen from Table 3.1, the fastText model demonstrates strong performance in sentiment analysis, with an overall confidence score of 0.6910, indicating reliable classification across sentiment categories. It excels in identifying Neutral sentiment (0.7336) and Very Negative sentiment (0.7095), highlighting its effectiveness in capturing moderate and highly dissatisfied user feedback. These results validate the model's ability to effectively handle diverse emotions and underscore the potential benefits of employing a more advanced model, such as BERT, to capture the nuanced and context-dependent aspects of UGC. These results suggest a substantial portion of users remain indifferent or moderately dissatisfied, emphasizing the need for targeted improvements in app functionality and user engagement.

### 3.2. Discussion

The sentiment analysis reveals a significant prevalence of Neutral, Negative, and Very Negative sentiments, with an overall confidence score of 0.6909, indicating substantial user dissatisfaction with the app's functionality. Complementing these findings, topic modeling identifies critical themes such as App Usability, Technical Performance, and Transaction Operations, which align with sentiment trends and account for the majority of negative feedback (Topic 7: 50.74%; Topic 4: 16.97%; Topic 6: 13.88%). These themes underscore recurring frustrations related to app crashes, transaction delays, and inadequate error resolution, as demonstrated by user feedback patterns. The sentiment and topic analysis provide an integrated framework for interpreting user experiences, highlighting the urgent need for targeted interventions to address these issues and enhance customer satisfaction.

### 3.3. Managerial Implications

The study highlights the effectiveness of the fastText model in classifying UGC sentiments and effectively distinguishing five specific sentiment types, providing a more nuanced understanding of customer behaviors (Salur & Aydin, 2020). This granular sentiment analysis reveals recurring areas of dissatisfaction, including frustrations with app performance, transaction reliability, and technical handling. Topic modeling further enriches these findings by identifying seven key topics, with App Usability, Technical Performance, and Transaction Operations emerging as dominant themes. These themes underscore critical pain points, such as slow response times, failed transactions, and unresolved system bugs, providing actionable insights into specific user concerns (Marani & Baumer, 2023). The study offers a cohesive approach to understanding user dissatisfaction and guiding improvement strategies by integrating sentiment analysis and topic modeling. These findings emphasize the need for targeted interventions, such as optimizing app stability, enhancing customer support, and refining payment processing mechanisms, to address user concerns effectively.

## IV. CONCLUSION

This study presents a comprehensive approach to analyzing user feedback on mobile banking applications by leveraging fastText for sentiment classification and LDA for topic modeling. The findings reveal critical key drivers of dissatisfaction, particularly in app performance, transaction reliability, and error handling, while sentiment analysis underscores the predominance of negative and neutral sentiments in UGC. These results offer valuable insights into user experiences, highlighting the need for targeted improvements to enhance satisfaction.

However, the study is constrained by several limitations. The reliance on app store reviews may exclude perspectives from less vocal users, introducing potential selection bias. Additionally, while fastText performed effectively, cultural nuances and linguistic variability may still challenge sentiment accuracy in the Vietnamese context. The static nature of the LDA model further limits adaptability to evolving user feedback trends.

Future research should address these gaps by incorporating diverse data sources, such as social media feedback and in-app surveys, to comprehensively understand multiple customer touchpoints across various digital channels. This approach will ensure a more representative view of user experiences, reducing selection bias and capturing real-time user sentiment that can facilitate the decision-making process. Moreover, enhancing the sentiment model with advanced NLP techniques such as BERT model can significantly improve contextual understanding for sarcasm and mixed-sentiment expressions as BERT's transformer-based architecture allows for better comprehension of longer context and more nuanced reviews, leading to higher classification accuracy. There is also an essential need to adapt to evolving user concerns rather than relying on static LDA models by deploying dynamic topic models. A real-time topic clusters system can identify emerging trends in UGC, enabling banks to enhance decision-making efficiency and adjust strategies proactively. These advancements would enable deeper insights and more robust strategies for improving user satisfaction in mobile banking applications.

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# RETHINKING CONSUMER ANIMOSITY: VIETNAMESE PERSPECTIVES ON CHINESE GOODS

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**ABSTRACT**

This study enhances the understanding of consumer animosity by addressing critical gaps in the existing literature. Unlike prior research that predominantly focuses on developed markets and relies on reflective measurement models, this study adopts an innovative formative approach to assess consumer animosity, incorporating pandemic-related animosity as a novel construct. Grounded in Social Identity Theory and Realistic Group Conflict Theory, the research examines Vietnamese consumers' perceptions of Chinese products using data from 827 respondents across Vietnam. The findings reveal that political, cultural, and pandemic-related animosities significantly influence consumer animosity, whereas war and economic animosities have diminished relevance in the contemporary Vietnamese context. Additionally, the study identifies the mediating role of product judgment, exposing a paradox where animosity simultaneously increases willingness to buy while negatively affecting product quality evaluations. This intricate dynamic highlights the evolving nature of consumer animosity and its implications for marketing strategies in developing markets. By focusing on Vietnam, a culturally unique and underexplored setting, this research provides valuable insights and contributes to the global discourse on consumer animosity and behavior.

*Keywords*: “formative animosity”, “pandemic animosity”, “product judgment”, “willingness to buy”.

## I. INTRODUCTION

In our increasingly globalized world, economic interdependencies and migration trends, several researchers are urged to explore different dimensions and the effects of consumer animosity on consumers' evaluations and willingness to purchase foreign products ((Farah & Mehdi, 2021; Farmaki, 2023; Nawaz et al., 2023) as understanding consumer behavior is crucial for crafting effective marketing strategies. Originally developed by Klein et al. (1998), and later extended by Kalliny et al. (2017) et al. (2017), the consumer animosity model comprises the following dimensions: war animosity, economic animosity, political animosity, and cultural and religious animosity. However, the Covid-19 pandemic has given rise to a new type of animosity (Carracedo et al., 2021; Nawaz et al., 2023). The animosity stemming from COVID-19 has led to significant geopolitical upheaval, reshaping international systems (Carracedo et al., 2021; Paul & Dhir, 2021; Sharma et al., 2020), thus accelerating de-globalization and de-regionalization while creating new trade and political alliances worldwide (Paul & Dhir, 2021). Consequently, pandemic-related animosity can be viewed as having an economic impact comparable to that of political, economic, wartime, and cultural animosities (Carracedo et al., 2021; Nawaz et al., 2023). However, limited research addresses and explores this emerging dimension: pandemic animosity, and incorporates this dimension into the animosity model of Klein et al. (1998).

Consumer animosity plays a crucial role in shaping digital market development and sustainable consumption practices, particularly in an era where e-commerce and global trade are increasingly intertwined (Garima et al., 2025). As digital platforms facilitate cross-border transactions, consumer animosity can influence purchasing decisions, brand perceptions, and online discourse, impacting market expansion and international business strategies. Moreover, in the context of sustainable consumption, animosity-driven boycotts or selective buying behavior may affect the adoption of environmentally responsible products, either reinforcing ethical consumption or limiting access to sustainable alternatives. Understanding these dynamics is essential for businesses and policymakers to navigate digital consumer behavior while promoting inclusive and sustainable market growth.

While measuring the animosity construct is essential for accurately assessing its behavioral impact on outcome

variables, the measurement models used by animosity researchers remain problematic (Diamantopoulos & Riefler, 2011; Hoffmann et al., 2011; Kalliny et al., 2017; Riefler & Diamantopoulos, 2007). Originally, Klein et al. (1998) created a measurement model with two constructs: war and economic animosities, plus a general animosity item. The model suggests that the second-order latent variable (animosity) influences first-order variables (war and economic animosities), which affect observable measures. Klein et al. (1998) describe this as a second-order reflective model. However, since animosity stems from specific historical events, the appropriateness of this model is questioned. This raises the possibility that a formative measurement model (Bollen & Lennox, 1991; Diamantopoulos & Riefler, 2011; Riefler & Diamantopoulos, 2007) may better fit the animosity definition. Klein et al. (1998) also proposed an alternative model that treats war and economic animosity as formative constructs affecting general animosity, though the observable measures remained reflective. According to several researchers (Kalliny et al., 2017; Riefler & Diamantopoulos, 2007), it's important to note that misspecification of measurement models can undermine reliability and validity assessments; high coefficient alphas do not guarantee a reflective model's suitability, so reliability estimates in animosity studies should be interpreted carefully. Additionally, misspecification can bias structural estimates between constructs (Riefler & Diamantopoulos, 2007), which is critical given the animosity construct's potential impact on outcomes like purchase intentions. As a result, several recent researchers (Diamantopoulos & Riefler, 2011; Kalliny et al., 2017; Riefler & Diamantopoulos, 2007) called for treating and using formative measures, and more research on investigating the effects of the (formative) animosity on purchase intentions.

The nature of situational animosity may vary among developed and developing countries, even among specific countries. Research has focused on developed nations, including the USA, Canada, Australia, Germany, New Zealand, and France (Amine, 2008; Bahaee & Pisani, 2009; Yu et al., 2020). Furthermore, animosity has increasingly attracted a few research attention of researchers in developing countries (Hoang et al., 2022). Furthermore, a growing body of literature explores how different dimensions of animosity and animosity influence consumer perceptions of foreign products in developed markets, research still remains scarce in developing markets.

The significance of this article is three fold. First, it enhances Klein et al. (1998) animosity model by incorporating the pandemic animosity construct and considering animosity as a formative construct. It investigates how consumer animosity influences judgment and willingness to purchase in the context of a developing country. Additionally, the present research sheds light on the consumer animosity literature and creates new opportunities for better understanding the application of animosity in Vietnam, a specific developing country.

## II. MATERIAL AND METHOD

### Consumer animosity

In the Country of Origin (COO) literature, the construct of "Consumer Animosity" is first examined by Klein et al. (1998). Animosity refers to the resentment individuals feel toward a foreign country (Klein et al., 1998) or the negative emotions associated with imported goods from that nation (Chaudhry et al., 2021). This consumer animosity model (Klein et al., 1998) encompasses measurements of war and economic animosity, as well as overall animosity toward a nation, and examines their effects on consumer willingness to purchase products from that country; consumer animosity serves as the primary focus of many COO studies.

Later, the comprehension of animosity is informed by research across diverse cultural, political, and demographic contexts, highlighting several distinct forms of animosity. Several researchers ((Farah & Mehdi, 2021; Kalliny et al., 2017; Yu et al., 2020) conducted a review of relevant literature and identified some types: war/military animosity which is characterized by hostile feelings arising from military actions between nations; economic animosity reflects sentiments of financial exploitation or dominance toward a country; political animosity which is stemming from conflicts at the national level driven by political ideologies or competition for resources; cultural animosity which is arising from aversion to a person or nation based on cultural disparities. Some other researchers categorize animosity into types (De Nisco et al., 2016; Fong et al., 2022). Situational animosity affects a specific moment, while stable animosity develops into a deeper, long-lasting aggression that accumulates over time. Cultural animosity is typically stable and challenging to eliminate or manage. In contrast, war, economic, and political animosities are often situational and can generally be resolved over time.

Pandemic-related animosity can be seen as having an economic impact similar to that of political, economic, wartime, and cultural conflicts. COVID-19 has significantly hindered companies' abilities to export products to various countries (Carracedo et al., 2021; Nawaz et al., 2023; Verschuur et al., 2021). COVID-19 sparked a wave of pandemic-related hate and dehumanization, particularly directed at immigrant communities of Chinese and East Asians globally (Hoang et al., 2022; Nawaz et al., 2023). These researchers also documented that the hostility stemming from the pandemic mirrors the consequences of war and economic strife, highlighting the need to understand its effects on foreign product purchasing intentions. However, little research incorporates pandemic animosity into animosity model, especially formative animosity measures and investigates the effects of these animosities on purchasing behaviour.

**The mediating role of product judgment**

Social Identity Theory (Tajfel & Turner, 1985) and Realistic Group Conflict Theory (Sherif, 1979) establish a foundational framework for understanding consumer animosity, directing this study's examination of its effects on product judgment and willingness to buy. These theories underpin the conceptualization of consumer animosity and are aligned with previous research findings (Cheah et al., 2016; Hoang et al., 2022). Social Identity Theory indicates that individuals who strongly identify with their own group are inclined to favor it over others. Research has demonstrated that variations in national identity and perceived threats can shape how people evaluate quality and their buying intentions, both positively and negatively (Cheah et al., 2016). Additionally, Realistic Group Conflict Theory posits that individuals who perceive they have lost something due to another group's gains may view that group as a threat, resulting in increased judgment against them. This bias can lead to negative stereotypes and prioritize loyalty to one's own group over objective quality judgment(Sherif and Sherif, 1979).

Consumer animosity, defined as a negative emotional response toward another country due to political, economic, or historical conflicts, has been shown to significantly impact product judgment, which refers to the overall assessment of a product's quality or attributes. Previous research supports the notion that animosity can skew consumers' perceptions of products from perceived adversaries (Huang et al., 2010). The "made in" effect (O'cass & McEwen, 2004) demonstrates how perceptions of a product's country of origin can significantly shape consumer attitudes, often exerting greater influence than the product's actual features.. For instance, studies by Hong and Wyer Jr (1989) found that a country's reputation can exert a greater influence on product judgment than the actual characteristics of the product. Moreover, research indicates that animosity can lead consumers to form negative evaluations of products from hostile nations, underscoring the critical role of emotional biases in product judgment, a perspective that Klein (2002) contests Shoham et al. (2006).

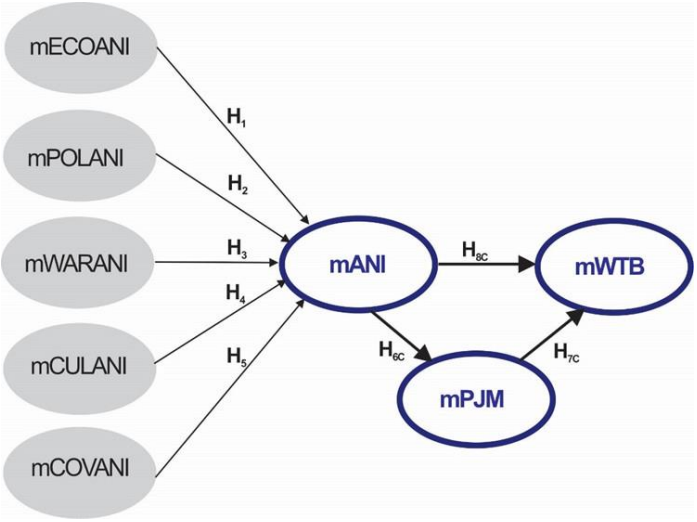



**Figure 5: The mediating role of product judgment in the relationship between consumer animosity and willingness to buy**

Animosity can significantly influence consumers' willingness to buy, which is defined as the likelihood or intent to purchase a product based on their perceptions of the product or its source. This animosity may prompt consumers to boycott goods from countries they dislike as a way to retaliate against perceived economic or political grievances and to protect their own economy from potential harm (Cui et al., 2012; Shoham et al., 2016). According to Cui et al. (2012),

animosity can negatively impact consumers' willingness to buy products from nations they view as hostile. Prior to this study, Papadopoulos et al. (1990) found that Japanese products ranked lowest on the “proud to own” question in the UK and France, largely due to animosity stemming from World War II. Additionally, consumer animosity can diminish the willingness to purchase imported goods, regardless of the product's jdgment (Klein et al., 1998). Shoham et al. (2006) noted that animosity affects both product judgment and purchase intention among Israeli consumers regarding Arab imports, highlighting the significant role of cultural symbolism in these dynamics.

Agreeing with the proposition that consumers who feel animosity towards a foreign country are likely to denigrate its products and refuse to purchase them, we advance the following three hypotheses:

H6c: Consumer animosity toward a country is likely to have a negative impact on their judgment of products from that country.

H7c: Consumers’ judgment of products from a country is likely to have a positive impact on their willingness to buy those products.

H8c: Consumer animosity toward a country is likely to have a negative impact on consumers’ willingness to buy products from that country.

**Method**

The study employed a mixed-method approach, integrating both qualitative and quantitative research methods to achieve a comprehensive understanding of the research objectives. This approach began with a qualitative phase, which informed the design of the subsequent quantitative survey. By combining these methodologies, the study leveraged the strengths of qualitative methods for exploratory insights and quantitative methods for statistical validation, ensuring robust and well-rounded results. First, a draft questionnaire was created, and then a semi-structured interview framework was developed based on the scale's components. Consumers were interviewed using this framework to identify themes and patterns, which informed the evaluation of the proposed questionnaire's suitability. The questionnaire was then revised accordingly. The quantitative phase involved a paper-based survey administered across various regions of Vietnam, from the North in Hanoi to the Central region in Quy Nhon, and the South in Ho Chi Minh City and Can Tho. The collected data were then analyzed using Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM) to test the hypotheses.

**Data collection**

The questionnaire, outlined in Table 1, was designed to ensure voluntary participation, confidentiality, and anonymity. To minimize common method variance (CMV), independent and dependent variables were separated (Podsakoff et al., 2003).

Definitions and measurements were adapted from established studies, with consumer animosity treated as a second-order construct comprising economic, war (Klein et al., 1998); political animosity (Witkowski, 2000); and cultural animosity (Kalliny et al., 2017);pandemic animosity Rojas-Méndez et al. (2022). Product judgment and willingness to buy followed Klein et al. (1998).Socio-demographic data (e.g., age, gender, education, income) were also collected, with questionnaires translated for semantic accuracy.

Table 1 summarizes demographic data from 827 participants: 45% male, 55% female, primarily from Ho Chi Minh and Ha Noi (25% each). The sample skews young (31% aged 18–27, 73% female), with 42% holding undergraduate degrees. Income data show 19% earn under 3 million VND, and many earn less than 10 million. These findings reveal demographic diversity and suggest a moderating role for product judgment in the link between consumer animosity and purchase willingness.

**Table 6: Sample characteristics (n=827)**

| | | **Gender** | | | | Total row | |
|---|---|---|---|---|---|---|---|
| | | **Male** | | **Female** | | | |
| | | n | Tỷ lệ % | n | Tỷ lệ % | n | Tỷ lệ % |
| City | Can Tho | 100 | 50% | 100 | 50% | 200 | 24% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ho Chi Minh | 84 | 42% | 123 | 62% | 207 | 25% |
| | Ha Noi | 91 | 46% | 120 | 60% | 211 | 26% |
| | Quy Nhon | 95 | 48% | 114 | 57% | 209 | 25% |
| Age | 18-27 | 110 | 55% | 145 | 73% | 255 | 31% |
| | 28-42 | 100 | 50% | 141 | 71% | 241 | 29% |
| | 43-60 | 91 | 46% | 80 | 40% | 171 | 21% |
| | >=61 | 69 | 35% | 91 | 46% | 160 | 19% |
| Education | Postgraduate | 74 | 37% | 69 | 35% | 143 | 17% |
| | Undergraduate | 137 | 69% | 210 | 105% | 347 | 42% |
| | College and Vocational school | 55 | 28% | 63 | 32% | 118 | 14% |
| | <= High school | 104 | 52% | 115 | 58% | 219 | 26% |
| Income | <3 million | 65 | 33% | 95 | 48% | 160 | 19% |
| | 3-5 million | 57 | 29% | 69 | 35% | 126 | 15% |
| | 5-10 million | 83 | 42% | 110 | 55% | 193 | 23% |
| | 10-15 million | 83 | 42% | 96 | 48% | 179 | 22% |
| | 15-20 million | 36 | 18% | 39 | 20% | 75 | 9% |
| | >=20 million | 46 | 23% | 48 | 24% | 94 | 11% |
| **Total** | | **370** | **45%** | **457** | **55%** | **827** | **100%** |

**Data analysis**

The data was analyzed in several steps. First, exploratory factor analysis (EFA) was conducted for each unidimensional concept, using SPSS software. Next, the EFA of multidimensional constructs was performed to assess their discriminant validity. Following that, confirmatory factor analysis (CFA) was utilized for willingness to buy and the components of consumer animosity. Finally, a structural equation model (SEM) was tested. AMOS software was used for CFA and SEM testing.

Confirmatory factor analysis was conducted to verify the fit of the measurement model, as well as the reliability, convergent validity, and discriminant validity of the scales. This process consisted of three steps: (1) testing the measurement model for each individual concept, (2) testing the overall measurement models, and (3) testing the structural model of consumer animosity and its theoretical relationships.

The testing of the consumer animosity measurement model involves evaluating unidimensional measurement models, including components for consumer animosity, product judgment, and willingness to buy. The evaluation follows Hair, Black, Babin, and Anderson's (2019) standards, focusing on two main criteria: model fit and construct validity. Model fit is assessed through specific indices. For absolute fit, the normalized $\chi^2$ (CMIN/df) must be below 2.0, and RMSEA should be under 0.08. Incremental fit indices require both TLI and CFI to exceed 0.92. Construct validity includes additional checks. Unidimensionality ensures each observed variable relates to only one factor, eliminating variables linked to multiple factors, with zero error covariance required. Convergent validity is met if standardized loading coefficients are at least 0.5, with an average variance extracted (AVE) of 0.5 or higher and composite reliability (CR) of 0.6 or more. Once these criteria are met, the validated unidimensional components of the multidimensional concept of consumer animosity will be integrated into the measurement model. This model will then undergo confirmatory factor analysis (CFA) to reassess all relationships among the latent variables. Besides the previously mentioned model fit and conceptual value criteria, the study will also evaluate discriminant validity, ensuring that correlation coefficients between the components of consumer animosity differ from 1.0. Testing the Overall Measurement

Model

All components and unidimensional concepts are collectively tested within the overall measurement model, which illustrates all correlations among the latent variables. The model must meet the requirements for fit and conceptual

value as outlined in Step 1, and the correlation coefficients between the concepts must be significantly different from 1.0.

This step involves examining the structural model of consumer animosity and subsequently testing the relationships among consumer animosity (mANI), product judgment (mPJM), and willingness to buy (mWTB), as demonstrated in the theoretical model in Figure 1. These testing steps reaffirm the theoretical fit of the second-order causal structural model of the consumer animosity concept.

## III. RESULT

### Exploratory Factor Analysis – Assessing Discriminant Validity

#### Animosity

The results in Table 2 show that Cronbach's Alpha exceeds 0.7, corrected item-total correlation is above 0.3, Extraction Sums of Squared Loadings surpass 50%, and factor loadings are greater than 0.5. Thus, the measurement items for mECOANI are retained. For mPOLANI, political animosity is divided into two components: External Political Animosity (mPOLANI) with statements like "China asserts territorial claims aggressively" and "China poses a security threat," and Internal Political Animosity (mPOLANII) with statements such as "China mistreats its labor unions and workers" and "China is unfair to religions." As this study focuses on Vietnamese consumers' animosity toward China, the political animosity is analyzed as mPOLANI, comprising two items related to external political animosity. Measurement items for mWARANI (war animosity), mCULANI (cultural animosity), and mCOVANI (pandemic animosity) are also retained. Finally, mANI (consumer animosity) meets the required criteria.

**Table 7: Results of exploratory factor analysis**

| | mCULANI | mCOVANI | mWARANI | mECOANI<br>mPOLANI |
|---|---|---|---|---|
| China may harm Vietnam's economy. | | | | .727 |
| China has negative effects on Vietnam. | | | | .799 |
| China exploits Vietnam economically. | | | | .633 |
| China asserts territorial claims aggressively. | | | | .575 |
| China poses a security threat. | | | | .471 |
| China mistreats its labor unions and workers. | .427 | | | |
| China is unfair to religions. | .420 | | | |
| I cannot forget China's 1,000 years of rule. | | | .686 | |
| I am angry with China over conflicts with Vietnam. | | | .826 | |
| I cannot forgive China for its history of domination. | | | .789 | |
| I am outraged by China's invasions. | | | .736 | |
| I dislike the public behavior of Chinese people. | .483 | | | |
| I have issues with people from Chinese culture. | .880 | | | |
| I prefer not to associate with people from Chinese culture. | .886 | | | |
| Generally, people from Chinese culture are not good. | .836 | | | |
| China is deceptive about COVID-19. | | .772 | | |
| I cannot forgive China for COVID-19. | | .514 | | |
| COVID-19 makes me fearful of China. | | .677 | | |
| China should be responsible for COVID-19. | | .767 | | |
| China mishandled the pandemic. | | .777 | | |
| China erred in the COVID-19 outbreak. | | .735 | | |
| **Cronbach's Alpha** | **.862** | **.845** | **.856** | **0.790**<br>**0.721** |

*Product judgment and willingness to buy*

Product judgment is categorized into two components: Quality Judgment, referred to as PJMQ (including the first seven items), and Design Judgment, referred to as PJMD (including the two last items Products from China have

aesthetic appeal, Products from China feature smart designs). Both structures will undergo testing through Confirmatory Factor Analysis (CFA) as unidimensional components of a second-order structure, denoted as mPJM, in a reflective format.

**Table 8: Factor analysis of product judgment**

| | PJMQ | PJMD |
|---|---|---|
| Products from China are produced carefully. | .760 | |
| Products from China are crafted intricately. | .530 | |
| Products from China are made with advanced technology. | .570 | |
| Products from China have high durability. | .851 | |
| Products from China are improving. | .604 | |
| Products from China do not pose health risks. | .666 | |
| Products from China are reliable. | .623 | |
| Products from China have aesthetic appeal. | | .743 |
| Products from China feature smart designs. | | .845 |
| **Cronbach's Alpha** | **.864** | **.751** |

The measurement items for willingness to buy will be retained, comprising four statements: I am open to buying products from China; I have a high probability of purchasing products from China; I will buy products from China when I need something; and I will sample products from China. The Cronbach's Alpha for these items is 0.842, indicating good reliability.

**The formative structure of consumer animosity and hypothesis testing**

Similar to the CFA evaluation, a structural model is considered to fit the market data well when the following criteria are met (Hair et al., 2019; Hair et al., 2020; Kline, 2023): the normed chi-square (CMIN/df) is less than 5.0, the RMSEA (Root Mean Square Error of Approximation) is below 0.08, the TLI (Tucker-Lewis Index) exceeds 0.92, and the CFI (Comparative Fit Index) is greater than 0.92.

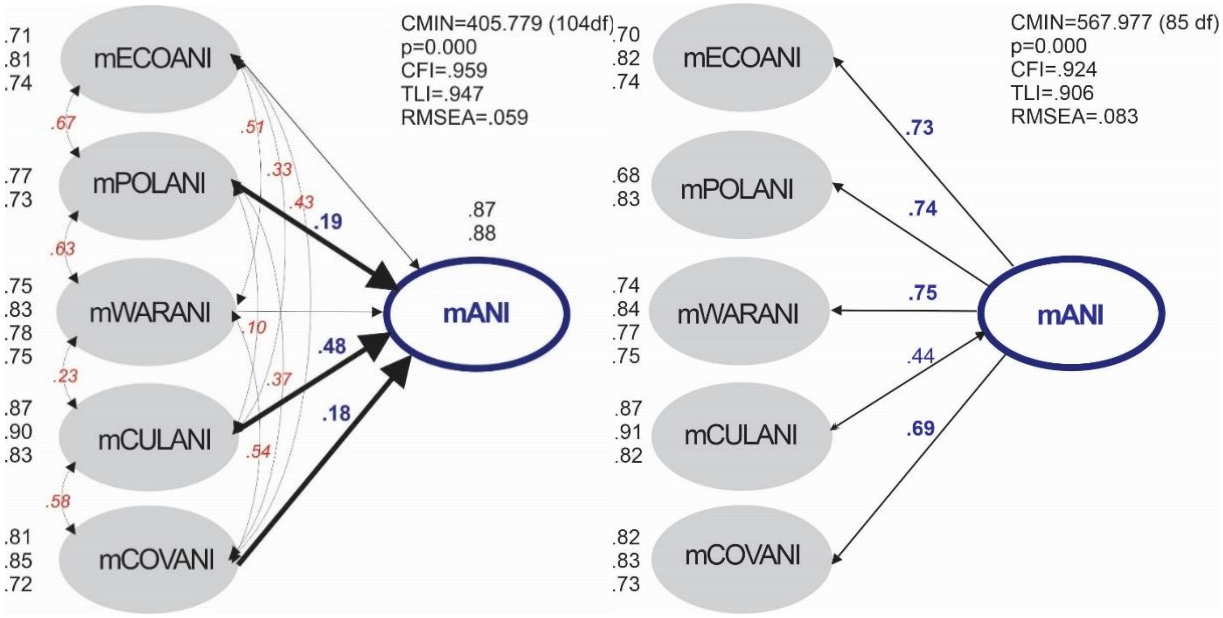



**Figure 6: (a) Formative structure and (b) Reflective structure of consumer animosity**

Figure 2 demonstrates that the formative model shows significantly better fit indices compared to the reflective model. Specifically, the CFI for the formative model is 0.950, which surpasses that of the reflective model (0.942). Similarly, the TLI for the formative model (0.947) is higher than that of the reflective model (0.906). In addition, the lower RMSEA in the formative model (0.059) suggests a better fit than the reflective model (0.083). Furthermore, the decrease in degrees of freedom without compensation indicates a significant difference in CMIN. As a result, the formative structure of consumer animosity has been selected, supporting both the theoretical and statistical validity of

this approach, thereby eliminating the need for reflective measurement of the construct.

Moreover, the results in Figure 2 (a) indicate that political, cultural, and pandemic factors contribute to Vietnamese consumer animosity toward China. However, war and economic factors do not appear to influence this animosity among Vietnamese consumers. Consequently, the next step is to investigate how consumer animosity significantly affects their willingness to buy Chinese-made products.

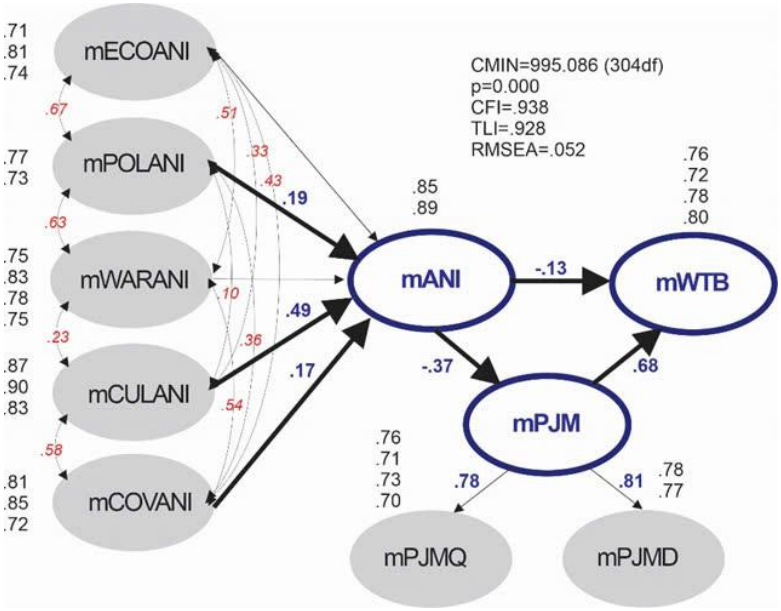



**Figure 7: Results of nomological validity and hypothesis testing**

Additionally, the results in Figure 3 confirm the nomological validity of the formative model of consumer animosity through product judgment and willingness to buy. The findings reveal that Vietnamese animosity toward China is influenced by various factors, including political, cultural, and pandemic-related elements, thereby confirming hypotheses H2, H4, and H5. This indicates that consumer animosity is dynamic, and shaped by contemporary events and cultural perceptions. In contrast, the lack of significant evidence for war and economic animosity suggests that these factors are less relevant in the present context, reflecting shifts in consumer sentiment.

Significantly, the findings show that product judgment mediates the relationship between consumer animosity and willingness to buy. While Vietnamese animosity toward China can enhance willingness to purchase Chinese products and positively impact product judgment, negative perceptions of product quality ultimately reduce purchase intent. This dual effect highlights the complexity of consumer behaviour, where emotional biases produce conflicting outcomes. These findings strongly support hypotheses H6c, H7c, and H8c, illustrating the intricate links between consumer animosity, product judgment, and purchasing decisions.

## IV. DISCUSSION AND CONCLUSION

This study enhances the existing literature on consumer animosity and product judgment by exploring the intricate interactions between these constructs, with a specific focus on how Vietnamese consumers perceive Chinese products. It underscores the significant impact of political, cultural, and pandemic-related factors in shaping consumer animosity, corroborating prior research that highlights the role of external influences on consumer sentiment. For example, studies by Cheah et al. (2016) and Hoang et al. (2022) emphasize that consumer animosity is a dynamic phenomenon, evolving with changes in geopolitical conditions and societal contexts. By addressing contemporary issues such as the COVID-19 pandemic (Nawaz et al., 2023), this research illuminates how major global events intensify or reshape consumer perceptions, adding layers of complexity to their purchasing behavior. These insights emphasize the necessity of understanding consumer animosity within a broader socio-political and cultural framework, as shifts in international relations, public health crises, and national sentiments profoundly influence consumer attitudes and behavior toward foreign products. Such understanding is crucial for businesses navigating markets affected by heightened animosity, as it highlights the need for adaptive, context-specific marketing strategies.

The study's findings that product judgment mediates the relationship between consumer animosity and willingness

to buy align with existing literature on consumer decision-making processes. Research by Shoham et al. (2006) and Shoham and Gavish (2016) suggests that negative emotions toward a country can bias evaluations of its products. This study reinforces those findings, demonstrating that animosity not only reduces willingness to buy but also contributes to negative product judgments, adding complexity to purchasing decisions. These results challenge earlier works by Klein et al. (1998) and Klein (2002), which did not account for the mediating role of product judgment. By reaffirming this mediation effect, the study provides a nuanced understanding of how consumer animosity influences buying behavior.

The findings also align with Huang et al. (2010), who highlighted that consumer animosity distorts product evaluations. The dual impact of animosity—where it can both deter purchasing while negatively influencing product perceptions—illustrates the interplay of emotional biases in consumer behavior. This complexity underscores the need for marketers to address both the emotional and rational dimensions of consumer decision-making to create more effective strategies.

Crucially, this study addresses gaps in the literature regarding the measurement of animosity by adopting a formative perspective. The findings demonstrate that a formative measurement model more accurately captures the multifaceted and context-dependent nature of animosity, particularly in the Vietnamese context regarding Chinese products. This supports arguments made by Diamantopoulos and Riefler (2011) and Riefler and Diamantopoulos (2007) that reflective models fail to account for the complexities of constructs like animosity. Additionally, the research corroborates concerns raised by Kalliny et al. (2017) and Riefler and Diamantopoulos (2007) regarding model misspecification, asserting that formative constructs provide a more robust framework for assessing animosity's impact on key outcomes such as purchase intentions. By validating the formative approach, the study addresses a call for more suitable measurement methodologies (Bollen & Lennox, 1991; Riefler & Diamantopoulos, 2007) and contributes empirical evidence that strengthens the theoretical and practical application of formative models in animosity research. This advancement ensures greater reliability and validity, minimizing biases in structural estimates while offering clearer insights into the behavioral implications of animosity.

The findings of this study offer valuable insights for marketers seeking to navigate consumer animosity in the digital era. Given that political, cultural, and pandemic-related animosities significantly shape consumer perceptions, businesses can leverage digital platforms to foster positive engagement and reshape brand narratives. Social media, influencer marketing, and data-driven personalization provide opportunities to address animosity-driven biases by highlighting quality, ethical sourcing, and cultural sensitivity. Additionally, e-commerce platforms can implement AI-driven recommendation systems to counteract negative biases by promoting product attributes over country-of-origin perceptions Tilahun et al. (2023). Interactive content, such as live-streaming, virtual product trials, and localized digital campaigns, can further enhance consumer trust and encourage purchase intent. By strategically using technology, companies can mitigate animosity-driven hesitations and create more favorable brand associations in competitive markets like Vietnam.

This study also identifies several areas for future research. Longitudinal studies are crucial for understanding how consumer animosity evolves in response to geopolitical, cultural, and pandemic-related changes, offering insights into its long-term impact on purchasing behaviors. Cross-cultural studies could deepen understanding of how regional and cultural factors influence consumer animosity, enabling the development of globally applicable theories. Additionally, investigating the psychological mechanisms that connect animosity, product perceptions, and purchase intentions could illuminate why negative sentiments sometimes coincide with positive buying behaviors.

The refinement of measurement models for animosity, including the exploration of formative frameworks, remains an important area of study to ensure robust and reliable constructs. Moreover, future research should assess the long-term effectiveness of targeted marketing strategies, such as age-specific or culturally sensitive campaigns, in reducing animosity and promoting brand engagement. These efforts will provide actionable insights for marketers and enrich the academic discourse on consumer behavior in an increasingly interconnected and dynamic global marketplace.

In conclusion, addressing consumer animosity requires a multi-faceted and deeply informed approach. By leveraging demographic insights, promoting cultural sensitivity, and maintaining adaptability through feedback, marketers can build meaningful connections with their target audiences. Future research will be instrumental in refining

these strategies, offering a more profound understanding of consumer animosity's dynamics and paving the way for more effective marketing practices in an evolving global context.

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# A BIBLIOMETRIC ANALYSIS OF "DROP THE C" IN LOGISTICS: TOWARD SUSTAINABILITY IN SUPPLY CHAINS

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**ABSTRACT**

The global logistics sector is undergoing a significant transformation to meet sustainability goals and reduce carbon emissions, often referred to as "Drop the C" in logistics. This study employs bibliometric analysis to examine scientific literature related to sustainable logistics, supply chain management, emission control, and emerging technologies. Using employing bibliometric tools in R, we analyze research trends, thematic clusters, and geographical contributions. The findings highlight a surge in green logistics research, driven by global environmental policies like Net Zero 2050. Key themes include sustainable development, decision-making, emission control, and alternative energy solutions. However, the study also identifies gaps, particularly in the limited adoption of advanced technologies (IoT, Blockchain) in developing economies; ineffective application of industry 4.0 technologies; low awareness of engagement among logistics service providers (LSPs). This research provides actionable insights for scholars and practitioners seeking to align logistics operations with sustainability objectives

*Key words:* “drop the C”, “green Logistics”, “net zero”, “sustainability supply chain”

## I. INTRODUCTION

Vietnam has demonstrated strong environmental commitments in recent years, including strict adherence to sustainability standards such as CO2 emissions reduction, green energy consumption, water conservation, and waste treatment. Policies issued by government like Decree 06/2022/ND-CP, which mandates establishments emitting over 3,000 tons of CO2 per year or consuming 1,000 tons of oil annually to report emissions, highlight the country’s pledge toward achieving Net Zero 205 (Dou et al., 2024) (Bell, Spinler, Winkenbach, & Müller, 2023). Despite these advancements in industrial sustainability, Vietnam's logistics sector behind, primarily relying on outdated diesel-powered trucks for road transport, the country's main mode of transportation. Other lower-emission modes, such as trains and vessels, remain underutilized for domestic logistics, despite Vietnam’s geographical advantages as a seafront country.

Globally, the concept of "Drop the C in Logistics" has gained momentum, emphasizing carbon reduction through innovative technologies, alternative fuels, efficient transportation methods, and collaborative supply chain management(Mao, Zhang, & Liu, 2024), (Zamboni, Scamardella, Gualeni, & Canepa, 2024). This study aims to explore the current state of research in sustainable logistics, identify critical gaps, and propose future directions to align Vietnam’s logistics operations with global sustainability trends.

Specifically, this research focuses on examining research trends in green logistics and carbon reduction; dentifying gaps in scaling green logistics in developing countries.

The organization of this paper is as follows: Part 1 serves as the introduction. Part 2 details the bibliometric methods and data used in the analysis. Part 3 presents a brief review of the literature on dropping the 'C' in logistics, summarizing previous findings to contextualize the results of the current study. It also presents the outcomes of citation-based bibliometric analysis, highlighting general trends and identifying key sources, documents, authors, and countries. Furthermore, it offers a thematic analysis of the research area surrounding the concept of dropping the C in logistics, exploring the evolution of research themes. Additionally, it discusses the study's findings and suggests potential trends for future research. Finally, Part 4 concludes the paper by emphasizing its contributions and addressing the study's limitations.

## II. MATERIAL AND METHODOLOGY

In this study, the author utilized the framework established by Tranfield, Denyer, and Smart (2003), which includes

three phases: planning, processing, and reporting. The initial phase involves selecting the database and researching keywords. To achieve the research goals, the author presents the process as follows:

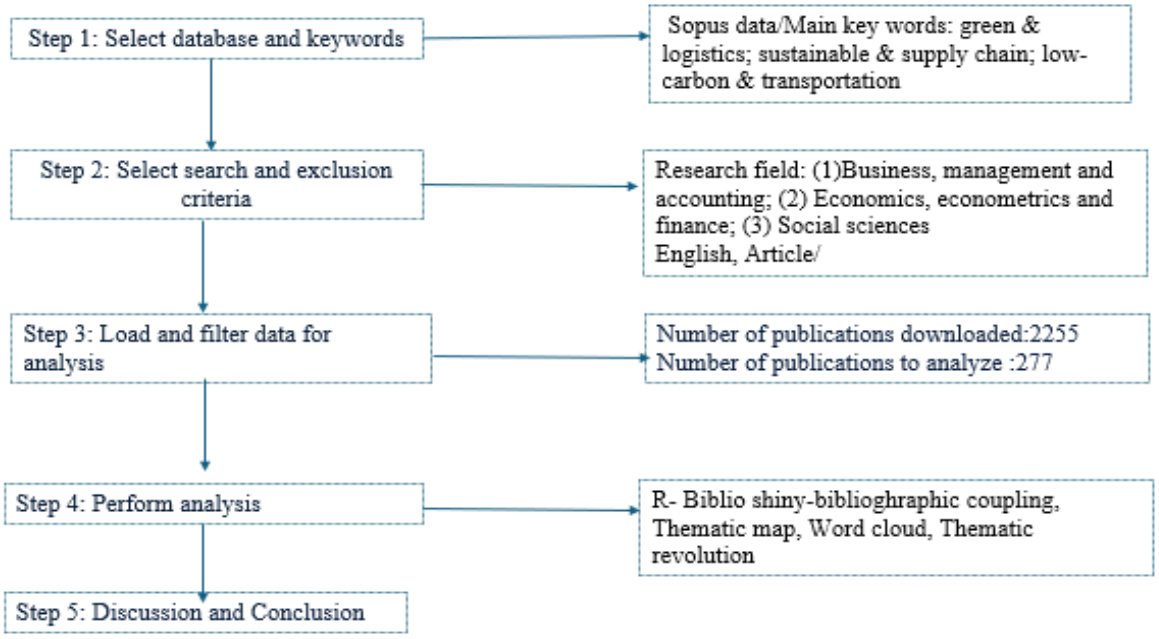



**Figure 1: Analysis process**

*Source: Author design*

To perform the bibliometric analysis, data were collected from two major academic databases Scopus, which are widely recognized for their comprehensive indexing of peer-reviewed literature. The time frame for data collection was set from 2006 to 2024, reflecting a period of heightened global focus on sustainability and logistics innovation, especially after milestones like the Paris Agreement in 2015. The search strategy was developed to capture relevant publications within the field of sustainable logistics and its associated themes. The following query was constructed to ensure a comprehensive yet targeted search: "ALL (drop AND the AND C) AND ALL (green AND logistics) AND TITLE-ABS-KEY (sustainable AND supply AND chain) OR ALL (low-carbon AND transportation) ) AND ( LIMIT-TO ( DOCTYPE , "or" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ).

**2.1. Data Analysis**

The collected bibliographic data were analyzed through a structured bibliometric approach to provide a detailed understanding of the research landscape in sustainable logistics. The analysis was divided into three key dimensions: Descriptive Analysis, Co-citation Analysis, and Thematic Mapping, enabling a comprehensive examination of publication trends, scholarly networks, and thematic developments over time.

The bibliometric analysis, conducted on research publications related to "Drop the C" in logistics, provided a detailed snapshot of scholarly contributions over a timespan from 2006 to 2025. The dataset contains 277 documents sourced from 169 unique outlets, showcasing a steady annual growth rate of 13.45%, reflecting increasing attention to sustainable logistics and carbon reduction. This consistent increase highlights a growing interest among researchers in sustainable logistics and carbon reduction, suggesting that these topics are becoming increasingly relevant in both academic and practical contexts. Such heightened focus can lead to the development of more innovative solutions and practices in the field. As more researchers contribute, the body of knowledge expands, facilitating a better understanding of the complexities and challenges associated with sustainable logistics. From that point, it is crucial for policymakers and industry practitioners to adopt more sustainable practices. Research findings can inform regulations and guidelines that promote carbon reduction efforts, leading to tangible environmental benefits. A total of 946 authors contributed to the research, with an average of 3.83 co-authors per document and an international co-authorship rate of 34.66%, indicating strong global collaboration in the field. A notable international co-authorship rate signifies that researchers from different countries and institutions are collaborating on projects. This collaborative approach fosters the exchange of diverse perspectives and expertise, which is crucial for tackling complex global challenges such as

sustainability in logistics. International collaborations often result in higher visibility for research findings, as they reach broader audiences across different regions and disciplines. This can enhance the impact of the research and encourage further studies in the area. Interestingly, only 16 single-author publications were recorded, emphasizing the collaborative nature of research in this domain. (Lin, Choy, Ho, Chung, & Lam, 2014);(Ghalehkhondabi, Maihami, Ahmadi, & Fallahtafti, 2024).




**Figure 2: Data sheet**

*Source: Authors collect data in R software*

– Top Contributors

Wang Y is the leading contributor with 6 documents, followed by Liu Y, Szklo A, and others, each contributing 4 documents. These authors predominantly address renewable energy systems, green logistics optimization, and emission control in transportation networks, as evidenced by their publication records.

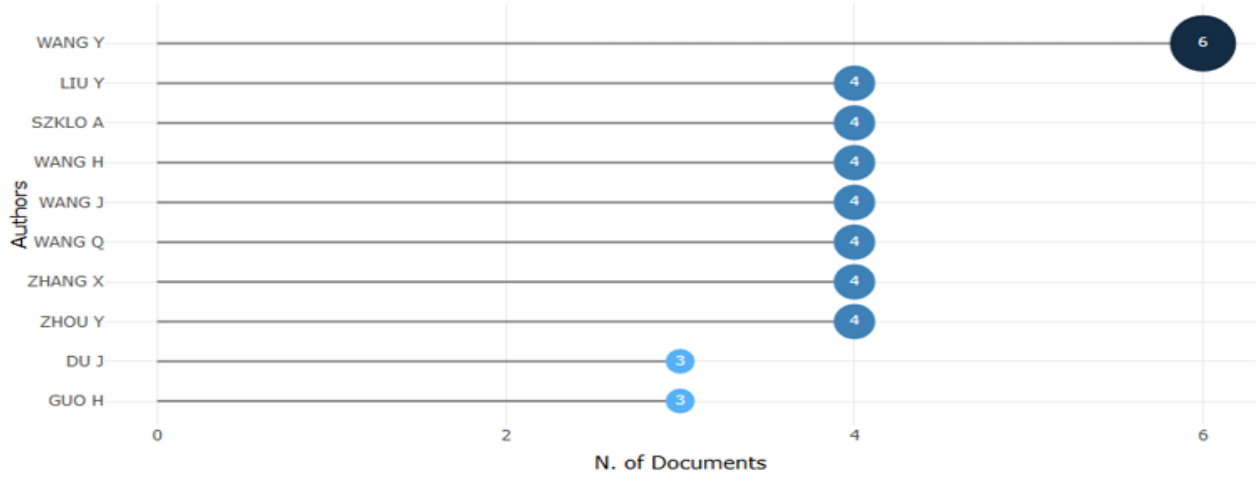



**Figure 3: Top authors**

*Source: Authors collect data in R software*

– Impact sources:

The documents amassed 22,134 references, with an average citation of 23.68 per document, highlighting the academic significance and relevance of the topic. The Journal of Cleaner Production and Sustainability (Switzerland) are the leading sources, each publishing 22 documents, underscoring their focus on environmental and sustainable topics (Jamali & Rasti-Barzoki, 2019); (Bell et al., 2023). Other prominent journals include Computers and Industrial Engineering (8 articles), International Journal of Production Research (5 articles). Renewable Energy and Energy (4 articles each); These journals reflect the interdisciplinary nature of the research, integrating sustainability, energy systems, and supply chain optimization.

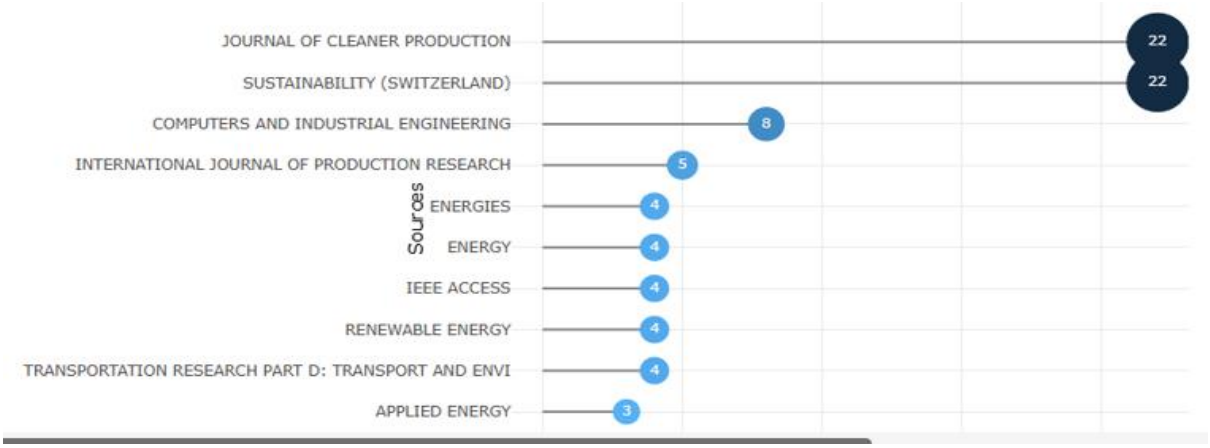



**Figure 4: The leading sources**

*Source: Authors collect data in R software*

### 2.2. Co-citation Analysis

This analysis explored the relationships between influential articles and authors, uncovering intellectual connections within the field of sustainable logistics. By examining co-cited articles, clusters of foundational and highly referenced works were identified, highlighting pivotal studies that have significantly shaped discussions on green logistics, low-carbon transportation, and circular supply chains. The results revealed a well-connected scholarly network with recurring themes, including emissions reduction, renewable energy adoption, and logistics optimization.

The co-citation networks pointed to foundational studies, such as those on sustainable fuels by (Al-Hamed & Dincer, 2021); (Verma et al., 2024); which advanced knowledge on renewable energy integration into logistics. Research on reverse logistics was also prominent, as exemplified by (Mukherjee, Sangal, Sarkar, Almaamari, & Alkadash, 2023);(Mao et al., 2024) emphasizing waste management and recycling practices. Additionally, works on emissions control and optimization models, including studies by (Kahalimoghadam, Thompson, & Rajabifard, 2024) ; (Wu, Xiao, Zhu, & Xiao, 2023) showcased the application of computational techniques to reduce carbon footprints and enhance logistics efficiency. These co-cited works form the backbone of scholarly contributions in the field, driving innovations and practical solutions in sustainable logistics.

### 2.3. Thematic Mapping

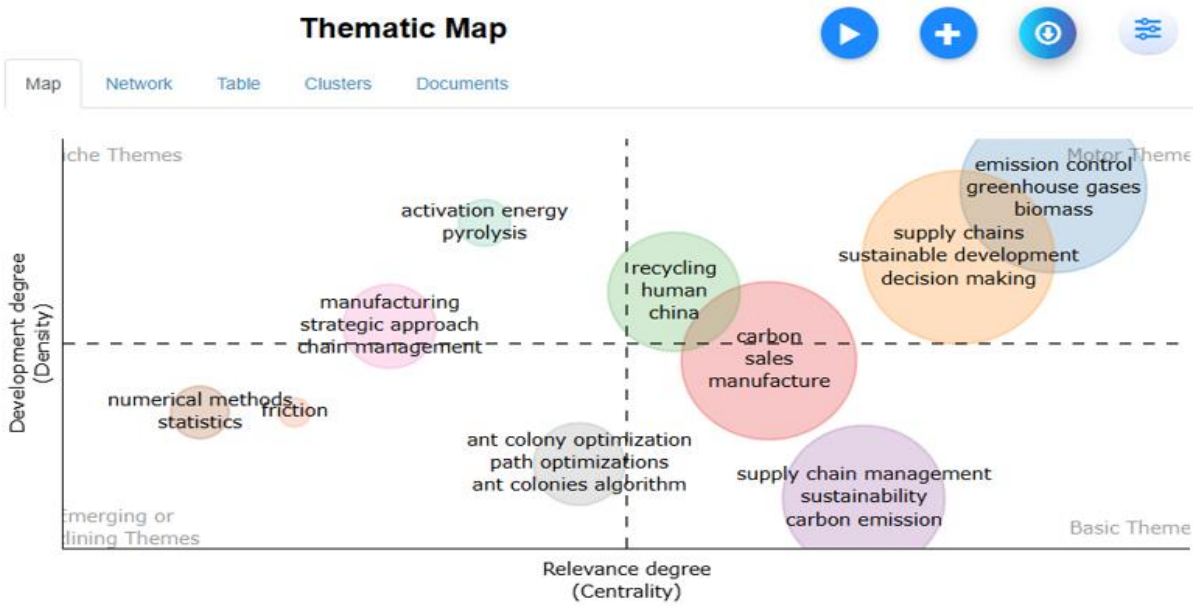



**Figure 5: The thematic Map**

*Source: Authors collect data in R software*

Thematic mapping was conducted to identify the evolution of research themes and emerging trends over time.

Using keyword co-occurrence and thematic clusters, primary themes were identified:

Sustainable Development – focusing on renewable energy and emissions reduction.

Supply Chain Management – emphasizing circular economy and green vehicle routing.

Decision-Making – integrating AI and multi-objective optimization in logistics.

Emission Control – exploring carbon pricing and alternative fuels like hydrogen and ammonia.

Recycling and Reverse Logistics – optimizing waste management systems.

Industry 4.0 – leveraging smart logistics, IoT, and blockchain technologies.

The thematic mapping not only revealed shifts in research priorities but also highlighted gaps, such as the limited focus on applying green logistics in developing economies and the scalability of new technologies. This comprehensive analysis lays the groundwork for understanding the current state of research and identifying avenues for future exploration in sustainable logistics.(Zhang et al., 2024)

The word cloud provides a visual representation of the dominant themes and key areas of focus in research related to sustainable logistics and "Drop the C" initiatives. The size and prominence of terms reflect their frequency and importance within the scholarly literature, offering valuable insights into current trends and priorities in this field.




**Figure 6: Word cloud**

*Source: Authors collect data in R software*

## III. RESULT AND DISCUSSION

### Dominant Themes

The most frequently occurring terms, such as Sustainable Development and Supply Chain Management, highlight the central role of sustainability in logistics practices (Kahalimoghadam et al., 2024). Research in this domain emphasizes the transition toward environmentally friendly supply chains, focusing on reducing greenhouse gas emissions, optimizing energy use, and adopting sustainable technologies. The integration of sustainable practices in supply chain management is seen as critical for achieving global targets like Net Zero 2050.

Another key term, Life Cycle Assessment, underscores the importance of evaluating the environmental impacts of logistics operations throughout their entire lifecycle, from resource extraction to product disposal. This approach ensures that all stages of the logistics process contribute to minimizing carbon emissions and energy consumption (Liu et al., 2022; Zamboni et al., 2024).

### Supporting Themes

Supporting terms such as Circular Economy and Closed-loop Supply Chain point to the growing emphasis on recycling, reusing (Al-Hamed & Dincer, 2021), and waste reduction in logistics networks. These concepts align with reverse logistics practices, where materials are repurposed to create a circular flow of resources, minimizing waste and

environmental impact (Verma et al., 2024).

Terms like Renewable Energy, Biofuels, and Energy Efficiency reflect the sector's efforts to transition away from traditional fossil fuels. The focus on renewable energy sources and alternative fuels demonstrates the increasing priority of reducing carbon footprints in logistics operations (Tountas, Ozin, & Sain, 2024).

**Emerging Trends**

Several terms highlight evolving areas of interest in logistics research:

Game Theory: Indicates studies exploring strategic decision-making and collaboration among supply chain stakeholders, particularly in reducing carbon emissions and improving efficiency (Ghalehkhondabi et al., 2024).

Blockchain Production and Information Sharing: These terms emphasize the role of digital technologies in enhancing transparency, traceability, and efficiency in logistics operations (Bell et al., 2023)

COVID-19: Highlights the temporary but significant impact of the pandemic on logistics systems, including disruptions to supply chains and the push for more resilient and sustainable logistics practices. (Lin et al., 2014);(Mukherjee et al., 2023)

The word cloud reveals that research in "Drop the C" in logistics is multifaceted, addressing global challenges like climate change and sustainability through diverse approaches. While dominant themes focus on sustainable development and supply chain optimization, emerging trends like blockchain and pandemic resilience indicate the dynamic evolution of this field. Future research must continue to explore innovative solutions, such as digital technologies and renewable energy systems, to drive the transition toward green logistics and achieve global sustainability goals.

**Niche Areas**

Specialized topics, such as Sustainable Aviation Fuel, reflect research into decarbonizing specific sectors like aviation. Meanwhile, terms like Location-routing Problem and Optimization suggest the application of advanced mathematical models and algorithms to design more efficient and environmentally friendly logistics systems.

This analysis provides a foundation for further exploration into these themes, ensuring alignment with both academic priorities and practical applications in the logistics industry

The thematic map illustrates the evolution of key research themes in logistics and sustainable supply chains over three distinct time periods: 2006–2018, 2019–2023, and 2024–2025. It highlights how research topics have developed, shifted, and expanded in focus over time.

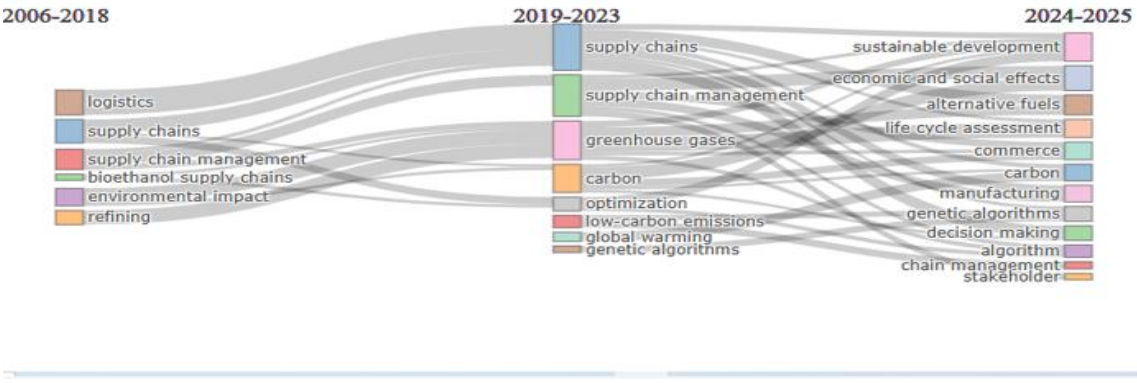



**Figure 7: Thematic revolution**

*Source: Authors collect data in R software*

During the period from 2006 to 2018, research in logistics and supply chain management primarily focused on foundational topics that laid the groundwork for future advancements in sustainability. Central themes such as Logistics and Supply Chains dominated the discourse, emphasizing improvements in traditional operational processes and the optimization of supply chain efficiency. Alongside these core areas, emerging topics began to gain traction, reflecting a growing interest in renewable energy and environmental sustainability. For instance, studies on Bioethanol Supply

Chains and Refining highlighted the early exploration of renewable energy sources within logistics, while the focus on Environmental Impact demonstrated an increasing awareness of the sector's role in contributing to climate change. This period was pivotal in establishing the conceptual and practical framework for integrating sustainability into logistics and supply chains, setting the stage for deeper investigations into biofuels and other environmentally conscious practices in subsequent years.

Between 2019 and 2023, research in logistics and supply chain management expanded significantly, shifting from foundational concepts to addressing urgent global challenges. Central themes such as Supply Chain Management and Supply Chains remained pivotal, but the focus broadened to include critical issues like Greenhouse Gases and Carbon emissions, reflecting a heightened emphasis on sustainability and climate action. Emerging areas of interest included Optimization, which showed the use of advanced mathematical and computational models to improve efficiency, and Low-carbon Emissions, highlighting the adoption of strategies to minimize the carbon footprint of logistics operations. Topics such as Global Warming emphasized the urgency of mitigating the sector's environmental impacts, while the incorporation of Genetic Algorithms demonstrated the application of innovative technologies to solve complex problems in logistics and supply chain systems. This period marked a transformative phase where sustainability became operationalized, integrating cutting-edge technologies and emissions reduction strategies to address global environmental concerns.

**Period: 2024–2025**

The period from 2024 to 2025 represents a forward-looking phase in logistics and supply chain research, with an emphasis on integrating sustainability across all dimensions of the field. Sustainable Development emerged as the dominant theme, reflecting the alignment of logistics practices with global environmental and economic goals, such as Net Zero 2050. Key topics during this period included Economic and Social Effects, which explored the broader impacts of sustainable logistics on society and economies, and Alternative Fuels, emphasizing the transition to renewable energy sources like hydrogen and biofuels. Life Cycle Assessment gained prominence as a tool to evaluate the environmental impacts of supply chain activities holistically, while topics such as Decision-Making and Stakeholders reflected the increasing complexity of collaborative efforts in achieving sustainability goals. Furthermore, themes like Manufacturing and Chain Management illustrated the integration of sustainable practices within production and supply chains, while advancements in Algorithms and Genetic Algorithms showcased the continued reliance on computational tools for solving complex challenges. This period represents a holistic and multidisciplinary approach to logistics and supply chain management, addressing environmental, social, and economic dimensions in a coordinated effort to achieve global sustainability targets

Each phase demonstrates a progressive evolution in research, transitioning from foundational studies to the integration of advanced technologies and multidimensional sustainability goals. This trend underscores the growing complexity and importance of logistics and supply chain management in the global push for sustainable development. Despite significant advancements in sustainable logistics research and practices, several gaps remain that hinder the effective implementation of emerging technologies for emission control. These gaps primarily revolve around technology adoption, effectiveness of emission control measures, and awareness among LSPs.

– Limited adoption of new technologies in emission control

While advanced technologies such as IoT, blockchain, and artificial intelligence have been widely discussed in the context of logistics, their actual implementation, particularly in emission monitoring and control, remains inadequate. Many logistics networks still rely on conventional methods for tracking emissions, which are less accurate and often fail to provide actionable insights in real-time. According to Verma et al. (2024), this technological lag is more pronounced in developing economies where the infrastructure for implementing Industry 4.0 technologies is either underdeveloped or prohibitively expensive.(Li, Tian, Li, Wu, & Liu, 2023). Furthermore, Ghalehkhondabi et al. (2024) highlight those tools such as game theory, which are crucial for fostering collaboration among stakeholders to optimize emissions, have seen limited practical application. This reflects a broader issue in translating theoretical frameworks into operational strategies. Certain technologies such as IoT, blockchain, and artificial intelligence are experiencing low adoption rates in logistics, particularly for emission monitoring and control, due to several interconnected factors. Firstly, in

developing economies, the necessary infrastructure for implementing Industry 4.0 technologies is often underdeveloped or prohibitively expensive Vial, G. (2019), (Verma et al., 2024). Additionally, the high costs associated with deploying these advanced technologies present significant barriers, especially for small and medium-sized enterprises that may lack the financial resources needed (Mathauer, M., & Hofmann, E. 2019). Furthermore, there is a notable lack of knowledge and skills within organizations, as many personnel are not adequately trained to implement these technologies effectively. Compounding these issues are challenges related to system interoperability, as technologies like blockchain and IoT require integration across multiple platforms, which can hinder their effective application. To address these challenges, it is essential to promote investments in IT infrastructure and provide financial support programs for smaller enterprises. Moreover, organizing training sessions can enhance employee skills and awareness regarding new technologies. Finally, encouraging research on integrating these technologies into existing processes, along with utilizing tools like game theory to foster collaboration among stakeholders, can optimize emissions and improve overall efficiency (Verhoef et al. 2021), (Ghalehkhondabi et al., 2024) (). To address the challenges associated with the low adoption rates of advanced technologies in logistics, several proposed solutions can be implemented. First, governments and organizations should promote investments in IT infrastructure to facilitate the deployment of new technologies. This infrastructure investment is crucial for enabling effective integration and utilization of systems like IoT and blockchain. Additionally, providing low-interest loans or financial assistance to small and medium enterprises can alleviate financial burdens and stimulate innovation, making it easier for these businesses to adopt advanced solutions. Furthermore, organizing training sessions and workshops can significantly enhance employee awareness and skills regarding these new technologies, ensuring that personnel are equipped to implement them effectively. Lastly, encouraging research on integrating these technologies into existing processes can lead to more practical applications, while tools like game theory can foster collaboration among stakeholders to optimize emissions (Ghalehkhondabi et al., 2024). Together, these solutions create a comprehensive approach to overcoming the barriers to technology adoption in logistics

- Low awareness and engagement among LSPs

Another critical gap is the lack of awareness and engagement among LSPs regarding the importance of emission control and sustainable practices. Many LSPs prioritize cost and time efficiency over environmental considerations. Tountas, Ozin, & Sain (2024) noted that while renewable energy and biofuel options are available, the adoption rates are low due to inadequate knowledge of their benefits and cost advantages in the long term. According to Mukherjee et al. (2023), the challenges faced during the COVID-19 pandemic further highlighted the need for resilient and sustainable logistics systems. However, this disruption also revealed that many LSPs lacked the readiness to integrate sustainable technologies into their operations effectively, even when the necessity was evident. While the necessity for sustainable practices became increasingly evident during this period, it was also revealed that many LSPs were unprepared to effectively integrate sustainable technologies into their operations (Cichosz, M., Wallenburg, C. M., & Knemeyer, A. M. 2017). This lack of readiness highlights a gap between recognizing the importance of sustainability and the actual implementation of sustainable solutions. As such, the pandemic served as both a catalyst for reevaluating logistics systems and a reminder of the challenges that remain in transitioning toward more sustainable practices. Addressing these challenges is crucial for building logistics systems that are not only resilient in the face of future disruptions but also aligned with sustainability goals.

- Ineffective application of industry 4.0 technologies

The limited use of Industry 4.0 technologies for real-time emission tracking and optimization is another major gap. While concepts like blockchain for transparency and IoT-enabled sensors for emission monitoring have been proposed (Bell et al., 2023), their practical deployment has been slow, particularly in regions where technological infrastructure is not robust. Liu et al. (2022) and Zamboni et al. (2024) suggest that a lack of standardized frameworks and regulations contributes to the inconsistent application of these technologies.

## V. CONCLUSION

The study underscores the critical role of sustainable logistics and supply chain management in achieving global environmental objectives such as Net Zero. Through bibliometric analysis, the research highlights the growing

prominence of green logistics, driven by the integration of renewable energy, circular economy principles, and advanced technologies such as AI, IoT, and blockchain. These findings reinforce the importance of interdisciplinary approaches and the adoption of innovative technologies to meet sustainability goals. However, the study also reveals several research gaps that warrant further exploration. For instance, there is a need to investigate the adoption of advanced technologies in developing economies, as well as the limited integration of Industry 4.0 technologies within existing logistics frameworks. Additionally, there is an opportunity to enhance awareness and understanding of new technologies among LSPs, which could facilitate more effective implementation. For researchers, this could involve proposing future studies focused on the barriers to technology adoption for emission reduction in various contexts. For practitioners, offering a detailed framework or checklist for implementing sustainable practices aimed at reducing emissions would greatly enhance the practicality of the research findings. Addressing these aspects will contribute to a more effective transition to sustainable logistics and supply chain management, ultimately leading to significant reductions in greenhouse gas emissions. Future research should focus on scaling these solutions, fostering cross-industry collaboration, and addressing region-specific challenges to ensure a comprehensive transition to sustainable logistics and supply chain management.

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# CLOUD COMPUTING POWER TO REDUCE THE IMPACT OF LOGISTICS SUPPLY CHAIN ENVIRONMENT

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**ABSTRACT**

In the context of globalization and the increasing pressure on sustainable development, this study examines the role of cloud computing in mitigating the environmental impact of logistics supply chains in Vietnam. Utilizing a structural equation model (SEM) and analyzing data from 465 survey samples, the study tested hypotheses regarding the relationship between cloud computing, GSCM, information transparency (IT), logistics operational efficiency (LOE), and reducing carbon emissions (RFC) The findings indicate that cloud computing not only exerts a direct impact but also operates through intermediary factors, such as GSCM and LOE, contributing to the reduction of carbon emissions and the enhancement of sustainable economic efficiency. LOE and GSCM are robust intermediaries, whereas IT plays a less significant supporting role. This study provides a scientific foundation and practical management implications that support logistics enterprises in the application of digital technology to achieve sustainable development goals and enhance competitiveness within the context of globalization.

*Keywords:* "Cloud computing", "Green supply chain", "Information transparency", "Logistics operational efficiency", "Sustainable development"

## I. INTRODUCTION

In the context of globalization and increasing pressure for sustainable development, the logistics industry plays a pivotal role in facilitating trade and interconnecting global supply chains. However, it is also one of the industries that generates substantial carbon emissions, consumes significant energy, and has adverse environmental impacts (McKinnon, 2014). With the emergence of environmental, social, and governance (ESG) standards, logistics enterprises face the imperative of mitigating their environmental impact and implementing sustainability initiatives to meet long-term development objectives (Sarkis et al., 2011). In this context, the transition to green and sustainable supply chains has become inevitable (Sbihi & Eglese, 2007). Digital Transformation (DT) plays a crucial role in providing tools such as the Internet of Things (IoT), artificial intelligence (AI), big data, and blockchain to optimize management and operations (Tan et al., 2020; Park et al., 2022).

Cloud computing has emerged as a transformative solution, providing an information management platform, optimizing operations, and supporting sustainability initiatives in logistics supply chains. Previous studies have confirmed that cloud computing not only enhances information transparency, but also supports green supply chain management (Tan et al. 2020). Applications such as Blockchain, IoT, and AI on this platform enable logistics enterprises to monitor and reduce their carbon footprints through transportation optimization and warehouse management (Zhu & Sarkis, 2004). Numerous studies have focused on the role of digital technology and cloud computing in sustainable supply chains. Iqbal et al. (2024) emphasized the application of digital technology in the green supply chain of the manufacturing industry, while McKinnon (2014) discussed the role of environmental sustainability in logistics management. Nureen et al. (2023) provide a novel perspective on digital transformation and ecological innovation, while Oubrahim et al. (2023) focus on the impact of supply chain integration and digital transformation in developing economies. Other studies such as those by Park et al. (2022), Song et al. (2022), and Tan et al. (2020) examined various aspects of green supply chains and logistics. However, most of these studies focus on the manufacturing sector or developed markets (Giannakis and Sarkis, 2004; Giannakis and Papadopoulos, 2016), while the logistics sector in emerging economies such as Vietnam has not been comprehensively explored.

Moreover, previous studies have primarily focused on the direct impact of digital technology without elucidating the mediating role of factors such as green supply chain management, formation transparency, and logistics operational efficiency in reducing carbon emissions. These factors can serve as significant intermediaries, enhancing the impact of

digital technology on sustainable economic efficiency (Tan et al. 2020; McKinnon 2014). The novel aspect of this study is its focus on evaluating the impact of cloud computing on green supply chains in the logistics sector of Vietnam, a developing country facing considerable pressure from international standards for sustainability and emission reduction. Through the application of a structural equation model (SEM), the study not only elucidates the direct impact of cloud computing but also investigates the mediating role of factors such as green supply chain management, information transparency, and logistics operational efficiency in reducing carbon emissions. The findings of this study not only provide a scientific foundation for logistics enterprises in Vietnam to develop strategies for implementing digital technology to achieve sustainable development goals but also contribute to enhancing the competitiveness of enterprises in the context of globalization.

## II. MATERIAL AND METHOD

### 2.1. Research hypothesis

#### 2.1.1. Green Supply Chain Management (GSCM)

According to Tan et al. (2020), the integration of cloud computing and blockchain technology has demonstrated efficacy in managing and monitoring carbon emissions in the supply chain, thereby contributing to the promotion of sustainable practices. Cloud computing not only provides a robust information management platform, but also supports the implementation of GSCM in the manufacturing and logistics sectors, expanding the potential for supply chain efficiency enhancement (Nureen et al., 2023). A salient feature of this technology is its capacity for real-time information sharing, which enhances transparency and improves coordination among stakeholders (Qiu et al., 2021). Blockchain, a key component of cloud computing, also facilitates traceability, enhances supply chain control, and promotes green initiatives (Giannakis and Papadopoulos, 2016). Furthermore, cloud computing has proven to be an essential tool for optimizing logistics processes and reducing delivery times, energy consumption, and operating costs. Through the utilization of solutions such as transportation management systems (TMS) and IoT technologies, cloud computing facilitates the optimization of transportation routes and smart warehouse management (Zhu & Sarkis, 2004; McKinnon, 2014). These improvements not only enhance operational efficiency, but also reduce energy consumption and carbon footprint (Tan et al., 2020). GSCM is defined as the integration of environmental factors into the stages of product design, procurement, production, distribution, and recycling with the objective of minimizing negative environmental impacts and optimizing economic efficiency (Srivastava, 2007; Sarkis et al., 2011). Studies indicate that GSCM, when combined with digital technologies such as blockchain and cloud computing, not only reduces emissions, but also enhances global logistics performance (McKinnon, 2014; Nureen et al., 2023). This study proposes three main hypotheses based on theoretical and empirical foundations:

**H1a: Cloud computing (CC) has a positive impact on Green Supply Chain Management (GSCM)**

**H1b: GSCM has a positive impact on reducing carbon emissions from logistics operations.**

**H1c: GSCM helps minimize the environmental impact of logistics activities**

#### 2.1.2. Transparency of information (IT)

IT is a fundamental factor in establishing trust, fostering collaboration, and enhancing operational efficiency among supply chain stakeholders. Giannakis and Papadopoulos (2016) asserted that information transparency facilitates data sharing, thereby improving coordination and supporting sustainability initiatives. In GSCM, information transparency enables parties to capture data on carbon emissions and operational activities, thereby contributing to the mitigation of environmental impacts. Cloud computing (CC) functions as a robust technology platform that facilitates the management and sharing of information in real-time. This technology not only supports efficient data storage and processing but also ensures traceability and reliability of information. According to Tan et al. (2020), the integration of blockchain technology with cloud computing platforms can enhance transparency by providing accurate and timely data on the origin and trajectory of products in the supply chain. Furthermore, Nureen et al. (2023) emphasize that information transparency, when supported by digital technologies such as cloud computing, can improve the efficiency of supply chain management, particularly in the field of logistics. McKinnon (2014) notes that information transparency not only assists logistics managers in tracking and reducing carbon emissions, but also optimizes operational processes, reduces energy costs, and enhances performance. Giannakis and Papadopoulos (2016) contended that transparency

allows stakeholders to evaluate operational efficiency, identify sources of waste, and implement innovative solutions, thereby reducing carbon emissions. Qiu et al. (2021) emphasized that information transparency promotes data sharing between logistics businesses and partners, facilitates the optimization of transportation routes, minimizes fuel consumption, and reduces greenhouse gas emissions. Through cloud computing technology, businesses can monitor and report their carbon emissions in real time and make decisions based on accurate and reliable data (Tan et al., 2020). Moreover, Sarkis et al. (2011) indicate that information transparency in green supply chain management not only improves environmental efficiency but also enhances economic efficiency, creating dual value. McKinnon (2014) further noted that the use of technologies such as blockchain and cloud computing facilitates the monitoring of emission indicators and the implementation of emission reduction strategies for logistics businesses. Based on the theoretical and empirical grounds, the following hypotheses are proposed:

**H2a: Cloud computing (CC) has a positive effect on Information Transparency (IT)**

**H2b: IT contributes to reducing logistics carbon emissions**

### 2.1.3. Logistics Operation Efficiency (LOE)

LOE is conceptualized as the capacity to optimize transportation activities, warehouse management, and the distribution of goods to reduce costs, conserve resources, and enhance productivity. In the contemporary context, the implementation of digital technology, particularly cloud computing, has emerged as a significant factor for improving logistics efficiency (Zhu & Sarkis, 2004). Cloud computing provides robust data analysis tools, optimizes shipping routes, and enables real-time tracking of goods. According to Tan et al. (2020), this technology not only reduces delivery time, but also enhances resource and fuel efficiency throughout the entire supply chain. Cloud-based integrated transportation management systems and IoT enable organizations to make expeditious decisions based on big data, thereby improving responsiveness and minimizing inefficiencies. Furthermore, Qiu et al. (2021) posited that the utilization of cloud computing in logistics facilitates route optimization and reduces transportation time and operating costs. In the warehousing domain, cloud-based solutions support the optimization of storage space, improvement of goods flow, and reduction of energy consumption (McKinnon, 2014). Through these applications, organizations not only enhance their competitiveness, but also adhere better to sustainable development standards. Logistics' operational efficiency also plays a crucial role in reducing carbon emissions (reduction of carbon footprint (RCF)). Measures such as route optimization, the utilization of environmentally friendly vehicles, and improved warehouse management collectively contribute to reducing greenhouse gas emissions. McKinnon (2014) emphasized that reducing transportation time and energy consumption are two critical factors in mitigating environmental impacts. Moreover, cloud computing provides real-time data, enabling organizations to identify waste sources and implement optimization solutions. According to Tan et al. (2020), the integration of blockchain technology into cloud computing not only facilitates the tracking of fuel consumption, but also significantly reduces carbon emissions in logistics. Qiu et al. (2021) further corroborated that cloud-based transportation management systems are highly effective in reducing emissions through resource optimization. Zhu and Sarkis (2004) add that initiatives such as smart warehouse management and sustainable distribution not only help to reduce environmental impacts but also improve economic performance. When logistics operations are optimized, carbon emissions are significantly reduced, contributing to the goal of sustainable development (Sarkis et al., 2011). Based on the theoretical and empirical grounds, the following hypotheses are proposed:

**H3a: Cloud computing (CC) has a positive impact on logistics operational efficiency (LOE)**

**H3b: The operational efficiency of logistics contributes to the reduction of carbon emissions**

### 2.1.4. Reducing of carbon Footprint

In the context of globalization and increasing pressure on sustainable development, reducing carbon emissions ($CO_2$) is not only an urgent requirement for the logistics industry, but also a factor that promotes operational efficiency. Carbon emissions are primarily generated by transportation, storage, and logistics management activities, causing negative impacts on the environment. Reducing emissions not only contributes to environmental protection but also improves operational efficiency through resource optimization and cost reduction. For example, Sarkis et al. (2011), GSCM not only focuses on reducing environmental impacts, but also improves operational efficiency through measures

such as route optimization, use of environmentally friendly vehicles, and operational process improvement. McKinnon (2014) emphasized that reducing carbon emissions can optimize energy consumption, reduce waste, and decrease costs, thereby improving operational efficiency in logistics. Evidence demonstrates that reducing emissions through transportation optimization not only yields economic benefits but also contributes to improving operational capacity. Tan et al. (2020) assert that the application of technologies such as blockchain and cloud computing supports the tracking and optimization of transportation, helps reduce fuel consumption and carbon emissions, and improves logistics efficiency. Zhu and Sarkis (2004) add that emission reduction solutions, particularly in warehousing, transportation, and distribution management, not only meet environmental standards but also optimize operations. Reducing carbon emissions from logistics yields three main benefits. First, reducing energy consumption helps optimize fuel costs and equipment maintenance (McKinnon, 2014). Second, businesses that reduce emissions often enhance their brand image and are highly regarded for their social responsibility, increasing trust among customers and partners (Nureen et al., 2023). Finally, through technologies such as the IoT and blockchain, operational management efficiency is significantly improved, helping to optimize logistics operations and minimize greenhouse gas emissions (Tan et al., 2020; Qiu et al., 2021). Based on the theoretical and empirical grounds, the following hypotheses are proposed:

**H4: Reduction of carbon footprint (RCF) has a positive impact on minimizing environmental impact**

### 2.1.5. Intermediary role

Cloud computing plays a significant role in supporting sustainable operations in the logistics supply chain, particularly through GSCM, information transparency, and improving logistics operational efficiency. These factors not only optimize operations, but also contribute to reducing carbon emissions by integrating advanced management processes, modern technology, and real-time information sharing. GSCM integrates environmentally friendly elements into the entire supply chain, including product design, procurement, production, and distribution (Sarkis et al., 2011). Cloud computing supports GSCM through tools such as data analysis, traceability, and operational process optimization. These initiatives not only RCF during transportation and storage but also enhance environmental efficiency (Zhu & Sarkis, 2004). Tan et al. (2020) emphasized that a cloud-based blockchain helps monitor and control carbon emissions in the supply chain, thereby improving operational efficiency. Information transparency is a core factor enabling supply chain stakeholders to make accurate data-driven decisions and coordinate more effectively (Giannakis & Papadopoulos, 2016). Cloud computing facilitates real-time information sharing, enhances traceability, and minimizes waste. McKinnon (2014) asserted that transparent information helps to optimize environmentally friendly transportation solutions, thereby significantly reducing carbon emissions. Tan et al. (2020) added that blockchain, combined with cloud computing, supports emission monitoring and enhances transparency in logistics operations. Cloud computing provides accurate data and modern management tools that help optimize transportation routes, reduce energy consumption, and reduce greenhouse gas emissions (Qiu et al., 2021).. Based on this theoretical and practical foundation, this study proposes the following hypothesis:

**H5: GSCM plays an intermediary role in the relationship between CC and RCF**

**H6: IT plays an intermediary role in the relationship between CC and the RCF**

**H7: LOE plays an intermediate role in the relationship between CC and RCF**

## 2.2. Proposed research model

Based on related hypotheses and theories, the author hypothesizes the following

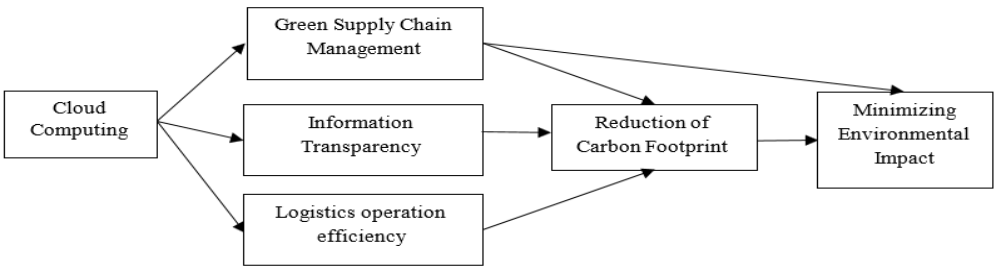



**Figure 1. Proposed research model**

### 2.3. Research methods

This study employs a quantitative approach to evaluate the impact of cloud computing, information transparency, and logistics operational efficiency on green supply chain management (GSCM) and the reduction of carbon emissions in the logistics sector. The methodology was implemented through data collection via surveys conducted between September and October 2024. The surveys were distributed to logistics enterprises, including transport companies, integrated logistics service providers, and warehouse storage units in key economic regions of Vietnam. A total of 465 valid samples were collected, ensuring high representation of the domestic logistics industry. The survey respondents comprised middle and senior managers, as well as employees directly involved in supply chain activities and digital technology applications. Each respondent provided an objective assessment of the level of cloud adoption, logistics operational efficiency, and sustainability initiatives within their respective organizations.

## III. RESULT AND DISCUSSION

### 3.1. Sample description results

A total of 600 questionnaires were distributed over a period of approximately two months, from early September to October 2024, at logistics enterprises across Vietnam, encompassing transport companies, warehouses, and integrated logistics service providers. The survey participants comprised middle and senior managers as well as employees directly responsible for supply chain management and the application of digital technology. Respondents were asked, "Have you ever participated in or directly managed activities related to the application of digital technology and green supply chain management?". Affirmative responses led to the continuation of the survey, whereas negative responses resulted in its termination. Participants' responses were subjective, focusing on assessing their awareness, experience, and level of understanding of the application of digital technology in logistics activities. The survey yielded 479 valid responses, corresponding to a response rate of 79.8% of the total number of surveys distributed. After eliminating cases that did not meet the requirements, such as incomplete responses or lack of information, the final number of responses was 465, accounting for 77.5% of the total number of questionnaires. This sample exceeded the minimum threshold of 200 participants, meeting the requirements to perform Structural Equation Modeling (SEM) analysis, as recommended by Hair et al. (2021).

### 3.2. Common Method Variance Bias Test (CMB)

The researcher analyzed the variance inflation factor (VIF) values as recommended by Kock (2015). The VIF values reported for the structures ranged from 1 to 1,526 (Table 1), substantially below the recommended threshold of 5, thus confirming the absence of common method bias (CMB).

**Table 1. Inner VIF Value**

| | CC | GSCN | IT | LOE | MEI | RCF |
|---|---|---|---|---|---|---|
| **CC** | | 1.000 | 1.000 | 1.000 | | |
| **GSCM** | | | | | 1.526 | 1.469 |
| **IT** | | | | | | 1.075 |
| **LOE** | | | | | | 1.437 |
| **MEI** | | | | | | |
| **RCF** | | | | | 1.526 | |

*Source: Extracted from PLS-SEM*

### 3.3. Results of scale assessment

A partial least squares structural equation (PLS-SEM) model was used to analyze the data. The factor load values (Table 2) were examined to assess convergence reliability. All factor load values exceeded the recommended threshold of 0.7 (Hair et al., 2019). Furthermore, the Cronbach Alpha values were both above the minimum threshold of 0.7 and below 0.95 (Hair et al., 2019), confirming the internal consistency reliability of the structures (Table 3). These findings indicate that the model demonstrates high reliability and can be applied in subsequent analyses.

**Table 2. The factor load values**

| Factor | Factor | Factor loading | VIF |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Cloud Computing = CC** | CC1 | 0.761 | 1.874 |
| | CC2 | 0.738 | 1.694 |
| | CC3 | 0.787 | 2.413 |
| | CC4 | 0.760 | 1.589 |
| | CC5 | 0.799 | 2.493 |
| **Logistics Operation Efficiency = LOE** | LOE1 | 0.808 | 1.684 |
| | LOE2 | 0.827 | 1.796 |
| | LOE3 | 0.782 | 1.650 |
| | LOE4 | 0.802 | 1.759 |
| **Green Supply Chain Management = GSCM** | GSCM1 | 0.848 | 1.457 |
| | GSCM2 | 0.733 | 1.338 |
| | GSCM3 | 0.799 | 1.381 |
| **Information Transparency = IT** | IT1 | 0.755 | 1.805 |
| | IT2 | 0.739 | 1.787 |
| | IT3 | 0.835 | 2.070 |
| | IT4 | 0.839 | 1.535 |
| **Reduction of Carbon Footprint (CO2): RCF** | RCF1 | 0.785 | 1.796 |
| | RCF2 | 0.813 | 1.957 |
| | RCF3 | 0.849 | 2.012 |
| | RCF4 | 0.829 | 1.825 |
| **Minimizing Environmental Impact = MEI** | MEI 1 | 0.816 | 1.553 |
| | MEI 2 | 0.843 | 1.799 |
| | MEI 3 | 0.863 | 1.756 |

*Source: Extracted from PLS-SEM*

The scale test table indicates that all loading factors exceeded 0.7, demonstrating a strong correlation between the observed variables and the latent variable. Cronbach's alpha and the composite reliability (CR) of the scales were all above 0.7, confirming high scale reliability. The median extracted variance (AVE) all surpassed the threshold of 0.5, suggesting good convergence of the scales and reflecting the robust interpretation of potential variables. In summary, the results of the confirmatory factor analysis demonstrated that the scales possessed high reliability and good convergence, meeting the requirements for quantitative research and enabling further research steps.

**Table 3. Reliability and value**

| | CA | CR | AVE | CC | GSCN | IT | LOE | MEI | RCF |
|---|---|---|---|---|---|---|---|---|---|
| **CC** | 0.828 | 0.879 | 0.592 | 0.769 | | | | | |
| **GSCM** | 0.710 | 0.837 | 0.631 | 0.650 | 0.795 | | | | |
| **IT** | 0.820 | 0.875 | 0.637 | 0.329 | 0.256 | 0.798 | | | |
| **LOE** | 0.819 | 0.880 | 0.648 | 0.517 | 0.550 | 0.206 | 0.805 | | |
| **MEI** | 0.794 | 0.879 | 0.707 | 0.527 | 0.585 | 0.218 | 0.532 | 0.841 | |
| **RCF** | 0.843 | 0.894 | 0.679 | 0.613 | 0.590 | 0.272 | 0.619 | 0.699 | 0.824 |

**Notes**: *CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted*

*Source: Extracted from PLS-SEM*

### 3.4. Structural model

**Table 4. Impact Relationship Assessment**

| H | Relationship | Original Sample (O) | STDEV | t Statistics | P- Values |
|---|---|---|---|---|---|
| **H1a** | CC → GSCM | 0.650 | 0.033 | 19.878 | 0.000 |
| **H1b** | GSCM → RFC | 0.218 | 0.042 | 6.740 | 0.000 |
| **H1b** | GSCM → MEI | 0.272 | 0.270 | 4.941 | 0.000 |

| | | | | | |
|---|---|---|---|---|---|
| **H2a** | CC → IT | 0.329 | 0.041 | 8.036 | 0.000 |
| **H2b** | IT → RFC | 0.094 | 0.032 | 2.918 | 0.004 |
| **H3a** | CC → LOE | 0.817 | 0.047 | 10.921 | 0.000 |
| **H3b** | LOE → RFC | 0.517 | 0.040 | 12.815 | 0.000 |
| **H4** | RFC → MEI | 0.699 | 0.031 | 22.624 | 0.000 |
| **H5** | CC → GSCM→ RFC | 0.181 | 0.183 | 5.781 | 0.000 |
| **H6** | CC → IT→ RFC | 0.031 | 0.112 | 2.565 | 0.011 |
| **H7** | CC → LOE→ RFC | 0.268 | 0.270 | 7.426 | 0.000 |

*Source: Extracted from PLS-SEM*

The analysis results in Table 4 confirmed the hypothesized relationships in the study with high statistical significance ($p < 0.05$). Cloud computing (CC) was demonstrated to have a strong impact on GSCM with an impact coefficient of $\beta = 0.650$ ($p < 0.001$). GSCM not only contributed to the reduction of carbon emissions (RFC) ($\beta = 0.218$, $p < 0.001$) but also positively affected the mitigation of environmental impact (MEI) ($\beta = 0.272$, $p < 0.001$). Concurrently, CC has a substantial effect on logistics operation efficiency (LOE) ($\beta = 0.817$, $p < 0.001$), and LOE has a significant impact on reducing carbon emissions ($\beta = 0.517$, $p < 0.001$). Furthermore, CC was observed to enhance information transparency (IT) ($\beta = 0.329$, $p < 0.001$), which exhibited a less pronounced impact on reducing carbon emissions ($\beta = 0.094$, $p = 0.004$). Notably, the identified carbon emission reduction (RFC) demonstrated a substantial effect on the environmental impact reduction (MEI) ($\beta = 0.699$, $p < 0.001$). Intermediary factors, such as GSCM, LOE, and IT, play a crucial role in linking CC to the reduction of carbon emissions. GSCM served as a significant mediator with $\beta = 0.181$ ($p < 0.001$), while LOE was identified as the most influential mediator ($\beta = 0.268$, $p < 0.001$). Although IT also functioned as an intermediary, its impact was less pronounced, with $\beta = 0.031$ ($p = 0.011$). In conclusion, this research has demonstrated that cloud computing not only directly impacts but also operates through influential intermediaries, such as LOE and GSCM, to RCF, thereby significantly minimizing environmental impact. These findings underscore the critical role of digital technology in advancing sustainability initiatives in the logistics supply chain.

### 3.5. Analyzing the role of intermediate variables

**Table 5. Results of intermediate variable analysis**

| Relationship | Original Sample (O) | STDEV | t Statistics | P-Values |
|---|---|---|---|---|
| CC → GSCM | 0.650 | 0.031 | 21.102 | 0.000 |
| CC → IT | 0.329 | 0.043 | 7.690 | 0.000 |
| CC → LOE | 0.517 | 0.048 | 10.685 | 0.000 |
| CC → MEI | 0.336 | 0.031 | 10.824 | 0.000 |
| CC → RCF | 0.481 | 0.033 | 14.562 | 0.000 |
| GSCM → MEI | 0.197 | 0.031 | 6.279 | 0.000 |
| GSCM → RFC | 0.281 | 0.041 | 6.808 | 0.000 |
| IT → MEI | 0.065 | 0.023 | 2.832 | 0.005 |
| IT → RFC | 0.094 | 0.032 | 2.883 | 0.004 |
| MEI → LOE | 0.361 | 0.032 | 11.132 | 0.000 |
| LOE → RFC | 0.517 | 0.042 | 12.266 | 0.000 |
| RFC → MEI | 0.699 | 0.030 | 23.686 | 0.000 |

*Source: Extracted from PLS-SEM*

Based on the results from Table 5 of the intermediary role analysis, the authors employed the bootstrapping method with 2000 resamples and a 95% confidence interval, as recommended by Kumar et al. (2022). The analysis results indicate that intermediaries, including GSCM, information transparency (IT), and logistics operational efficiency (LOE), play a significant role in mediating the relationship between cloud computing (CC) and reducing carbon

footprint (RFC). GSCM demonstrates a substantial intermediary role, with an indirect impact coefficient of $\beta = 0.181$ and a high level of statistical significance ($p < 0.001$). The variance accounted for (VAF) value suggests that a considerable portion of the impact of CC on RFC can be explained through GSCM. Information transparency (IT) also functions as an intermediary, albeit with a less pronounced impact than GSCM and LOE, exhibiting an indirect impact coefficient of $\beta = 0.031$ ($p = 0.011$). The VAF value indicates that IT only partially elucidates the relationship between the CC and RFC. Conversely, logistics operational efficiency (LOE) emerged as the most robust intermediary, with an indirect impact coefficient of $\beta = 0.268$ ($p < 0.001$), suggesting that LOE plays the most critical role in linking CC to carbon emission reduction. The t-values and p-values both attained clear statistical significance ($t > 1.96$, $p < 0.05$), supporting the hypothesis that GSCM, IT, and LOE serve as important mediators in the relationship between cloud computing and carbon emission reduction.

## IV. CONCLUSIONS AND IMPLICATIONS OF GOVERNANCE

### 4.1. Conclusion

This study elucidated the significant role of cloud computing in facilitating GSCM and mitigating carbon emissions in the logistics industry in Vietnam. Through the application of a Structural Equation Model (SEM), the research has validated that cloud computing not only exerts a direct influence on factors such as green supply chain management, information transparency, and logistics operational efficiency but also plays a crucial role in reducing environmental impacts and enhancing sustainable economic efficiency. Compared to previous research, this outcome aligns with the findings of Tan et al. (2020) and Zhu and Sarkis (2004), as both studies affirmed that digital technologies, particularly blockchain and cloud computing, are essential tools for managing carbon emissions and optimizing green supply chains. However, the novel contribution of this study lies in elucidating the mediating role of factors, such as green supply chain management, information transparency, and logistics operational efficiency, in linking cloud computing with carbon emission reduction. While prior studies have predominantly focused on the direct impact of digital technology (Iqbal et al., 2024; McKinnon, 2014), this research extends this understanding by analyzing intermediary relationships in greater depth. Furthermore, this study contributes a new perspective in the context of emerging economies, specifically Vietnam, where the pressure from international ESG standards and emission reduction requirements is intensifying. Whereas previous studies have concentrated on the manufacturing sector or developed markets (Nureen et al., 2023; Giannakis & Papadopoulos, 2016), this research focuses on the logistics sector in a developing economy, where businesses encounter numerous challenges in integrating sustainability initiatives. The originality of the study is evident not only in its geographical and industry context but also in its methodological approach, employing SEM models to validate intermediary roles. The findings of this study provide a significant scientific foundation for logistics enterprises in Vietnam to implement digital technology, not only to optimize operations, but also to meet the requirements of sustainable development and enhance competitiveness in the context of globalization.

### 4.2. Administrative implications

Enterprises should prioritize investing in digital technology and cloud computing to optimize green supply chains. Cloud computing can enhance information management and improve operational processes, while technologies like blockchain, AI, and big data can boost information transparency, manage carbon emissions, and promote sustainability.

Increased transparency in the supply chain is key to reducing carbon emissions. Logistics companies should establish real-time information-sharing systems to enhance collaboration and enable informed decision-making, which helps reduce waste and emissions.

Improving logistics operational efficiency is essential for minimizing environmental impact. Tools like transportation management systems (TMS) and IoT can optimize routes, reduce fuel consumption, and increase delivery efficiency. Green supply chain management should be an integral part of logistics enterprises' sustainable development strategy. Implementing environmentally friendly transportation, sustainable warehouse management, and optimized transport routes can reduce emissions, enhance brand image, and increase competitiveness.

Logistics companies must engage in green initiatives to meet ESG requirements and adapt to global sustainability trends. Adhering to ESG standards mitigates legal risks and opens doors to international markets, building trust with

partners and customers. Lastly, to successfully implement digital solutions, companies should invest in training employees, particularly in digital technology and green supply chain management, to ensure the effective adoption and maintenance of sustainability initiatives.

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# THE IMPACT OF DIGITAL TECHNOLOGY ECOSYSTEM ON INNOVATIVE STARTUPS: THE MEDIATING ROLE OF DIGITAL CAPABILITIES AND COLLABORATIVE NETWORKS

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**ABSTRACT**

This study evaluated the impact of the digital technology ecosystem (DTE) on innovation and entrepreneurship (ISU), and analyzed the mediating role of digital capabilities (DC) and collaborative networks (CN). Against the backdrop of the thriving development of DTE in Vietnam, this study reveals that DTE not only has a direct impact, but also promotes innovation in startups through DC and CN. Based on experimental data from 455 survey samples, the PLS-SEM analysis method was applied to validate the hypothesis. The results indicate that DTE has a positive impact on ISU, with DC and CN being key intermediaries that help optimize the impact. This study brings theoretical and practical value, supporting Vietnamese startups and decision-makers to effectively utilize DTE for sustainable development and enhance competitiveness in the digital age.

*Keywords*: "Collaborative networks (CN)", "Digital Competency (DC)", "Digital Technology Ecosystem (DTE)", "Innovation Startup (ISU)", "Vietnam".

## I. INTRODUCTION

In the context of globalization and significant digital transformation, the Digital Technology Ecosystem (DTE) has emerged as a crucial factor in fostering the development of Innovative Startups. DTE not only provides a technological platform and establishes support networks and digital resources but also creates an environment conducive to promoting innovation (Rong et al., 2015). In Vietnam, the digital transformation process is being vigorously promoted, establishing urgent requirements for startups to leverage this ecosystem and develop innovative products and services.

However, startups frequently encounter numerous challenges including access to technology, financial resources, and support networks. DTE has emerged as a significant solution, offering a favorable environment for startups to overcome these difficulties and promote innovation (OECD, 2010; World Bank, 2020). In the context of the Fourth Industrial Revolution, digital technology has become a key driving force for socioeconomic development. Innovative startups (IE) are considered essential for promoting economic growth, creating employment opportunities, and enhancing national competitiveness (Ministry of Science and Technology, 2019). Although the role of the DTE in innovative startups has been emphasized by numerous studies, most of these studies focus on developed markets and have not thoroughly examined the mediating role of factors such as digital competencies and support and collaboration networks (Elia et al., 2020; Zahra et al., 2023). Cavallo et al. (2021) have demonstrated that DTE connects startups with strategic partners but have not elucidated the intermediary role of digital competencies and support networks in the context of emerging economies such as Vietnam. Zhang et al. (2023) and Zheng et al. (2024) also emphasize the significance of these two factors in improving innovation efficiency. However, integrating them into a comprehensive model for in-depth analysis of the relationship between DTE and innovation remains insufficient. In addition, previous studies (Rong et al., 2015; Yoo et al., 2010) asserted that DTE promotes innovation through the provision of technology platforms, data resources, and connections. However, these studies have not focused on emerging economies such as Vietnam, where DTE is thriving but still faces numerous challenges in terms of technology infrastructure and a startup support environment. Elia et al. (2020) and Khuan et al. (2023) emphasized that digital competency is a core factor for businesses to effectively exploit resources from DTE. Concurrently, Adner (2017) and Spigel (2017) posit that support networks not only facilitate connections between businesses and strategic partners, but also enable knowledge sharing and the development of innovative solutions. However, the mediating role of digital competencies and support networks in the relationship between DTE and innovation has not been investigated thoroughly.

This study addresses the aforementioned academic gap by analyzing the relationship between DTE and innovative

startups through the mediating roles of digital competencies, support, and collaboration networks. The novelty of this study lies in integrating these two intermediaries into a comprehensive model, elucidating their interconnections, and enhancing the impact of DTE on innovation. Furthermore, the research focuses on the context of Vietnam, an emerging economy with significant development potential that has not yet been fully explored in this field. This study not only illuminates the factors that promote innovation, but also provides a crucial theoretical and practical foundation, supporting startups in optimizing the benefits of the digital technology ecosystem, thereby contributing to economic growth and enhancing competitiveness in the current digital era.

## II. RESEARCH HYPOTHESES

### 2.1. Related concepts

*Innovative Startup (ISU):* According to Decision 844/QD-TTg of the Government of Vietnam, ISU is defined as "the process of realizing business ideas based on the application or commercialization of new products, services, and business models that are innovative, breakthrough, capable of rapid growth and create high added value." (Prime Minister, 2016). The OECD (2010) emphasizes that ISU not only focuses on starting a business but also emphasizes the utilization of advanced technologies and ideas to achieve competitive advantage. Consequently, ISU is defined as the process by which individuals or groups develop new products, services, or business models, with the objective of creating disruptive value and exploiting new opportunities in the market based on technological elements, creative ideas, or innovation in operational methodologies.

*Digital Technology Ecosystem (DTE):* According to Rong et al. (2015), DTE not only encompasses hardware and software, but also includes factors such as data, policies, culture, and collaborative relationships between stakeholders in the digital economy. DTE is also conceptualized as "an integrated network of technologies, services, platforms, and related organizations designed to work together, creating value for users through connecting, optimizing, and sharing data effectively in a digital environment." (World Economic Forum 2019).

### 2.2. Impact of the digital technology ecosystem (DTE) on Innovative startups (ISU)

DTE functions as a platform to facilitate ISU by providing resources, tools, and opportunities to enable startups to maximize the potential of technology for creating new products/services. According to Yoo et al. (2010), the development of digital technologies, including the Internet of Things (IoT), big data, and artificial intelligence (AI), has created opportunities for innovation in business models, enhancing the competitiveness of startups. Conversely, Adner (2017) emphasizes that an effective digital ecosystem fosters close interactions among stakeholders, including governments, startup support organizations, and businesses, thereby promoting innovation initiatives and supporting the startup process. In Vietnam, the Ministry of Science and Technology (2019) stated that "DTE is the foundation to help ISU enterprises access 4.0 technology, build innovative solutions to meet social needs and promote economic growth." According to World Bank research (2020), the development of DTE has "facilitated access to resources such as data, capital, and technological skills, thereby fostering creativity and innovation in startups." Consequently, DTE plays a significant role in promoting ISU as it provides a conducive environment, including technology platforms, support services, and networking between businesses, investors, and other organizations. These factors facilitate ISU access to cutting-edge technology, the optimization of business operations, and market expansion.

### 2.3. Entrepreneurial Ecosystem Theory

Isenberg (2010) introduced the entrepreneurial ecosystem theory, asserting that the success of startups is not solely dependent on individual efforts but rather on a comprehensive environment that includes policies, infrastructure, finance, education, networks, culture, and government support. This ecosystem consists of dynamic relationships between organizations and individuals, fostering the creation and development of new enterprises. The entrepreneurial ecosystem framework is widely used to examine factors influencing ISU within the digital ecosystem, alongside the supportive role of local governments. Isenberg (2010) highlights the interaction of key elements such as policy, education, culture, networks, markets, and finance. Mason and Brown (2014) emphasize that high-growth businesses often thrive within a strong entrepreneurial ecosystem, where supportive policies and affiliate networks are crucial. In the Southeast region, local government support acts as an intermediary factor, helping SMEs maximize the benefits of the DTE. Spigel (2017) underscores the importance of relationships within the entrepreneurial ecosystem, particularly

the connections among businesses, investors, governments, and other organizations. Local governments play a key role in fostering these relationships to build a sustainable innovation ecosystem. Additionally, the World Bank (2020) highlights that the DTE enhances access to resources and data, facilitating startup growth and scalability. In this study, local governments serve as enablers, helping SMEs leverage the DTE to develop innovative solutions.

### 2.4. Hypothesis development

#### 2.4.1. Digital Ecosystem (DTE)

According to Rong et al. (2015) and Yoo et al. (2010), DTE not only enables startups to leverage advanced technology to develop new products and services, but also facilitates their access to the market and scaling of operations. Cavallo et al. (2021) emphasized the role of DTE in enhancing collaboration between SMEs and innovative startups, thereby establishing a sustainable ecosystem. Furthermore, DTE not only provides technical infrastructure but also supports the development of digital capacity in startups through advanced technologies such as AI, Big Data, and IoT (World Economic Forum, 2019; Elia et al., 2020). These factors enable startups to optimize their operational processes and enhance innovation efficiency. Research by Tukiainen et al. (2019) indicates that digital competency is the core factor for success in the business ecosystem, while Assay (2021) emphasizes the necessity for digital upskilling in tech startups. In addition, DTE promotes the formation and development of Collaborative networks, facilitating connections between startups, investors, and supporting organizations. Adner (2017) and Spigel (2017) asserted that these networks enable startups to access resources, share knowledge, and expand partnerships. Pustovrh et al. (2020) found that DTE encourages open innovation through knowledge sharing and collaboration among stakeholders, whereas Primario et al. (2024) emphasized the role of DTE in balancing collaboration and competition among startups. Therefore, we propose the following hypothesis:

*H1: DTE has a positive impact on innovative start-ups.*

*H2: DTE has a positive impact on Digital Competencies*

*H3: DTE has a positive impact on Collaboration Network*

#### 2.4.2. Collaboration Networks (CN)

CN play a fundamental role in connecting startups with digital resources, such as knowledge, technology, and infrastructure, thereby enhancing their digital capabilities and fostering innovation. Spigel (2017) emphasizes that these networks provide an environment for businesses to access cutting-edge technology and share knowledge, while Pustovrh et al. (2020) highlight that collaboration and resource sharing within networks can promote open innovation and improve digital capabilities. Consequently, the support network serves not only as a conduit for sharing knowledge and experience in digital technology, but also creates conditions for startups to learn from partners, experts, and other supporting organizations. Through training, cooperation, and exchange activities, businesses can enhance their digital skills, access new technologies, and effectively apply them to business activities (Bărbulescu et al. 2021; Kamariotou and Kitsios 2022). Szakos (2023) affirmed that next-generation digital technology, when integrated into the collaboration network, can increase momentum and support the development of the startup ecosystem. Adner (2017) argues that network relationships help businesses capitalize on market opportunities, while Zheng et al. (2024) emphasize the role of collaborative networks in sharing information and resources to promote innovation. These networks also create synergy, enabling start-ups to expand their markets, reach new customers, and enhance their competitiveness. Cavallo et al. (2021) and Ojaghi et al. (2019) emphasize that network collaboration helps startups develop innovative solutions and adapt to market changes. Similarly, Zhang et al. (2023) and Marcon et al. (2024) asserted that collaborative networks can support startups in addressing random market factors and improving innovation performance. Therefore, we propose the following hypothesis:

*H4: CN have a positive impact on Digital Competencies.*

*H5: CN have a positive impact on Innovative start-ups.*

#### 2.4.3. Digital competencies (DC)

According to Elia et al. (2020), digital competencies encompass the ability to access, manage, and apply advanced technologies, such as AI, Big Data, and IoT, facilitating businesses in innovating processes, developing novel products

and services, and enhancing overall operational performance. Cavallo et al. (2021) emphasized that digital empowerment enables businesses to optimize their utilization of the digital ecosystem to gain a competitive advantage. Furthermore, digital capabilities enable startups to not only analyze data and automate processes but also engage customers online, create innovative business models, and adapt rapidly to market changes (Condom-Vilà, 2020; Zhavoronkova et al., 2021). Research by Khuan et al. (2023) also indicates that businesses with high digital capabilities often accelerate product launches, enhance customer satisfaction, and effectively expand markets. Similarly, Zahra et al. (2023) asserted that digital competencies serve as a bridging mechanism in integrating resources and knowledge to promote innovation. Additionally, empirical studies by Ruggieri et al. (2018) and Morande et al. (2020) have demonstrated that digital competencies not only influence business models, but also transform service ecosystems, generating innovative solutions in areas such as healthcare. Therefore, we propose the following hypothesis:

*H6: DC have a positive impact on Innovative start-ups.*

**2.4.4. The Intermediary role of Digital Competencies (DC) and Cooperation Networks (CN)**

Digital competency is a crucial factor for optimizing processes, developing innovative products, and increasing business efficiency (Elia et al. 2020; Zahra et al. 2023). Zhang et al. (2023) indicate that when startups possess high digital capabilities, they can effectively utilize resources from the digital ecosystem to drive innovation, rendering this capability an essential bridge to achieve business success. In addition to its direct impact, DTE indirectly promotes innovative start-ups through the formation of digital competencies. According to Cohen et al. (2017) and Zahra et al. (2023), DTE provides an environment and tools to assist businesses in developing digital capabilities, thereby enhancing their ability to capitalize on opportunities in the digital ecosystem. Elia et al. (2020) emphasize that digital technology and collective intelligence are reshaping business practices, with digital capabilities playing an intermediary role. Similarly, Thomas et al. (2019) asserted that digital competency is essential for startups to leverage opportunities from the ecosystem. Furthermore, DTE facilitates the formation and development of CN that connect startups with investors, strategic partners, and supporting organizations. These networks not only provide resources, but also create a conducive environment for businesses to share knowledge and develop innovative solutions (Adner, 2017; Spigel, 2017). Zheng et al. (2024) emphasized that network collaboration is a key factor for businesses to effectively exploit resources from DTE and promote innovation. Mason and Brown (2014) and Isenberg (2010) also argued that support and collaboration networks play a significant role in exchanging knowledge, sharing experiences, and encouraging innovative collaboration among startups. Cavallo et al. (2021) explore the relationship between SMEs and innovative startups in the business ecosystem, affirming the intermediary role of collaborative networks. Similarly, Ojaghi et al. (2019) synthesized a theoretical framework for the formation of an innovation ecosystem for startups, in which CN networks are considered important intermediaries. Therefore, we propose the following hypothesis:

*H7: Digital competencies play an intermediary role in the relationship between DTE and ISU*

*H8: Collaboration Network play an intermediary role in the relationship between the DTE and ISU*

**2.5. Proposed research model**

Based on related hypotheses and theories, the author hypotheses the research:

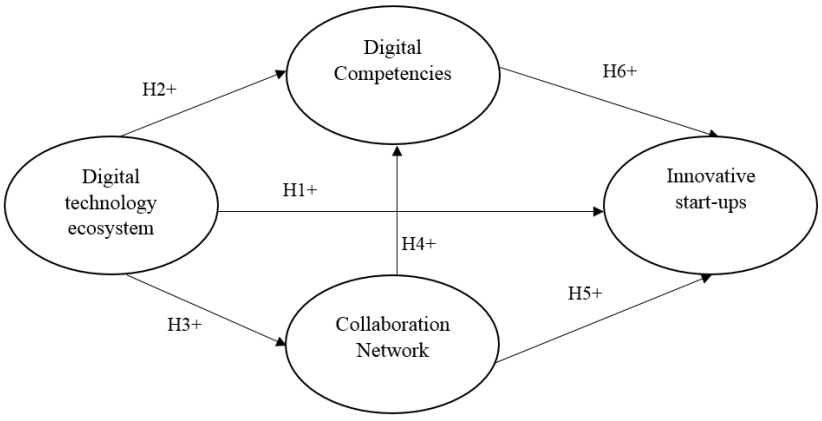



**Fig.1. Proposed research model**

## III. RESEARCH METHODS

This study employs a quantitative methodology to evaluate the impact of the digital technology ecosystem (DTE) on innovation startups (ISU) through the mediating role of DC and CN. Data were collected using a questionnaire that incorporated items measuring key variables in the research model. The questionnaire was designed using a 5-point Likert scale (1 = completely disagree, 5 = completely agree), ensuring an assessment of respondents' level of agreement with statements pertaining to each variable. Data collection was conducted from October 2024 to November 2024. A total of 550 surveys were distributed, and 455 valid samples were obtained, yielding a response rate of 82.7%. Survey samples were gathered from startups in Vietnam, focusing on key economic sectors and industries related to digital technology and innovation. The survey participants were middle and senior managers and employees responsible for innovation within their respective enterprises. The collected data were analyzed using Structural Equation Modeling (SEM) with SmartPLS software. SEM was selected for its capacity to simultaneously examine the relationships between latent and observed variables in the research model, thereby testing the hypotheses regarding the mediating role of digital competencies and support networks. The results of the SEM analysis not only elucidate the direct impact of DTE on ISU but also highlight the mediating role of DC and CN in this relationship. This methodology provides a robust scientific foundation for understanding how DTE drives innovation, and assists in guiding businesses and policymakers in leveraging the digital ecosystem for sustainable development.

## IV. RESULT AND DISCUSSION

### 4.1. Sample description results

The data collection was conducted from the beginning of November to the end of December 2024. A total of 550 surveys were distributed and 455 valid samples were obtained, yielding a response rate of 82.7%. Survey samples were collected from startups in Vietnam, focusing on key economic and industrial sectors related to digital technology and innovation. The survey participants comprised middle and senior managers as well as employees responsible for innovation in their respective businesses. Descriptive statistics of the survey sample include: (1) Gender: The survey sample exhibited a balanced gender ratio, with 52% males and 48% females, ensuring multidimensional representation for the analysis and reflecting the participation of both genders in decisions and evaluations; (2) Education: The majority of respondents possessed undergraduate and postgraduate degrees (87%), indicating a high level of comprehension and ability to evaluate factors in the research, with solid professional knowledge; (3) Age: The age range of respondents primarily spanned from 20 to 55 years old (79%), with the 30–40 age group representing the highest proportion, suggesting substantial practical experience among participants. These statistics provide a robust foundation for further analyses and ensure that the survey sample is highly representative, capable of testing research hypotheses, and facilitating subsequent quantitative analyses.

### 4.2. Common Method Variance Bias Test (CMB)

Variance inflation coefficient (VIF) values were examined as recommended by Kock (2015). The VIF values reported for the structures ranged from 1 to 1.585 (Table 4.1), well below the recommended limit of 5, confirming the absence of CMB.

**Table 4.1. Inner VIF Value**

| | CN | DC | DTE | ISU |
|---|---|---|---|---|
| **CN** | | 1.366 | | 1.554 |
| **DC** | | | | 1.585 |
| **DTE** | 1.000 | 1.366 | | 1.563 |
| **ISU** | | | | |

### 4.3. Reliability Measurement

The partial least squared structure equation model (PLSSEM) was employed to analyze the data. The factor loading values (Table 4.2) were examined to assess convergent reliability. All factor loading values exceeded the recommended threshold of 0.7 (Hair et al. 2019). Furthermore, the Cronbach's Alpha values were all above the minimum threshold of 0.7 and below 0.95 (Hair et al., 2019), confirming the internal consistency reliability of the constructs (Table 4.3). These findings indicate that the model demonstrates high reliability and can be used for subsequent analyses.

**Table 4.2. Factor Loading**

| Factor | Factor | Factor loading | VIF |
|---|---|---|---|
| **Digital technology ecosystem – DTE** | DTE1 | 0.809 | 1.695 |
| | DTE2 | 0.837 | 1.857 |
| | DTE3 | 0.784 | 1.676 |
| | DTE4 | 0.805 | 1.792 |
| **Digital Competencies - DC** | DC1 | 0.818 | 1.561 |
| | DC2 | 0.845 | 1.798 |
| | DC3 | 0.826 | 1.762 |
| **Collaborative Networks - CN** | CN1 | 0.790 | 1.932 |
| | CN2 | 0.748 | 1.728 |
| | CN3 | 0.803 | 2.481 |
| | CN4 | 0.774 | 2.447 |
| | CN5 | 0.746 | 1.604 |
| **Innovative start-ups - ISU** | ISU1 | 0.787 | 1.798 |
| | ISU2 | 0.830 | 1.967 |
| | ISU3 | 0.851 | 2.043 |
| | ISU4 | 0.838 | 1.911 |

The aggregate reliability value exceeded the recommended threshold of 0.7 (Hair et al., 2019). Furthermore, the interpreted mean variance value (AVE) also surpassed the threshold of 0.5 (Hair et al., 2019). The criteria of Fornell and Larcker (1981) were applied to establish the discriminant validity (Table 4.3).

**Table 4.3. Reliability and value**

| | CA | CR | AVE | CN | DC | DTE | ISU |
|---|---|---|---|---|---|---|---|
| **CN** | 0.832 | 0.881 | 0.597 | 0.773 | | | |
| **DC** | 0.795 | 0.880 | 0.709 | 0.527 | 0.842 | | |
| **DTE** | 0.824 | 0.883 | 0.654 | 0.517 | 0.531 | 0.809 | |
| **ISU** | 0.846 | 0.5896 | 0.684 | 0.614 | 0.698 | 0.690 | 0.827 |

Note: *CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted*

**4.4. Hypothesis testing**

**Table 4.4. Hypothesis test results**

| Hypothesis | Relationship | Original Sample (O) | Standard deviation (STDEV) | *t-value* | *p-Value* | Supported |
|---|---|---|---|---|---|---|
| H1 | DTE → ISU | 0.373 | 0.044 | 8.499 | 0.000 | Yes |
| H2 | DTE → DC | 0.353 | 0.053 | 6.686 | 0.000 | Yes |
| H3 | DTE → CN | 0.517 | 0.050 | 10.428 | 0.000 | Yes |
| H4 | CN → DC | 0.344 | 0.060 | 5.738 | 0.000 | Yes |
| H5 | CN→ ISU | 0.217 | 0.037 | 5.933 | 0.000 | Yes |
| H6 | DC→ ISU | 0.368 | 0.040 | 9.743 | 0.000 | Yes |
| H7 | DTE → DC → ISU | 0.136 | 0.024 | 5.517 | 0.000 | Yes |
| H8 | DTE → CN → ISU | 0.113 | 0.022 | 5.126 | 0.000 | Yes |

Based on the results of the analysis in Table 4.4, all the hypotheses in the study are supported with a high level of statistical significance ($p < 0.001$), confirming the significant role of the DTE, DC, and CN in promoting innovative startups (ISU). Specifically, cooperation (CN) networks demonstrate a positive impact on digital competencies ($\beta = 0.344$) and innovative startups ($\beta = 0.217$), while DC also have a significant impact on innovative startups ($\beta = 0.368$, $t = 9.743$). Furthermore, DTE had a strong impact on CN ($\beta = 0.517$) and DC ($\beta = 0.353$) and exerted a direct effect on ISU ($\beta = 0.373$, $t = 8.499$). The results also elucidate the intermediary roles of DC and CN in the relationship between

DTE and ISU. Digital capacity serves as a crucial intermediary between DTE and ISU, with an indirect impact (β = 0.136), while cooperation networks also contribute significantly to the indirect impact coefficient (β = 0.113). Notably, the relationship between DTE and CN (H3) was identified as having the strongest impact among the direct relationships, underscoring DTE's role in establishing collaborative networks to foster innovation. These findings not only corroborate the theory regarding the role of the digital ecosystem, but also emphasize the importance of digital capabilities and collaborative networks as essential intermediaries in achieving innovation effectiveness.

### 4.5. Intermediary Role Analysis

**Table 4.5. Intermediary Role Analysis**

| Relationship | Original Sample (O) | Standard deviation (STDEV) | t-value | p-Value |
|---|---|---|---|---|
| CN→ DC | 0.344 | 0.606 | 5.704 | 0.000 |
| CN → ISU | 0.350 | 0.041 | 8.547 | 0.000 |
| DC → ISU | 0.368 | 0.039 | 9.853 | 0.000 |
| DTE → CN | 0.517 | 0.047 | 10.994 | 0.000 |
| DTE → DC | 0.631 | 0.034 | 12.240 | 0.000 |
| DTE → ISU | 0.690 | 0.028 | 24.293 | 0.000 |

The authors investigated the mediating role of DC and CN using a bootstrapping method with 2000 resamples and a 95% confidence interval, as recommended by scholars. The results of the analysis indicate that intermediary factors play a significant role in the relationship between DTE and ISU. The variance accounted for (VAF) value was examined to assess the influence of intermediate factors, which were calculated based on the ratio between indirect effects and the sum of the effects (including direct and indirect effects). The results demonstrate that DC serve as a strong mediator, with VAF values exceeding the 20% threshold, indicating that a substantial portion of the impact of DTE on ISU is explained through DC. Similarly, CN also function as important intermediaries, with the VAF value confirming that CN facilitates the transformation of DTE's impact of DTE on ISU. Bootstrapping analysis further reveals that all t-values are greater than 1.96, and p-values are less than 0.05, confirming the statistical significance of intermediary relationships. This supports the hypothesis that digital capabilities are crucial intermediaries in connecting DTE to startup innovation. Concurrently, the CN not only facilitates businesses' access to strategic partners, but also creates a conducive environment for knowledge sharing and the promotion of innovative solutions. Consequently, Table 6 emphasizes that DTE not only directly impacts innovation but also operates through intermediary factors such as DC and CN. These findings underscore the role of intermediaries in optimizing the impact of the digital ecosystem, and provide a foundation for businesses and policymakers to focus on developing digital capabilities and expanding collaborative networks to drive innovation.

## V. CONCLUSION

### 5.1. Conclusion

This investigation elucidated the role of the DTE in fostering innovative startups and confirmed the intermediary function of DC and CN. The findings of this study have demonstrated that DTE not only enables startups to access advanced technology and optimize operational processes but also assists them in developing innovative solutions and enhancing business efficiency and global competitiveness (Elia et al., 2020; Zahra et al., 2023). Compared to previous research, this study further corroborates the conclusions of Cavallo et al. (2021) regarding the role of DTE in enhancing collaboration between startups and strategic partners. Concurrently, the results align with Spigel's (2017) assertion that support and collaboration networks are indispensable elements of the innovation ecosystem. However, this study expands our understanding by highlighting the mediating role of digital competencies and collaborative networks and elucidating how DTEs not only directly impact but also operate through these factors to drive innovation (Zhang et al., 2023). The novel aspect of this study is its focus on startups in Vietnam, an emerging economy in which DTE plays a crucial role in supporting businesses to access digital technology and develop sustainably. The results indicate that digital competencies play a stronger intermediary role in connecting DTE and innovation than do support and collaboration networks. Additionally, research demonstrates that collaborative networks are not only a resource but also

a platform for businesses to share knowledge and develop innovative strategies (Adner, 2017; Zheng et al., 2024). This study contributes to the theoretical foundation of the digital ecosystem and innovative startups and provides a practical basis for businesses and policymakers in Vietnam to construct strategies to support digital-based startups, promote innovation, and sustainable development in the digital era.

**5.2. Administrative implications**

Based on the results, several significant governance implications are proposed to support innovative startups in effectively exploiting the benefits of the digital technology ecosystem.

First, enterprises should invest in developing digital capabilities through the application of advanced technologies such as AI, Big Data, and IoT. This approach not only optimizes operational processes but also enhances products and services and improves business efficiency.

Second, organizations need to maximize the opportunities presented by the digital technology ecosystem to promote innovation. This necessitates managers to proactively integrate technology into business strategies, participate in startup support programs, and collaborate within the ecosystem to access resources and develop innovative initiatives.

Third, the development and expansion of CN are crucial. These networks not only connect startups with investors, support organizations, and strategic partners but also facilitate the sharing of knowledge, experience, and the development of innovative solutions.

Fourth, startups should be encouraged to engage in open innovation activities to leverage external resources for rapid and effective development. Supporting organizations and governments must develop policies, organize technology cooperation, and incubate programs to promote open innovation.

Fifth, the legal environment and support policies play a significant role. The government needs to create policies that encourage the development of the digital technology ecosystem, provide modern digital infrastructure, offer financial support, and organize networking forums to create favorable conditions for startups to develop sustainably.

Finally, enterprises need to establish systems to measure and evaluate the effectiveness of digital technology utilization and participation in cooperative networks. The establishment of evaluation indicators (KPIs) aids in tracking the progress and effectiveness of innovation, thereby enabling timely strategy adjustments to achieve optimal results.

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# LANGUAGE, INTERDEPENDENCE, AND PROJECT PERFORMANCE IN GLOBAL SOFTWARE DEVELOPMENT

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**ABSTRACT**

This study investigates the impact of language distance on dependence, knowledge sharing, and project team performance in software project teams. Using data collected from 229 respondents who work in virtual project teams in the software industry, the study reveals that language distance does not influence team performance directly but affects it through dependence and knowledge sharing among team members. Language barriers create a sense of dependence for team members as they need to rely on others to clarify task requirements. Furthermore, they also enhance communication and collaboration, causing team members to share critical knowledge to avoid misinterpretation. The results show that dependence among team members plays a key mediating role in improving knowledge sharing and, ultimately, project team performance. Moreover, language distance has a full indirect effect on project team performance through dependence and knowledge sharing. These results add to prior research by suggesting that while language barriers can be a challenge to teamwork, they actually act as an enabler to team performance. In addition, dependence fosters collaboration and mitigates these challenges. The study emphasizes the importance of knowledge sharing in overcoming language distance and highlights strategies such as communication tools, language training, and clear information-sharing channels to enhance project team performance in multilingual settings.

*Keywords*: “Language Distance”, “Knowledge Sharing”, “Project Team Performance”, “Dependence”, “Software Project Teams”

## I. INTRODUCTION

### 1.1 Background of the study

In a globalized work environment, particularly in software projects, knowledge sharing among team members is a key determinant of project team performance. However, teams often face multiple complex factors, such as language differences, dependence among team members, and coordination in the knowledge-sharing process.

Numerous studies have provided empirical evidence on the crucial factors affecting the knowledge transfer process, including absorptive capacity—the ability to identify, assimilate, and apply new knowledge (Cohen & Levinthal, 1990), mutual dependence among team members, shared vision, and trust within the team. These factors influence innovation and learning and are closely related to job performance (Michailova & Mustaffa, 2012). Unlike tangible resources, when knowledge is widely disseminated, it takes on the characteristics of a "public good," leading to the phenomenon of "free riding" (Davenport, 1997). This has made knowledge sharing a major challenge in knowledge management (Ruggles, 1998). To maximize the potential of internal knowledge, sharing knowledge among individuals and teams is essential (Chang et al., 2013). An effective sharing process not only enhances collaboration but also shortens problem-solving time by accumulating and spreading knowledge throughout the organization.

Global software development and release model offers numerous strategic benefits, such as adopting the "Follow The Sun" (FTS) model to optimize time, reduce costs, improve customer reach, attract talent, and expand international cooperation opportunities. However, this model also increases the complexity of project management, particularly due to "distances" in time, geography, culture, and language. These distances pose significant challenges in communication, coordination, and collaboration—particularly impacting knowledge sharing, a critical factor in the success of software development. In this context, understanding the relationships between the factors affecting knowledge sharing and project performance is crucial.

For software developers in Vietnam, the globalization of software development projects presents increasingly

complex challenges, especially when there is coordination between local and international teams. Differences in language, culture, and working styles not only create communication barriers but also deeply affect the knowledge-sharing process among team members. In this environment, language distance and mutual dependence emerge as two crucial factors, but they impact knowledge sharing and project performance in different ways. However, these relationships have not been fully explored, particularly regarding how these factors influence knowledge sharing—a core component determining software project performance in multicultural and distributed settings. The lack of in-depth research on the relationship between language, dependence, and knowledge sharing has created a gap that needs to be explored to support more effective management strategies in this complex context.

This research aims to investigate the effects of language distance, dependence, and knowledge sharing on the performance of software project teams. Moreover, the direct and indirect effects of language barriers on performance through dependence and knowledge sharing will be tested. The study makes two key contributions. It identifies language barriers as an enabler to software project team performance and it points out the importance of dependence and knowledge sharing as key factors to realize the benefits of language barriers on team performance.

The paper is structured into four main sections. After the introduction, a literature review is presented to highlight key concepts and existing research of the constructs in the model. Then, the methodological approach will be presented in the methodology followed by findings and discussion. The paper ends with implications for further research and practitioners.

## II. LITERATURE REVIEW AND MODEL DEVELOPMENT

### 2.1. Key concepts

#### Software and Software Release

Computer software has emerged as a major global industry. Software encompasses a collection of programs, processes, algorithms, and documentation that operate computer systems. According to Krishnan (1994), software is not merely a technological product but also a strategic asset, delivering long-term value to businesses. With its pervasive presence across numerous industries and products, software is regarded as one of the most critical assets of modern companies.

Krishnan (1994) also emphasized that software release is not solely the process of creating a technological product but also involves deploying, maintaining, and optimizing software to meet the increasing demand of the market. For many businesses, the use and development of software has grown at a pace far exceeding the overall growth rate of the enterprise, reflecting the growing importance of software in shaping competitive capabilities and sustainable success. As a result, software is increasingly seen as a core factor determining the success of any business, regardless of size or industry.

In addition to software developed internally by businesses, releasing commercial software is also gaining increasing attention in Vietnam. Commercial software refers to any software or application developed and designed for licensing or sale to end-users for commercial purposes. Traditionally, commercial software was defined as proprietary software products. However, in the modern era, some open-source and free software applications are also available for licensing or sale to end-users. Typical examples of commercial software include off-the-shelf software such as games and applications distributed through specialized computer stores or online application stores.

#### Project Team Performance

Project team performance refers to the effectiveness with which a group of individuals collaborates on a project to achieve predefined goals (Jiang et al., 2004). Fundamentally, it serves as a measure of how well the team delivers results. This often involves achieving objectives across three dimensions: meeting deadlines, staying within budget, and producing high-quality work. However, evaluating project performance in a specific context is inherently complex and depends on the evaluator as well as the timing of the evaluation.

The performance of software project teams is a critical factor in determining project success. Research by Jiang et al. (2004) highlights that the performance of software project teams depends on several factors, including the skills and experience of team members, the level of communication and coordination, the commitment and motivation of the

team, and effective project management. Similarly, Hoegl and Gemuenden (2001) emphasize that software project team performance improves when members share common goals, receive leadership support, and have mechanisms for feedback and evaluation. Furthermore, research by Krishnan et al. (2000) underscores the role of knowledge management in software project teams, noting that the sharing of knowledge and experience significantly enhances team performance.

### 2.2 Social Cognitive Theory

Bandura's (1986) Social Cognitive Theory (SCT) emphasizes the interaction between three main factors: that shape human behavior. They are cognitive factors (knowledge, attitude), environment (social norms, access in community, influence by others), and competence factors (skills, self-efficacy). Human behavior is formed by their observation, learning from the environment, and personal motivation. Following this theory, language distance is identified as an environmental factor that influences individual cognition of their ability to complete tasks and their collaborative behavior. Dependence, as an individual factor, is defined as the extent to which individuals feel secure and confident in performing tasks (Bandura, 1986). Language distance creates feelings of insecurity, anxiety, and isolation (Gardner & Lambert, 1972), which leads to the need to depend on others to complete tasks. Differences in language also increase misunderstanding and thus pose challenges for teamwork. Therefore, collaborative activities are necessary to overcome misunderstanding and dependence. This research model highlights the intricate relationships between social, individual, and behavioral factors in enhancing team performance. Reducing language distance and fostering dependence can improve knowledge sharing and project team performance.

### 2.3 Hypotheses Development

#### 2.2.1 Language Distance

Language distance refers to differences in language used by team members. In today's era, software project teams consist of individuals from diverse cultural backgrounds and face cultural differences such as variations in language, traditions, values, and behavioral norms, which can lead to misunderstandings and conflicts (Baumard, 1999; Zhang & Du, 2011). Language distance also creates significant communication gaps among distant colleagues (Zahedi et al., 2016). Team members dispersed globally find it challenging to share and acquire knowledge due to linguistic differences. Moreover, when native languages differ, the diversity in the common working language (often English) leads to various issues and misunderstandings (Aranda et al., 2010). However, language distance also demonstrate diversity in the workplace. Diverse teams may benefit from different perspectives enhanced by contribution of different viewpoints and creative solutions. Therefore, it is offered that:

**H1: Language distance positively impacts project team performance.**

#### 2.2.2 Dependence

In teamwork, particularly in complex projects such as software development, dependence among team members plays a crucial role in coordinating activities and facilitating knowledge sharing. Dependence is defined as the extent to which team members rely on one another to complete their work, requiring close collaboration and continuous information exchange (Van der Vegt & Van de Vliert, 2005). As the level of dependence increases, team members tend to interact more frequently (Kiggundu, 1983; Pearce & Gregersen, 1991). In the context of cross-functional and virtual teams, knowledge sharing among members is indispensable for achieving work efficiency. These teams often face challenges in integrating diverse technical knowledge and expertise, and without effective knowledge sharing, achieving team goals becomes difficult (Sapsed et al., 2002). Leveraging and sharing tacit knowledge enables teams to innovate and address problems creatively, thereby improving performance and work quality (Mascitelli, 2000). Therefore, it is suggested that

Furthermore, research has shown that high levels of dependence positively impact project team performance, as close collaboration among team members enables the team to fully leverage collective knowledge and respond more effectively to project challenges (Rusbult, 1996). This is particularly true in teams where dependence is shaped by repeated and institutionalized interactions over time (Brass & Burkhardt, 1993).

**H2: Dependence is positively related to project team performance**.

**H3: Dependence is positively related to knowledge sharing.**

When teams comprise members from various linguistic backgrounds, they may need to interact more often to reduce misunderstanding. To reduce uncertainty, members need to interact and exchange information with their team mates more often. Interaction and communication among team members are essential to foster commitment, trust, and cohesion, which enable knowledge exchange (Zboralski, 2009). Therefore, it is proposed that:

**H4: Language distance positively impacts dependence.**

**H5: Language distance positively impacts knowledge sharing**

Empirical findings have long confirmed the positive relationship between knowledge sharing and project team performance, especially in virtual and traditional teams (Majchrzak et al., 1995; Cummings, 2004; Hong et al., 2004). This study capitalizes on existing research and agrees that:

**H6: Knowledge sharing is positively related to project team performance.**

### 2.4 Research model

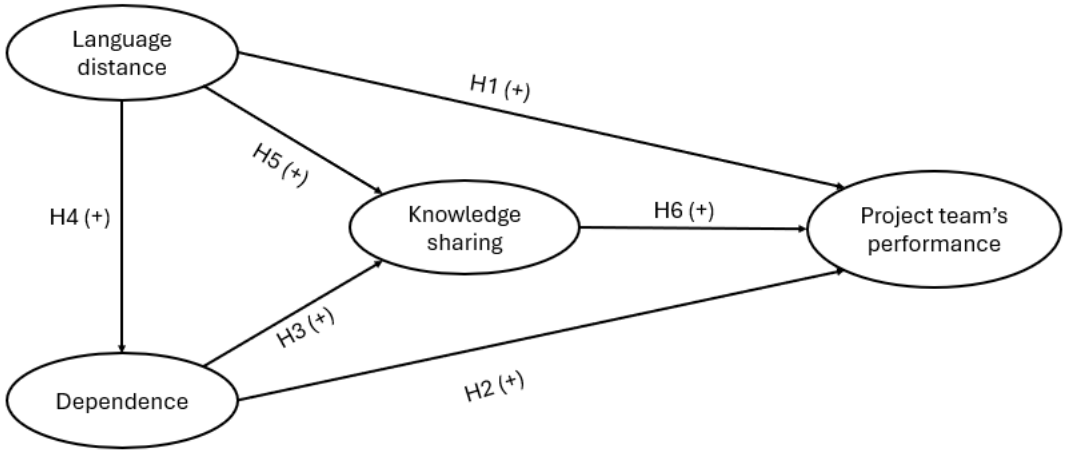



**Fig 1 - Proposed Conceptual Model**

## III. METHODOLOGY AND RESULTS

### 3.1 Methodology

The study adopts the quantitative approach. A large-scale survey was conducted from February to May 2024. Existing scales were adopted to measure the constructs in the model. The 7-Likert six items to measure language distance were borrowed from Anwar et al. (2019). The five item measurement for dependence was borrowed from Park and Lee's (2014) study. Knowledge sharing was measured by five items from Davenport et al (1998) and project team's performance was measured by five items from Park and Lee (2014). Data was analyzed using the SmartPLS 3.0 software

Data was collected using Google Forms. We posted the link to the online survey in social communities of software engineers. In total, we collected 238 responses, of which 229 were valid observations. Among these, 94 respondents were male (41%), and 135 were female (59%). Regarding age groups, 6 responses (2.6%) were collected from participants under 20 years old. The 20–29 age group accounted for the highest number of responses, with 183 (39.9%). The 30–39 age group contributed 33 responses (14.4%), while the 40–49 age group provided 6 responses. Finally, the 50+ age group contributed 1 survey response.

### 3.2. Results

We applied the two-stage approach to test the model. The measurement model was validated by checking the convergent validity, discriminant validity, and reliability. We tested the measurement model until the critical thresholds were met, they are 0.5 for average variance extracted (AVE), above 0,7 for item loadings when testing convergent validity. HTMT values less than 0.85 for discriminant validity, and Cronbach's alpha values are all greater than 0,7. Several items were removed to ensure the quality of the measurement model. Then, we proceeded to investigate the

structural model. Figure 3.2 showed the results of the inner model.

**Table 1 - Reliability and validity of variables**

| | Cronbach's Alpha | rho_A | Composite Reliability | AVE |
|---|---|---|---|---|
| DE | 0.703 | 0.704 | 0.818 | 0.529 |
| KS | 0.752 | 0.755 | 0.843 | 0.574 |
| LD | 0.713 | 0.713 | 0.839 | 0.636 |
| PTP | 0.711 | 0.715 | 0.822 | 0.536 |

**Table 2 – The discrimination of the variables**

| | DE | KS | LD | PTP |
|---|---|---|---|---|
| DE | **0.727** | | | |
| KS | 0.501 | **0.758** | | |
| LD | 0.333 | 0.297 | **0.797** | |
| PTP | 0.428 | 0.553 | 0.283 | **0.732** |

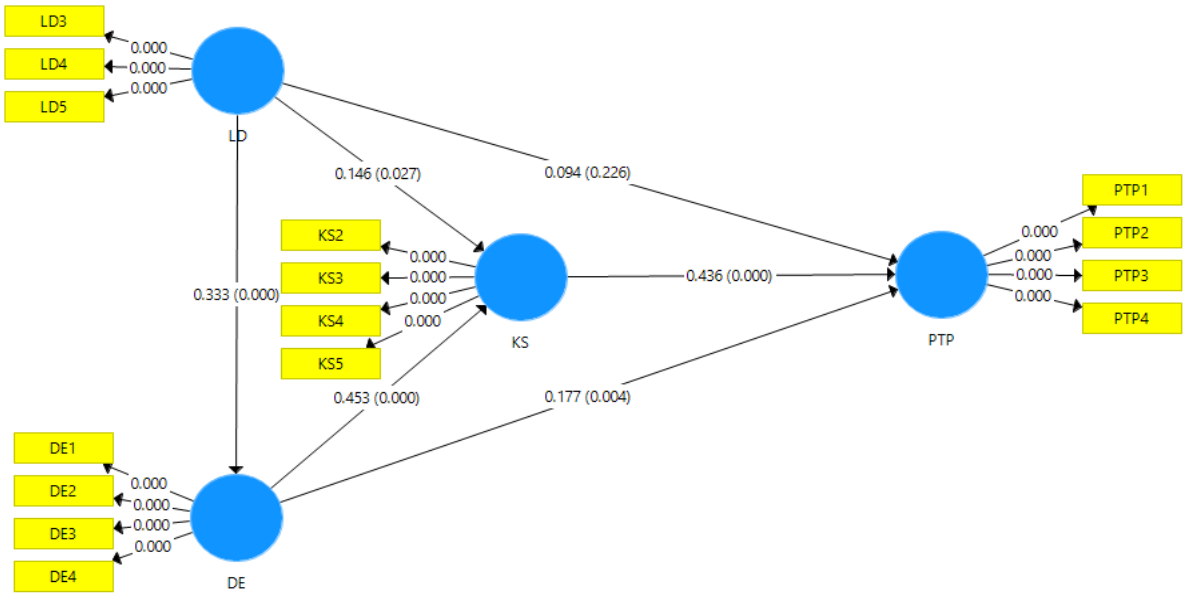



**Fig 2 – The result of research model**

The results of the analysis show that language distance insignificantly influences team performance (β = 0.094, p > 0,05). Therefore, hypothesis H1 was not supported. However, language distance significantly influences dependence (β = 0.333; p < 0.001). Therefore, hypothesis H4 was supported. The results showed that all remaining hypotheses were supported. Dependence positively influences team performance, so H2 was supported (β = 0.177; p < 0.01). Dependence also positively influences knowledge sharing (β = 0.453; p < 0.001). Therefore, H3 was supported. Language distance positively influences knowledge sharing (β = 0.146; p < 0.05), showing H5 was supported. Knowledge sharing positively influences team performance (β = 0.436; p < 0.001), showing that H6 was also supported.

**Table 3 – Results of path coefficient**

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|
| DE -> KS | 0.453 | 0.455 | 0.056 | 8.143 | 0.000 |
| DE -> PTP | 0.177 | 0.179 | 0.061 | 2.904 | 0.004 |
| KS -> PTP | 0.436 | 0.433 | 0.065 | 6.677 | 0.000 |
| LD -> DE | 0.333 | 0.342 | 0.062 | 5.404 | 0.000 |
| LD -> KS | 0.146 | 0.149 | 0.066 | 2.206 | 0.027 |
| LD -> PTP | 0.094 | 0.100 | 0.078 | 1.212 | 0.226 |

**Table 4 – Specific indirect effects**

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|
| LD -> DE -> KS | 0.151 | 0.157 | 0.037 | 4.106 | 0.000 |
| LD -> DE -> PTP | 0.059 | 0.062 | 0.025 | 2.376 | 0.018 |
| DE -> KS -> PTP | 0.197 | 0.198 | 0.039 | 5.032 | 0.000 |
| LD -> DE -> KS -> PTP | 0.066 | 0.068 | 0.019 | 3.508 | 0.000 |
| LD -> KS -> PTP | 0.064 | 0.065 | 0.031 | 2.080 | 0.038 |

**Table 5 – Total indirect effects**

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|
| DE -> KS | | | | | |
| DE -> PTP | 0.197 | 0.197 | 0.039 | 5.103 | 0.000 |
| KS -> PTP | | | | | |
| LD -> DE | | | | | |
| LD -> KS | 0.151 | 0.156 | 0.037 | 4.124 | 0.000 |
| LD -> PTP | 0.189 | 0.193 | 0.040 | 4.694 | 0.000 |

Tables 3 and 4 presented the indirect effects. Results showed that language distance indirectly influenced team performance through dependence ($\beta = 0.059$; $p < 0.05$), knowledge sharing ($\beta = 0.064$; $p < 0.05$), and the link between dependence and knowledge sharing ($\beta = 0.066$; $p < 0.001$). This finding also revealed that the mediation path through the link between dependence and knowledge sharing absorbs the most variance as compared to the other two mediation paths.

## IV. DISCUSSION AND CONCLUSION

In this study, we examine the effect of language distance on project team performance. We find that linguistic diversity does not affect project team performance directly, but through dependence, knowledge sharing, and the link between these two factors.

These findings reveal that knowledge sharing plays a crucial role in enhancing project team performance in software development. The results indicate that knowledge sharing is not only a vital factor in teamwork but also a powerful mediator that mitigates the negative effects of language distance and dependence on team performance. In software project teams, knowledge sharing facilitates members in overcoming language barriers and helps establish a shared knowledge base, thereby optimizing team effectiveness. These findings are supported by previous studies, such as Ahmad and Widén (2015), who highlighted that language barriers can be a decisive factor in knowledge sharing, as code-switching beyond the organizational language reduces the ability to share information among employees from diverse linguistic backgrounds.

Similarly, previous research, such as Maznevski and DiStefano (2000), emphasizes that implicit cultural values, including language, influence how team members interact and share knowledge within the group. Although language distance does not directly impact project team performance, it can create a challenging communication environment, leading to difficulties in knowledge sharing and thus reducing team efficiency. However, as highlighted by Lee and Choi (2003), cultural and language barriers can affect the sharing of tacit knowledge—a critical type of knowledge that fosters innovation and problem-solving within teams. Therefore, knowledge sharing serves as an essential bridge, helping to mitigate the negative effects of language distance and dependence.

Within the framework of Bandura's Social Cognitive Theory (SCT), dependence among team members plays a critical role in overcoming language distance barriers. Our findings reveal that dependence (DE) not only has a direct positive impact on knowledge sharing (KS) but also serves as an important mechanism to address the challenges posed by language distance. The relationship LD -> DE -> KS ($\beta = 0.151$) is significantly stronger than the direct relationship LD -> KS ($\beta = 0.146$), affirming that dependence is not merely a mediating factor but also a mitigating force against the

negative effects of language distance on knowledge sharing within teams. Ahmad and Widén (2018) similarly asserted that while code-switching due to language differences may reduce the capacity for knowledge sharing, dependence among team members fosters a willingness to share information and knowledge despite linguistic disparities. This highlights that dependence can enhance collaboration and create a more conducive environment for knowledge sharing, even in multilingual teams.

Our study also demonstrates that dependence influences project team performance (PTP), but its impact becomes more pronounced when mediated through knowledge sharing. Knowledge sharing enhances coordination among team members, improves decision-making processes, and optimizes work performance. This aligns with the findings of Pee et al. (2010), who emphasized that knowledge sharing improves team performance by integrating technical and business expertise. Alongside other theories on knowledge sharing in cross-functional team environments (Holland et al., 2000), our research confirms that knowledge sharing not only compensates for the shortcomings caused by language distance but also equips teams to tackle complex project challenges effectively.

Although our findings indicate that language distance does not directly impact project team performance (PTP), it still exerts an indirect influence through dependence (DE) and knowledge sharing (KS). Previous studies by Hinds et al. (2001) have shown that multilingual teams often face challenges in communication and knowledge sharing, leading to decreased work performance. When language distance is not effectively managed, it can reduce the efficiency of communication and collaboration within the team, negatively affecting decision-making capabilities and task execution in projects.

However, language distance remains a critical factor in multicultural and multilingual teams. While it may not directly affect team performance, if not properly addressed, it can result in adverse effects such as reduced creativity, decreased flexibility in teamwork, and extended timeframes for task completion. Therefore, managing language distance and fostering effective knowledge sharing among team members are crucial to maintaining and enhancing work performance.

While our study is centered on software development teams, the mechanisms identified—namely, the mediating roles of dependence and knowledge sharing in offsetting the negative impacts of language distance—may be applicable to a wide range of industries. For instance, sectors such as manufacturing, finance, and research & development also operate with cross-functional and multilingual teams where effective communication is essential. Harzing (2018) discusses how language barriers in multinational companies can impede communication and collaboration across various sectors. Similarly, Tenzer, Pudelko, and Harzing (2014) highlight the impact of language barriers on trust formation in multinational teams, which is crucial for effective teamwork. Future research could extend our model to these contexts, thereby enhancing the generalizability of the findings.

It is important to note that our study has several limitations. First, the reliance on self-reported data may introduce common method biases, as individual perceptions could be influenced by subjective factors. Incorporating objective performance metrics or multi-source data in future studies could provide a more robust validation of the proposed relationships. Second, the cross-sectional survey design employed in this study limits our ability to draw causal inferences between language distance, dependence, knowledge sharing, and team performance. Longitudinal or experimental research designs would help to better establish causal links and examine these dynamics over time.

Building on the present findings, future research should explore innovative strategies and tools that support multilingual communication in diverse work environments. Investigating the effectiveness of advanced translation technologies, online knowledge-sharing platforms, or intercultural communication training programs could offer practical solutions to mitigate the adverse effects of language distance. Harzing (2018) emphasizes the need for language management strategies in multinational companies to overcome communication challenges. Additionally, comparative studies across different industries could uncover context-specific factors that influence how language distance and dependence interact with knowledge sharing to affect team performance. Lauring and Klitmøller (2015) examine how language diversity impacts knowledge sharing in multinational organizations, suggesting that industry-specific dynamics play a significant role.

In conclusion, language distance indirectly impacts project team performance through dependence and knowledge

sharing. Researchers and managers must pay close attention to minimizing the negative effects of language distance in multilingual environments and develop supportive strategies to optimize knowledge sharing. By addressing these challenges, organizations can not only improve team performance in software development but also enhance collaboration and innovation across a variety of industries.

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# FACTORS THAT INFLUENCE CUSTOMER ATTITUDE AND INTENTION TO PURCHASE LIFE INSURANCE: A CASE STUDY IN HO CHI MINH CITY

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## ABSTRACT

Life insurance is a financial product that is committed by contract between the buyer and the insurance company. Life insurance is an important tool for risk management and providing financial security (Omar and Owusu, 2007). This financial product is also a financial accumulation tool, so life insurance has witnessed significant growth globally. The insurance industry in general and life insurance in particular has witnessed significant growth worldwide, with premiums reaching approximately $2.8 trillion in 2021 (Swiss Re, 2022). However, Vietnam recorded only 10% of the population participating in life insurance, a much lower penetration rate than other developing countries (Vietnam Insurance Association, 2024). This study mainly investigates the factors that affect customers' attitudes and intentions to purchase life insurance in Ho Chi Minh City. There are 6 variables that the study focused on, including subjective norms, risk aversion motives, saving motives, financial literacy, perceived product benefits, and trustful belief. The findings showed that: (1) savings motives and perceived product benefits have a direct positive influence on purchase intention; (2) while subjective norms, trustful beliefs, and financial literacy have an indirect positive influence on purchase intention through the mediation of attitude.

*Keywords: "attitude", "indêpndent variables", "life insurance", "purchase intention"*

## I. INTRODUCTION

The insurance industry in general and life insurance in particular has witnessed significant growth worldwide, with premiums reaching approximately $2.8 trillion in 2021 (Swiss Re, 2022). This growth is influenced by several factors that influence consumer attitudes towards life insurance products. Life insurance is an important tool for risk management and providing financial security (Omar and Owusu, 2007). Because human life is regarded as the most precious asset, life insurance offers financial security to individuals and their families in times of uncertainty, such as untimely death or an accident (Chaudhary, 2016). According to Zakaria et al. (2016), life insurance not only saves people money, but also shields them against personal risks and hazards. Hofstede (1995) emphasized that the basic goal of life insurance is to protect against financial losses caused by early death.

The Vietnamese market for insurance has expanded considerably over the 30 years prior, with companies growing both in size and in large quantities. To date, there are 81 insurance companies in operation, with total assets exceeding 913 trillion VND. Recent statistics show that the life insurance sector, with more than 11.7 million contracts in force, only covers about 10% of the population. This is in stark contrast to developed countries, where life insurance penetration can reach 70-80%. Although life insurance companies' revenue will decline in early 2024, the overall contributions of insurance to the Vietnamese economy remain significant, such as supporting macroeconomic stability and providing financial security for individuals (Vietnam Insurance Association, 2024). Despite its importance, the literature on the topic of life insurance in Vietnam is still quite limited and lacking in generality. Moreover, with a rapidly developing economy like Vietnam, previous studies cannot portray a comprehensive picture of the current insurance market. Therefore, this paper aims to investigate the role of subjective norms, risk aversion motives, saving motives, financial literacy, perceived product benefits, and trustful belief on purchase intention through consumer attitudes in Vietnam.

The paper opens with an introduction that summarizes the study's background, justification, and purpose. The second section, a literature review, examines the literature on independent variables, attitudes, and purchase intentions for life insurance. Following that, the methodology, results of research, discussion, and conclusion are presented. The final section discusses the implications for practitioners and future investigations.

## II. LITERATURE REVIEW

### 2.1 Factors affecting life insurance purchase intention

This study incorporates a number of factors influencing life insurance purchase intention from earlier research to offer a comprehensive model. By combining subjective factors (including attitude, belief, financial literacy, risk aversion motive and saving motivation), objective factors (sociodemographic traits), and product-related factors (including perceived value), the model offers a comprehensive understanding of the variables influencing consumer decisions. Unlike other research that frequently focuses on distinct elements, this study fills the gap by addressing the interdependence of psychological, social, and economic aspects. As a result, the suggested model is more thorough and includes more elements, offering a better comprehension of the motivation behind purchasing life insurance and acting as a helpful manual for further study and real-world application in the insurance industry.

**Trustful Belief on insurance**

In the insurance business, trust is essential since it fosters strong bonds between policyholders as well as providers. Customers need to feel confident that the insurance company will carry out its end of the bargain, which includes fast claim handling and supplying the promised coverage when needed (Gambetta, 1988). Customers are reassured that their money will be safeguarded by trust, which helps to lower the perceived risk involved with insurance purchases. Research shows that consumers who feel more confident with a provider's dependability are more likely to purchase insurance because they feel more comfortable signing long-term agreements with them (Morgan & Hunt, 1994; Kim et al., 2008). Moreover, trustful belief plays a crucial role in customer loyalty, beyond the factors that influence initial purchase decisions. This makes it an essential component of long-term growth for businesses in the industry (Berry, 1995). In order to establish trust and create enduring client relationships, insurers must prioritise openness, clarity in communication, and dependable service (Sirdeshmukh, Singh, & Sabol, 2002).

**Perceived Product Value**

An assessment of the price of an item and advantages is known as recognised product value, therefore it has a big influence on the decision of the purchaser to buy (Zeithaml, 1988). Perceived value in the life insurance environment is determined by the benefits that clients anticipate, including options for investing, financial security, and protection in the future for those closest to them. When considering insurance, customers will often carefully consider policies, comparing the benefits and costs of purchasing life insurance, as well as whether the level of coverage satisfies their demand (Zakaria et al., 2016). Previous research has found that customers are more inclined to buy life insurance when they perceive it will deliver significant benefits, such as the potential for future wealth growth or comprehensive coverage for health risks (Lim & Haberman, 2003; Chua, 2018).

**Subjective norms**

Subjective norms are the expectations of significant others - friends, family, and coworkers - that influence people's felt social pressure to participate in or refrain from participating in particular behaviors (Fishbein & Ajzen, 1975). These conventions have a big impact on how customers want to use life insurance and make decisions. People are more likely to consider and consider purchasing life insurance when influential people or important social groups around them promote the purchase of life insurance (Ajzen, 1991). These effects are especially noticeable in communal cultures such as Vietnam, where family and community ties deeply influence an individual's decision (Hofstede, 2001). According to research, people in such societies are more likely to consider their social circle's attitudes and behaviors when making financial decisions, such as whether to buy life insurance (Lee & Neale, 2012; Lim et al., 2014). Based on studies, subjective norms can create either positive or negative pressure; if the widespread opinion is that life insurance is necessary for financial stability, people are more inclined to buy it. However, if life insurance is considered septically or as superfluous, social pressure may deter potential buyers (Chua, 2018). Understanding the impact of subjective norms is critical for insurance firms because leveraging positive social influence through targeted marketing or testimonials can enhance consumer engagement and purchase intention (Kotler & Keller, 2016; Lin et al., 2017).

**Saving motives**

Saving motives encompass a range of objectives that drive individuals to secure life insurance, including preparing for emergencies such as illness or unemployment, as well as investing in significant expenditures like housing and medical care (Katona, 1975; Harris et al., 2002; Webley et al., 2000). With the main task of providing a source of

money in unforeseen circumstances, life insurance is considered an important financial safety net in today's volatile society. Understanding this, insurance companies can adjust their products to meet customers' needs effectively, promoting life insurance not only as a means of protection but also as a strategic investment for future financial stability and security (Canova et al., 2005; Huang et al., 2016).

**Risk aversion motives**

Risk aversion motives reflect an individual's preference for certainty and stability over uncertainty and potential risks (Rousseau et al., 1998). This psychological bias significantly influences financial decision-making, especially the purchase of insurance products. Studies have shown a positive correlation between risk aversion and insurance consumption, suggesting that individuals with higher risk aversion tend to seek protection through life insurance (Huang et al., 2016; Lin et al., 2017). For these individuals, life insurance will play an extremely important role in reducing the risks associated with unexpected events, such as illness, disability, or death. It provides them with peace of mind when problems arise that could lead to worrying financial instability for themselves and their families in the future (Browne & Kim, 1993). Furthermore, their desire to protect their personal finances and the quality of life of their dependents motivates them to view life insurance as an important part of their risk management strategy. Understanding this need, insurers can leverage this understanding by promoting a greater focus on the safety and security that life insurance provides. This can effectively attract risk-averse consumers who value safety and financial stability.

**Financial literacy**

According to Bhatia, Bhat & Tikoria (2024), the ability to understand and use knowledge to make decisions is called financial literacy. It includes understanding important financial concepts, such as compound interest, risk management, and the essentials for long-term financial stability (Ismail, Roslan & Shamsuddin, 2024). These studies show that individuals with financial knowledge are more likely to participate in financial plans such as life insurance (Tewari & Sanjay, 2024). However, financial literacy alone is not enough to motivate interest in participating in life insurance. Financial literacy requires other complementary factors, such as risk perception and savings motivation, to make the decision to buy life insurance (Briguglio, Camilleri & Fenech, 2024). It can be said that financial literacy significantly enhances the ability to manage financial matters. According to Liu et al. (2025), financial literacy can help mitigate the negative consequences of impulsive decisions. Individuals who tend to accumulate less wealth and do not have a retirement plan tend to have lower levels of financial literacy (Yu et al., 2025). Lack of financial literacy can have a long-term negative impact on an individual's financial stability.

**Attitude toward life insurance**

The theory of planned behavior (Ajzen, 1991) emphasizes that an individual's attitude is an important predictor of their behavioral intentions, meaning that people with positive attitudes are more likely to perform certain behaviors. In the life insurance sector, positive attitudes correlate with a higher probability of purchasing those products (Ajzen, 1991; Salem & Salem, 2018). Further research suggests that customers' understanding, awareness, and knowledge play a pivotal role in shaping their attitudes toward financial products, especially life insurance (Tania Driver, 2018). When individuals understand exactly what benefits and security life insurance can provide, they will have a more positive attitude toward it. The understanding referred to here may include the recognition of life insurance as a means of financial protection, an investment for future emergencies, or a means of protecting the family from financial crises. Therefore, increasing knowledge and changing the perspective of customers are important strategies for insurers to have a positive impact on attitudes and ultimately promote purchase intentions. Our research investigated the impact of independent factors on the mediating variable attitude. Consequently, the following hypotheses were proposed:

H1.1: Subjective norms directly affects attitude toward life insurance

H1.2: Risk aversion motives directly affects attitude toward life insurance

H1.3: Saving motives directly affects attitude toward life insurance

H1.4: Financial literacy directly affects attitude toward life insurance

H1.6: Trustful belief of insurance directly affects attitudes toward life insurance

H1.7: Perceived product benefits of insurance directly affects attitudes toward life insurance

### 2.2 Life insurance purchase intention

The desire to buy life insurance is reflected in consumers' tendency to buy personal insurance (Sheeran 2002). Purchase intention is a multidimensional concept that represents a consumer's intentional decision or willingness to purchase a product or service. It indicates a consumer's purchasing opportunities, making it a key predictor of actual purchasing behavior (Fishbein & Ajzen, 1975). While intentions don't always result in revenue, they are a reliable sign of customer interest and commitment. Research on life insurance demand has become popular since the 1960s (Hwang & Gao, 2003). Family income (Beck & Webb, 2003; Browne & Kim, 1993), inflation (Beck & Webb, 2003; Outreville, 1996), insurance premiums (Browne & Kim, 1993; Outreville, 1996), and socio-cultural factors (Chui & Kwok, 2008) are all important factors driving the demand for life insurance. Furthermore, socio-demographic characteristics, financial knowledge, and reasons for risk aversion all have a significant impact on consumer intentions (Jahan and Sabbir, 2018). This study examined the influence of eight factors (attitude, subjective norms, ris aversion motives, saving motives, financial literacy, trustful belief, perceived product benefits) on the intention to purchase life insurance. Therefore, the following hypotheses were proposed:

H2.1: Attitude toward life insurance directly affects intention to purchase life insurance.

H2.2: Subjective norms directly affects purchase intention life insurance.

H2.3: Risk aversion motives directly affects purchase intention life insurance.

H2.4: Saving motives directly affects purchase intention life insurance.

H2.5: Financial literacy directly affects purchase intention life insurance.

H2.7:Trustful belief of insurance directly affects purchase intention life insurance.

H2.8: Perceived product benefits of insurance directly affects purchase intention life insurance.

Furthermore, this study also examines the mediating role of customer attitudes between independent variables and life insurance purchase intention. According to Mahdzan and Victorian (2013), people with strong savings motivation tend to have more positive attitudes towards financial products, especially life insurance. Meanwhile, Zeithaml (1988) argued that when customers are aware of specific values and benefits of the product, they will have more positive attitudes. Regarding product benefits, Lim and Haberman (2003) emphasized that factors such as financial protection and estate planning have a strong impact on attitudes. Although Lusardi et al. (2010) argued that people with higher financial literacy tend to have more positive attitudes towards complex financial products such as life insurance. And according to Ajzen (1991), subjective norms—social pressure from family, friends, or colleagues—have a strong influence on attitudes. But according to Morgan and Hunt (1994), trust in the honesty and trustful belief of the supplier will increase the customer's positive attitude towards the product. This research focused on the mediating variable (attitude) to see how independent factors affected intention for buying life insurance. Thus, the following hypotheses were proposed:

H3.1: Subjective norms indirectly affects intention to purchase life insurance through the mediation of attitude

H3.2: Risk aversion motives indirectly affects intention to purchase life insurance through the mediation of attitude

H3.3: Saving motives indirectly affects intention to purchase life insurance through the mediation of attitude

H3.4: Financial literacy indirectly affects intention to purchase life insurance through the mediation of attitude

H3.6: Trustful belief of insurance indirectly affects intention to purchase life insurance through the mediation of attitude

H3.7: Perceived product benefits of insurance indirectly affects intention to purchase life insurance through the mediation of attitude

## III. METHODS

### 3.1 Research Sample

The study's target group is those aged 18 to 59 who live in Ho Chi Minh City, Vietnam, with a preference for those who are familiar with life insurance products and have the financial means to make educated judgments. The research intends to collect data from 200 respondents, which is deemed sufficient for conducting a representative and statistically

relevant examination of customer views and purchase intentions for life insurance.

### 3.2 Data Collection

We obtained data for offline surveys in two ways. The first method of data collection was through Vietnamese life insurance firms. Insurance firms gathered offline questionnaires within three weeks. However, many consumers did not come to obtain life insurance, resulting in a lower number of responders. For online surveys, data was collected using a Google Doc Form. The primary method was to gather replies online by publishing the questionnaire form in online social groups and forums on Facebook. There are several organizations formed for clients who use life insurance in Vietnam to discuss their experiences while purchasing life insurance, particularly in Ho Chi Minh City from November to December 2024.

## IV. FINDINGS

### 4.1 The Profile of the Respndents

A total of 261 respondents over the age of 18 from Vietnam were polled using both online and offline approaches. Table 1 presents an overview of the respondents' demographic characteristics. Females accounted for 49.04% of the total sample. This equates to 128 of 261 responders being female. The other 133 people were men, accounting for 50.96% of all replies.

The bulk of respondents were under 35 years old, accounting for 43.7% of the 261 survey samples. Participants aged 35 to 45 years accounted for 23.4%, while those aged 46 to 55 made up 26.1%. A lower proportion of responders, 5.4%, were aged 56 to 65, while 1.5% were beyond 65.

The largest group of respondents, 38.7%, earn between 10 - 15 million dong, followed by 23.4% of respondents who earn Under 10 million dong. A lower percentage of individuals earns between 16 and 20 million dong (19.5%), 6.5% earn between 21 and 25 million dong, and 5.7% earn between 26 and 30 million dong. The remaining respondents are divided among the higher income brackets: 2.3% make between 31 and 45 million dong, while 3.8% earn over 45 million dong.

About 53.6% held a bachelor’s degree or equivalent. The second-largest group, 19.9%, had a high school diploma, while 16.1% had a technical school diploma or certificate. Only 10% of respondents had earned a master’s degree, and 0.4% had a PhD.

**Table 1. Summary of Demographic Information**

| Variables | Categories | Frequency | Percentage |
|---|---|---|---|
| | Male | | |
| | Female | 133 | |
| **Gender** | Under 35 | 128 | 51 |
| | 35 - 45 | 114 | 49 |
| **Age** | 46 - 55 | 61 | 43.7 23.4 |
| | 56 - 65 | 68 | 26.1 |
| | Above 65 | 14 4 | 5.4 |
| | Under 10 million dong | 61 | 1.5 |
| | 10 - 15 million dong | 101 | 34.1 31.4 |
| **Income** | 16 - 20 million dong | 51 | 16.9 |
| | 21 - 25 million dong | 17 | 5.7 5.7 2.3 |
| | 26 - 30 million dong | 15 6 | 3.8 |
| | 31 - 45 million dong | 10 | 19.9 16.1 |
| | Above 45 million dong | 52 | 53.6 |
| | Secondary school certificate | 42 | 10 |
| | Diploma/technical school certificate | 140 | 0.4 |
| **Education** | Bachelor’s degree or equivalent | 26 | |
| | Master’s degree | 1 | |
| | Doctoral degree | | |

### 4.2 Reliability Test

This study uses reliability analysis to investigate items that are unrelated in each aspect to increase the quality of the final results. Table 2 shows the composite reliability of each variable. According to Hair et al. (2009), a meaningful observation variable should have an outer loading coefficient of at least 0.7. The authors propose that values below 0.4 be eliminated from the model. After determining if all the study items met Hair et al.'s (2007) standards, some with outer loadings less than 0.7 were removed from the model. It is RAM 1. The remaining things in the table are very reliable.

**Table 2. Scales Reliability**

| Constructs | Items | Indicator Reliability |
|---|---|---|
| Subjective norms | SN1/SN2/SN3 | .884/.935/.922 |
| Risk aversion motives | RAM2/RAM2/RAM3/RAM4/RAM5 | .822/.830/.820/.787 |
| Financial literacy Saving | FL1/FL2/FL3 | .869/.876/.894 |
| motives | SM1/SM2/SM3/SM4 | .884/.873/.911/.776 |
| Trustful Belief | T1/T2/T3 | .892/.920/.940 |
| Perceived Product Benefits | PB1/PB2/PB3/PB4/PB5/PB6 | .830/.887/.838/.870/.891/.864 |
| Attitude | ATT1/ATT2/ATT3/ATT4 | .902/.952/.947/0.933 |
| Purchase intention | PI1/PI2/PI3/PI4 | .914/.845/.920/.922 |

### 4.3 Validity Test

Convergent validity assesses the extent to which observed measurements of a latent concept are strongly positively associated. Hair et al. (2014) define a valid measurement scale as one in which a latent variable explains for more than 50% of the variation in the observed variables. This is represented by an Average Variance Extracted (AVE) value of 0.5 or higher. Discriminant validity was assessed using the Fornell-Larcker Criterion, as shown in Table 22. According to this criterion, the square root of the Average Variance Extracted (AVE) for each construct (displayed on the diagonal) should be greater than its correlations with other constructs to ensure that each construct is distinct. The results indicate strong discriminant validity for all constructs. These results confirm that the constructs in the model are distinct from one another, supporting the discriminant validity of the measurement model.

**Table 3. Variable Average Variance Extracted**

| Variable | AVE |
|---|---|
| Subjective norms | 0.835 |
| Risk aversion motives | 0.604 |
| Financial literacy | 0.774 |
| Saving motives | 0.744 |
| Trustful Belief | 0.842 |
| Perceived Product Benefits | 0.746 |
| Attitude | 0.871 |
| Purchase intention | 0.811 |

**Table 4. Discriminant Validity**

| Variable | ATT | FL | PB | PI | RAM | SM | SN | T |
|---|---|---|---|---|---|---|---|---|
| ATT | 0.933 | | | | | | | |
| FL | 0.628 | 0.880 | | | | | | |
| PB | 0.869 | 0.590 | 0.864 | | | | | |
| PI | 0.873 | 0.489 | 0.803 | 0.901 | | | | |
| RAM SM | 0.305 | 0.236 | 0.359 | 0.300 | 0.777 | | | |
| SN | 0.547 | 0.488 | 0.600 | 0.512 | 0.483 | 0.862 | | |
| T | 0.580 | 0.499 | 0.519 | 0.534 | 0.340 | 0.392 | 0.914 | |
| | 0.856 | 0.604 | 0.789 | 0.813 | 0.235 | 0.474 | 0.540 | 0.917 |

### 4.4 Hypotheses Testing

**Factors Affecting attitude**

**Table 5. The direct impact on customer's attitude**

| Hypothesis | | Path coefficient | T-value | Result |
|---|---|---|---|---|
| H1.4 | Financial literacy -> Attitude | 0.062 | 1.366 | Rejected |
| H1.6 | Perceived Product Benefits -> Attitude | 0.465 | 8.477 | Accepted |
| H1.2 | Risk aversion motives -> Attitude | -0.009 | 0.318 | Rejected |
| H1.3 | Saving motives -> Attitude | 0.018 | 0.402 | Rejected |
| H1.1 | Subjective norms -> Attitude Trustful | 0.090 | 2.662 | Accepted |
| H1.5 | Belief -> Attitude | 0.397 | 6.784 | Accepted |

According to the above table, three factors - perceived product benefits, subjective norms, trusting belief, and visual appearance - had a substantial direct impact on attitude, with T-values more than 1.96 (Hair, Sarstedt, Ringle, & Mena, 2012).

**Factors Affecting Life Insurance Purchase Intention**

**Table 6. The direct impact on life insurance purchase intention**

| Hypothesis | | Path coefficient | T-value | Result |
|---|---|---|---|---|
| H2.5 | Financial literacy -> Purchase intention | -0.157 | 3.527 | Accepted |
| H2.7 | Perceived Product Benefits -> Purchase intention | 0.132 | 1.959 | Rejected |
| H2.3 | Risk aversion motives -> Purchase intention | 0.015 | 0.439 | Rejected |
| H2.4 | Saving motives -> Purchase intention | 0.045 | 1.029 | Rejected |
| H2.2 | Subjective norms -> Purchase intention | 0.045 | 0.922 | Rejected |
| H2.6 | Trustful Belief -> Purchase intention | 0.259 | 2.708 | Accepted |
| H2.1 | Attitude -> Purchase intention | 0.579 | 6.549 | Accepted |

Based on the data in table 7, it can be inferred that Attitude (β=0.579, T=6.549) and Trustful Belief (β=0.259, T=2.708) have statistically significant and positive relationships with life insurance purchase intention. On the other hand, Financial Literacy (β=-0.157, T=3.527) has a negative impact on purchase intention, with the relationship being statistically significant. Therefore, hypotheses H2.1, H2.6 and H2.5 were accepted.

**Table 7. Indirect effects on life insurance purchase intention**

| Hypothesis | | Path coefficient | T-value | Result |
|---|---|---|---|---|
| H3.4 | Financial literacy -> Attitude -> Purchase intention | 0.062 | 1.366 | Rejected |
| H3.6 | Perceived Product Benefits -> Attitude -> Purchase intention | 0.465 | 8.477 | Accepted |
| H3.2 | Risk aversion motives -> Attitude -> Purchase intention | -0.009 | 0.318 | Rejected |
| H3.3 | Saving motives -> Attitude -> Purchase intention | 0.018 | 0.402 | Rejected |
| H3.1 | Subjective norms -> Attitude -> Purchase intention | 0.090 | 2.662 | Accepted |
| H3.5 | Trustful Belief -> Attitude -> Purchase intention | 0.397 | 6.784 | Accepted |

As shown in table 8, the indirect effects of attitude towards three factors on life insurance purchase intention are analyzed. Perceived Product Benefits (β=0.269), Trustful Belief (β=0.230) and Subjective Norms (β=0.052) have significant positive indirect effects on purchase intention through attitude.

**Table 8. Total effects on life insurance purchase intention**

| | Effect on Purchase Intention | | |
|---|---|---|---|
| Variable | Direct | Indirect | Total |
| Financial literacy (FL) | -0.157 | - | -0.157 |
| Perceived Product Benefits (PB) | 0.132 | 0.269 | 0.401 |
| Risk aversion motives (RAM) | - | - | - |
| Saving motives (SM) | - | - | - |

| | | | |
|---|---|---|---|
| Subjective norms (SN) | - | 0.052 | 0.052 |
| Trustful Belief (T) | 0.259 | 0.230 | 0.489 |
| Attitude (ATT) | 0.579 | - | 0.579 |

In summary, regarding the total effects on life insurance purchase intention, Attitude (ATT) has the largest impact, with a total effect of β = 0.579, followed by Trustful Belief (β = 0.489), Perceived Product Benefits (β = 0.401), Subjective Norms (β = 0.097) and Financial Literacy (β = -0.157), respectively.

Attitude and purchase intention have fairly high explained variances (R2) for the endogenous components (84.2% and 79.7%, respectively). The findings of the structural model are visually displayed in Figure 1.

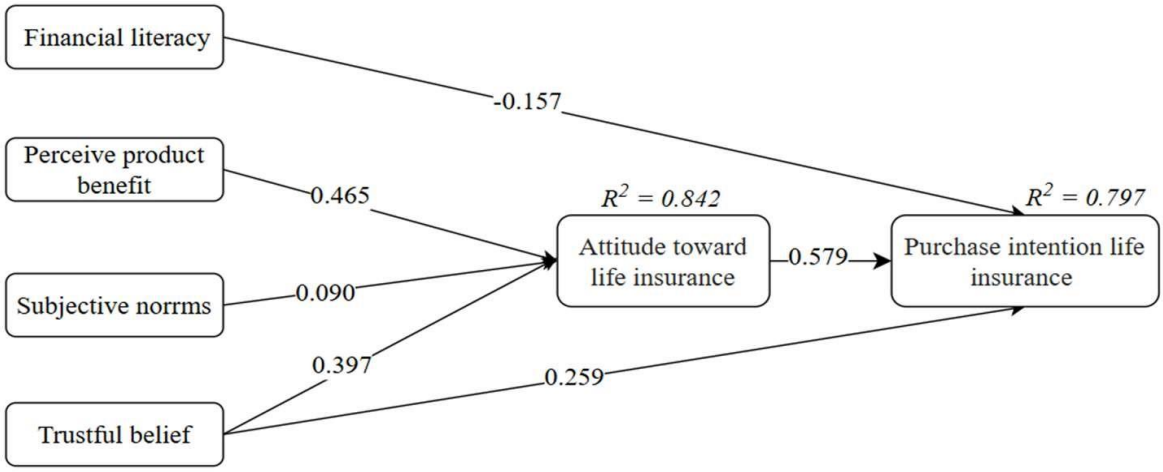



**Figure 1.** Results of the structural model

## V. DISCUSSIONS AND CONCLUSIONS

### 5.1. Discussions

The Impact of Subjective Norms on Life Insurance Purchase Intention Through the Mediation of Attitude

The study found a substantial positive correlation between subjective norms and attitudes towards life insurance. This shows that those who get social support or pressure from family, friends, and coworkers to buy life insurance are more likely to have a positive opinion toward it. Participants who reported significant family support for life insurance, for example, had a more favorable outlook on its advantages and usability. However, the direct influence of subjective standards on purchase intention was not statistically significant. While prior studies, such as Ajzen (1991), stressed the impact of social norms in customers' insurance purchase choices, this study discovered that subjective norms mostly indirectly influenced purchase intention via attitude mediation. Positive social reinforcement enhanced the chance of acquiring life insurance, as evidenced by a strong mediation effect. This complicated finding emphasizes the need of promoting good social discourse around life insurance. By using the power of huge social groups, insurers may alter attitudes and indirectly affect consumer behavior.

The Role of Risk Aversion Motives in Purchase Intention

Risk aversion motives were found to have a significant effect on both attitude and purchase intention. Respondents who prefer certainty and stability tend to value life insurance as a financial safety net. These people see life insurance as a reliable financial cover when they face health risks (they are reimbursed, have money to pay for treatment, surgery, and so on) or life hazards (family members receive compensation, may continue to live well). The study also clearly demonstrates that risk aversion reasons have a twofold impact on buyers. While they have a direct impact on clients' purchasing intentions, they also boost their willingness to acquire life insurance by altering their views. This finding is also consistent with the work of Gokhan and McKenzie (2014), who stressed the importance of risk reduction in insurance uptake. As a result, life insurance companies should stress open communication of corporate policies, and advisors should reinforce these points during the sales process if consumers purchase life insurance. Especially given the nature of life insurance, a product that requires long-term companionship. Customers need to know that when economic risks occur, customers can still maintain regular insurance premium payments for 10-20 years. Therefore,

customers should only participate in life insurance when they can pay for more than 10 years. Highlighting these aspects can resonate with risk-averse individuals and reinforce both attitudes and intentions to purchase life insurance.

Saving Motives and Their Influence on Purchase Intention

Saving motivation significantly predicted attitude and purchase intention. Among these motives, saving for emergencies was the most prominent, reflecting customers' higher awareness of unforeseen events that could seriously impact their personal and family finances. The study identified a strong mediating effect of attitude between saving motive and purchase intention, thus emphasizing the importance of promoting positive perceptions of life insurance as a valuable savings tool. This study also replicated the findings of Katona (1975), reinforcing the results of identifying saving motives as reflecting consumers' sensitivity to risks. The study has contributed to strengthening and emphasizing the role of psychological factors of saving that strongly affect attitudes. Consistent with the research results of Mahdzan and Victorian (2013), the current study shows that attitudes have a strong impact on purchase intention through attitudes. In addition, the study has emphasized the role of savings through data from emergencies, retirement plans, and income continuity. This is completely consistent with the findings of Canova et al. (2005) and Huang et al. (2016). The studies by Canova and Huang also note that life insurance serves as a dual-purpose financial tool - both as a protection against unforeseen risks and as a long-term investment mechanism. Promotional campaigns by insurance companies that focus on the dual role of life insurance will bring positive feedback from customers. When life insurance is both a protection mechanism and a financial planning tool, transparency in these roles can increase its appeal to consumers who have a genuine need to save.

Financial Literacy as a Determinant of Purchase Intention

Financial literacy significantly affects attitude and purchase intention. People with higher levels of financial knowledge have a better understanding of the benefits of life insurance. That allows them to make more informed decisions than other individuals. This finding is consistent with previous studies by Lusardi et al. (2010), which highlighted the important role of financial literacy in shaping consumer behavior. Interestingly, financial literacy had both direct and indirect effects on purchase intentions, indicating its particular importance. While it directly equips individuals with the knowledge to appreciate life insurance benefits, it also fosters positive attitudes that further enhance their purchase intentions. These findings highlight the need for insurers to invest in educational initiatives, such as seminars, webinars and user-friendly materials, to improve consumers' financial literacy and empower them to make confident, informed decisions.

The Role of Perceived Product Benefits

Perceived product benefits had a significant positive impact on attitudes and purchase intentions. Respondents emphasized specific benefits of life insurance, including financial security, wealth planning, and risk reduction. The results of the study show that when life insurance is viewed as a tool to reduce financial uncertainty and provide future financial stability, the intention to purchase life insurance will also change positively. These findings are consistent with Zeithaml's (1988) assertion that perceived value is an important factor in customers' decisions. Lim and Haberman (2003) also found that people tend to be more interested in life insurance when they perceive it as both a risk management tool and a financial asset. In addition, the study highlighted long-term stability and reduced financial uncertainty, like the findings of Zakaria et al. (2016). They found that perceived product benefits, such as comprehensive health coverage and financial protection, are important drivers in life insurance adoption. This implies that, while understanding the physical benefits of insurance may spark immediate interest, building favorable views about insurance might increase the effect and lead to long-term engagement. By contextualizing these findings within the Vietnamese market, the study provides a rich contrast to other developing markets. In a 2019 study by Weedige et al., they highlighted the need for culturally appropriate marketing approaches to effectively highlight product benefits.

To capitalize on these findings, life insurance marketers could create marketing messages that emphasize the real benefits of their products, thereby improving attitudes and purchase intention.

**5.2. Conclusion**

By combining subjective norms, saving motives, risk aversion motives, financial literacy, and perceived product benefits, the study highlighted the mediating role of attitude in these relationships. The findings further supported the

conclusions of previous studies that while subjective norms and risk aversion motives have direct pathways to purchase intention, other variables, such as saving motives, financial literacy, and perceived product benefits - exert their influence primarily through the mediating role of attitude. These results highlight the complex interplay between personal motivation, social influence, and cognitive understanding in driving life insurance adoption. A key finding of this study is the negative relationship between financial literacy and intention to purchase life insurance. Although financial literacy is considered a factor that promotes informed decision-making, its impact on insurance purchase behaviour is more complex. Financial literacy makes consumers more cautious when evaluating insurance products and reduces their likelihood of purchasing life insurance. While financial literacy induces more cautiousness and conservatism, the remaining independent variables may positively influence the intention to purchase life insurance through the mediating variable attitude. The comprehensive analysis of the study provides insights into customer behavior and highlights the important role of cultivating positive attitudes as a path to enhancing purchase intentions. These results underscore the complex interplay between personal motivations, social influences, and cognitive understanding in driving life insurance adoption. The study's comprehensive analysis provides insights into customer behavior and highlights the critical role of fostering positive attitudes as a pathway to enhancing purchase intentions.

**Theoretical Implications**

This study has outlined the theoretical aspects of life insurance purchase behavior more clearly by making some outstanding contributions. First, by incorporating two important variables in financial decision-making, namely financial knowledge and saving motives, the study has extended Ajzen's Theory of Planned Behavior. The paper enriches the theoretical model and better captures the nuances of consumer behavior in the life insurance market. It thus emphasizes the importance of knowledge and cognitive processes in forming key psychological constructs such as attitudes.

Secondly, attitude—the study's mediation variable—has been strengthened as a bridge that converts external factors, such as subjective standards and risk aversion reasons, into precise intents. This study focuses on the attitudinal processes that drive consumer choices and underlines the need of including cognitive and emotional mediators into theoretical frameworks. By establishing this hypothesis, we may enhance the effect of cognitive and social pressure on attitudes. Following that, it offers a thorough explanation of the customer interest in life insurance.

Furthermore, the study applied global ideas to local consumer behavior by taking into account Vietnam's cultural and economic contexts. Vietnam's collectivist culture heavily relies on shared values and social conventions to influence decision-making. Subjective standards have a unique influence in a rising country such as Vietnam, where the middle class is growing. This tweak has helped to improve the appropriateness of current models in Vietnam. It opens up potential for other emerging economies with comparable cultural traits to use this rich theoretical model.

Finally, ensuring long-term financial stability and minimizing risks is one of the main tasks of life insurance that the study wants to emphasize. Through the importance of ensuring financial stability and minimizing risks, the study can determine the level of consumer interest in life insurance. From that result, the study provides valuable insights and, at the same time, depicts a comprehensive picture of the factors that motivate consumers to seek financial security by investing in life insurance. Overall, these findings have partly strengthened the theoretical foundation for future research, especially research in markets with growing economies and developing financial systems.

**Practical Implications**

As a result, governments and insurance firms will find this study especially relevant. We advocate that insurance businesses use the relationships between influencing elements to combine and diversify their marketing efforts. This will build additional bridges, allowing people to get life insurance more easily and consistently. Furthermore, our research indicates that people in their peak earning years (35 to 55 years old) are highly interested in life insurance. By concentrating on these elements, insurance businesses may develop a successful customer strategy.

The outcome shows that trustful belief has both direct and indirect effects on the intention to purchase life insurance of customers. The nature of life insurance contracts is that they are long-term contracts. Along with financial commitments in the event of a crisis, trust is considered a core element and the foundation for the relationship between customers and insurance companies. Research shows that consumers who feel more confident with a provider's

dependability are more likely to purchase insurance because they feel more comfortable signing long-term agreements with them (Morgan & Hunt, 1994; Kim et al., 2008). It can be said that trust is the customer's expectation that the insurance company will fulfill the commitments stated in the contract, especially in difficult times, such as when customers or their families need financial support due to risks. Although the life insurance market is growing, people's trust in insurance is still limited. Especially after the crisis of trust in recent years, insurance companies are having a hard time rebuilding customer trust. First, insurance companies need to increase product transparency. This includes providing full contract information, terms and conditions, and additional costs. In addition, insurance companies also need to publicize and resolve insurance benefits quickly, in accordance with commitments and conveniently for customers. Customers being clearly informed of the necessary documents and waiting times will help them not feel lost or lose confidence when claiming benefits. Improve the compensation process by designing a simple, easy-tounderstand, and effective process. Especially applying digital technology to optimize the process and minimize errors. In addition, it is important to focus on building and enhancing the professionalism of the distribution channel team. Consultants need to have solid knowledge of insurance products and compensation processes to avoid employees providing incomplete information, answering questions, and handling requests ineffectively, leading to misunderstandings and loss of trust from customers. Last but not least, the complaint response and settlement process of insurance companies needs to be concerned and improved. When there is a complaint about insurance benefits, companies need to have a complaint handling process that is as effective as or more effective than the compensation process. Handling complaints transparently, quickly, and accurately will help the company maintain good relationships with customers and enhance the company's image. Trust plays an extremely important role in building customer loyalty and promoting sustainable development for insurance companies. To achieve this, insurance companies need to always ensure service quality, transparency in commitments and benefits, as well as improve customer experience. Customer loyalty is not only the driving force for current development but also a solid foundation for long-term growth in the future.

Perceived product benefits have a significant positive impact on attitude and intention to purchase life insurance. Meanwhile, financial knowledge has a significant negative impact on intention to purchase. The contrast between perceived product benefits and financial knowledge in the study has highlighted the mediating role of attitude. The mediating variable of attitude acts as a psychological bridge, helping consumers easily use financial knowledge to make informed and confident decisions. When consumers have higher financial knowledge, they tend to scrutinise financial products such as life insurance. They easily recognise the potential risks, such as additional costs and investment performance related to policies. From there, they hesitate or refuse to purchase life insurance despite recognising its basic benefits. Therefore, attitude plays an important mediating role, helping to balance rational financial evaluation with emotional and psychological motivation in making life insurance purchase decisions. It can be said that the results of this research can provide important opportunities and strategies for insurance companies. First, raising awareness of insurance benefits is important, as many people do not fully understand or have insufficient awareness of the value of life insurance. Therefore, providing easy-to-understand information about product benefits, especially the intangible values they bring, such as family protection and financial risk avoidance. Companies should avoid focusing too much on complex financial factors such as the level of return or investment; companies should emphasize the peace of mind and protection that insurance brings and help customers feel more clearly the intangible value of life insurance. In addition, financial literacy can make customers cautious and skeptical because they are able to deeply analyze the financial elements of life insurance. They may perceive unreasonable costs, investment performance, or lack of transparency in the contract, thereby reducing their intention to buy insurance. To overcome this situation, insurance companies should provide detailed information about insurance benefits, costs, and contract terms without creating a feeling of being "hidden" about potential costs. This transparency can reduce the concerns of financially literate customers about participating in insurance. To make it accessible to the majority of people, insurance companies need to simplify financial products instead of complicated insurance contracts. Adjustments in marketing strategies, product optimization, and information simplification by companies can increase people's awareness and participation in insurance.

According to research, saving motives and risk aversion motives are two variables that are inextricably connected

and complement one another in influencing the desire to acquire life insurance. Individuals who tend to be risk averse often seek solutions through safe financial solutions such as life insurance. It provides them with peace of mind when problems arise that could lead to worrying financial instability for themselves and their families in the future (Browne & Kim, 1993). Understanding this psychological tendency helps insurance companies easily highlight the protective role of life insurance by exploiting the fear of risk. For example, building strong communication messages, providing real-life situations, and risk simulation videos. On the contrary, insurance companies can receive negative attitudes from these risk-averse individuals when they do not trust or are concerned about the transparency and commitment of the companies. In addition, for individuals who are interested in the financial value of life insurance, companies can turn products that only have a protective function into products that can meet dual needs (both protection and asset growth). Saving motives encompass a range of objectives that drive individuals to secure life insurance, including preparing for emergencies such as illness or unemployment, as well as investing in significant expenditures like housing and medical care (Katona, 1975; Harris et al., 2002; Webley et al., 2000). Thus, insurance firms must adapt their policies to meet the savings needs of each consumer. At the same time, they need to develop confidence by providing transparent information regarding interest rates, accumulation processes, and withdrawal terms. Based on the above analysis, insurance companies should have advertising campaigns focusing on promoting positive perceptions of life insurance as a savings tool with dual value. Life insurance is both a protection product and a tool for family financial planning. However, it should be reiterated that the prerequisite for this campaign to be effective is the effort to strengthen trust and the quality of service provided by insurance companies.

Subjective norms have been found to have a favorable impact and serve as the foundation for attitudes that in turn impact the desire to buy life insurance. On the other hand, the direct effect of subjective standards on purchase intention remains modest. According to Fishbein and Ajzen (1975), subjective norms are the expectations of significant others—friends, family, and coworkers—that influence people's felt social pressure to participate in or refrain from participating in particular behaviors. Attitudes are the bridge between subjective norms and purchase intention. Buyers often have to have positive attitudes toward the product, such as trust and need for financial security, before intending to buy, even when society supports them to do so. It can be concluded that customers' intention to purchase life insurance cannot be based solely on social recommendations and expectations. Therefore, insurance firms should focus on strategies that highlight product benefits, foster trust, and reinforce the financial role of the product. These factors can have a stronger impact on converting attitudes into purchase intentions than subjective norms.

**Limitations and Recommendations for Future Research**

The study has some weaknesses although it provides some useful information. Since this study focused only on Ho Chi Minh City, it is limited in its ability to apply the findings to other locations or cultures. The scope of the study could be increased by including different geographic and demographic contexts. Furthermore, the sample was predominantly young and female, which may have led to demographic bias. Future research should seek more equitable representation to confirm these findings. Furthermore, the study focused on a narrow set of characteristics, ignoring issues such as digital engagement, app usability, and cultural variations. Exploring these additional variables could provide a more complete picture of customer behavior. Researchers should extend previous findings and lead to the creation of stronger strategies to promote life insurance adoption in diverse markets.

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**APPENDIX**

This includes the survey's measuring questions for the suggested structures. Respondents were asked to rate their response on a Likert scale of 1 to 5, where 1 represented "strongly disagree" and 5 represented "strongly agree."

| Construct | Code | Measurement items | Sources |
|---|---|---|---|
| Subjective norms | SN1 | Most people who are important to me think I should purchase a life insurance policy | Han et al. (2010) |
| | SN2 | My friends who are important to me would want me to purchase a life insurance policy | |
| | SN3 | My colleagues/peers whose opinions I value would prefer that I purchase a life insurance policy | |
| Risk aversion motives | RAM1 | I do not feel comfortable about taking chances | Mandrik and Bao (2005) |
| | RAM2 | I prefer situations that have foreseeable outcomes | |
| | RAM3 | Before I make a decision, I like to be absolutely sure about how things will turn out | |
| | RAM4 | I avoid situations that have uncertain outcomes | |
| | RAM5 | I feel nervous when I have to make decisions in uncertain situations | |
| Financial literacy | FL1 | I understand the life insurance policy | Mahdzan and Victorian (2013); Hassan (2014) |
| | FL2 | I know about other financial products that might satisfy my financial needs | |
| | FL3 | I understand the financial phrases and symbols of life insurance policy | |
| Saving motives | SM1 | I save money for securing my retirement period | Mahdzan and Victorian (2013) |
| | SM2 | I save money for emergency purposes | |
| | SM3 | I save money because I want to ensure continuity of income upon my death | |
| | SM4 | I save money because I want to leave it as an inheritance | |
| Trustful Belief | T1 | Based on my belief about insurance, I think it is honest and trustworthy | Ajzen, I.B. (2002) |
| | T2 | Based on my belief about insurance, I think it cares about customers | |
| | T3 | Based on my belief about insurance, I think it is well regulated and trustful | |
| Perceived Product Benefits | PB1 | Insurance reduces or eliminates losses hidden in life's uncertainty | Ajzen, I.B. (2002) |
| | PB2 | Insurance provides stability for wealth planning | |
| | PB3 | Insurance serves as capital or wealth accumulation | |
| | PB4 | Insurance provides financial relief to society | |
| | PB5 | With the insurance policy, I obtain a sense of security | |
| | PB6 | The insurance policy assists me to plan my personal financial management | |
| Attitude | ATT1 | I have a positive opinion about life insurance | Marakarkandy et al. (2017); Alam et al. (2012) |
| | ATT2 | I like the life insurance policy because of the advantages it provides | |
| | ATT3 | I think life insurance is good for me | |
| | ATT4 | I think life insurance is beneficial to me | |
| Purchase intention | PI1 | Purchasing a life insurance policy will provide me future surety which I need most for my inheritance | Jahan & Sabbir (2018); Han et al. (2010) |
| | PI2 | I am willing to purchase a life insurance policy | |
| | PI3 | I plan to purchase a life insurance policy in the future | |
| | PI4 | I will make an effort to purchase a life insurance policy | |

# THE INFLUENCE OF GREEN INNOVATION ON THE PERFORMANCE OF SMALL AND MEDIUM ENTERPRISES IN VIETNAM

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**ABSTRACT**

Green innovation has emerged as a vital trend in the sustainable economic advancement of contemporary organizations. A growing number of enterprises are contemplating green innovation in their production, processes, and management to improve organizational performance and establish lasting competitive advantages. This study seeks to establish a research model for green innovation determinants within firms, encompassing green product innovation, green process innovation, and green management innovation. These elements are closely linked to enhancing operational performance, which includes financial, environmental, and operational metrics. The study also investigates the moderating influence of green image on the correlation between green product and process innovation and financial performance. Through a survey of 512 small and medium-sized enterprises (SMEs) in Vietnam and the application of regression analysis, Cronbach's Alpha testing, exploratory factor analysis, and the SEM model via SmartPLS, the authors present recommendations aimed at fostering investment and formulating policies that support green innovation to improve the operational efficiency of SMEs. The research underscores the necessity for governmental bodies to enhance guidance papers and create a regulatory framework for this trend, facilitating the sustainable development of SMEs in Vietnam while augmenting their financial, environmental, and operational performance.

*Keywords*: "Firm Performance", "Green Innovation", "Small and medium-sized enterprises", "Vietnam"

## I. INTRODUCTION

Environmental pollution is escalating in severity and has emerged as a critical concern globally, particularly for Vietnam, especially in light of its industrialization and modernization objectives. The problem necessitates that the government implement suitable steps to comprehensively address it within the framework of the global shift towards prioritizing sustainable development and green innovation. The advancement of the economy in conjunction with environmental conservation has consistently been highlighted; notably, the European Union has introduced an initiative known as the "Carbon Border Adjustment Mechanism" (CBAM). The CBAM mechanism, as reported by the European Commission, the WTO, and the Vietnam Chamber of Commerce and Industry, serves as a tool to promote clean industry and mitigate environmental emissions by levying a carbon tax on all goods imported into European Union (EU) markets, contingent upon the greenhouse gas emission intensity during production in the exporting country.

According to the Vietnam Energy Sector Vision Report from March 2023, our country has the most rapidly increasing greenhouse gas (GHG) emissions in the Greater Mekong Subregion, projected to reach 1,495.4 million tons of CO2 by 2050. Furthermore, the Global Climate Risk Index 2020 research by Greenwatch indicates that from 2016 to 2020, our nation placed 6th among countries most adversely impacted by climate change, with anticipated damages amounting to 0.5% of GDP. The government, cognizant of the urgent situation and its crucial role in fostering economic growth, enhancing competitiveness, and diminishing reliance on polluting fuel sources via green innovation in sustainable development, has proposed policies and strategies for sustainable national development. Nonetheless, given the magnitude of enterprises, the aggregate number of businesses involved in innovative endeavors remains comparatively limited, suggesting that to attain the overarching objective of sustainable development and enhance operational efficiency concerning environmental, financial, and operational aspects, there are persistent challenges and barriers that must be promptly addressed and executed by businesses. A comprehensive array of studies on green innovation has been undertaken globally to elucidate the precise definition of green innovation, its effects on business operational efficiency, and to present the latest data regarding the implementation of green innovation in companies worldwide. Nevertheless, there remains a paucity of research on small and medium-sized organizations, and the

available studies exhibit several shortcomings, including small sample sizes, with some failing to offer strategies for enhancing corporate efficiency. In Vietnam, certain studies have examined industries to elucidate the present status of green innovation implementation in enterprises, the motivators prompting businesses to embrace innovation, and the effects of green innovation on the financial and environmental performance of each enterprise within specific sectors. Nonetheless, the quantity of research concerning the present state of green innovation implementation and its influence on the environmental performance of small and medium-sized enterprises (SMEs) remains significantly restricted and has not thoroughly examined the specific effects of green innovation on diverse facets of enterprises, particularly regarding environmental performance. The study seeks to examine the present circumstances and recommend pragmatic ways to enhance green innovation, thereby improving the environmental performance of small and medium-sized firms.

## II. LITERATURE REVIEW AND THEORETICAL FRAMEWORKS

### 2.1. Green innovation

Green innovation originated in the late 1990s, advocating a transition from traditional industrial technologies to novel processes and products that adhere to environmental standards, with the objective of achieving sustainable development (Cleff & Rennings, 1999; OECD, 2009). This term is frequently delineated in two dimensions: the organization's competencies and ecological initiatives, with this study selecting the latter dimension for consideration. Green innovation denotes environmental initiatives designed to enhance corporate efficiency (Chen et al., 2006; Gluch et al., 2009; Lin et al., 2009). Green innovation enhances product value, conserves energy, reduces expenses, and elevates the company's reputation. Terms like ecological innovation and sustainability might substitute for green innovation to denote efforts to mitigate environmental impact (Schiederig et al., 2011). Moreover, it improves resource efficiency, diminishes pollution, and strengthens long-term competitive advantage (Porter & Van der Linde, 1995; OECD, 2009). Academically, green innovation is categorized into three primary types: product, process, and green management (Chen et al., 2006; Chen, 2008).

#### Green products

Notion Green product innovation pertains to the enhancement of products concerning environmental concerns, including energy conservation, pollution mitigation, and waste recycling, hence increasing product value (Chen et al., 2006). This enables enterprises to manage pollution at its origin and improve their social standing (Hu et al., 2017; Guo et al., 2017). Green product innovation is assessed through three primary dimensions: environmental impact, materials, energy consumption, and pollution, influencing the full product lifecycle from manufacture to disposal. Quantification Green product innovation can be realized by selecting low-pollution materials, incorporating energy-saving features, and ensuring the product's recyclability (Chen et al., 2006). The utilization of sustainable materials and recycling in production mitigates resource and environmental effect (Ljungberg, 2007). Recycling decreases waste while also providing economic and societal advantages (D'Ambrieres, 2019).

#### *G*reen Process

Concept Green process innovation refers to the use of novel production methods that mitigate environmental pollution and enhance energy and resource efficiency (Ma et al., 2019; Kivimaa and Kautto, 2010). This technique entails pollution management with specialized technology and equipment, while adhering to environmental standards (Mantovani et al., 2017). Implementing sustainable procedures enables firms to minimize waste, enhance energy efficiency, and attain competitive cost and market benefits (Chiou et al., 2011). Quantification Green process innovation encompasses elements such as emission reduction, ecological efficiency, and circularity (Sharma & Henriques, 2005; Chen, 2007). Businesses must enhance production processes to minimize waste at the source, optimize resource use, and augment recycling capabilities, consequently diminishing environmental effect and production expenses (Hart, 1995; Gladwin et al., 1995).

#### Green management

Management innovation (MI), often referred to as administrative or organizational innovation, largely emphasizes alterations in managerial practices and has not been thoroughly investigated (Naveh et al., 2006; Alange et al., 1998; Armbruster et al., 2008). Management innovation encompasses two primary perspectives: the rational perspective, grounded in economic theory and focused on improving business efficiency (Sturdy, 2004), and the social approach,

motivated by societal pressure to attain repute and legitimacy (Birkinshaw et al., 2008). Green management innovation refers to the implementation of novel environmental management strategies aimed at reducing adverse effects on the environment (Qi et al., 2010; Ma et al., 2018).

The assessment of green management innovation presently lacks a defined quantitative scale. Studies have suggested measurement based on elements like environmental management methodologies, advanced energy management, knowledge management, and product-service innovation to fulfill environmental requirements (Cramer, 1998; Roy et al., 2020; Ooi, 2014). The implementation phase is the most discernible aspect of the intricate process of green management innovation (Birkinshaw et al., 2008).

### 2.2. Firm performance

#### Financial performance

Financial performance indicates a company's capacity to transform assets into revenue via primary business activities. Net profit serves as a crucial metric that aids analysts in making investment decisions (Jao et al, 2020). Financial performance and green innovation initiatives are interrelated, as green innovation can enhance profitability by minimizing expenses and circumventing environmental rules (Wang et al., 2021; Ki-Hoon Lee et al., 2015). Nonetheless, the financial outcomes of green innovation may require time to manifest (Aguilera-Caracuel & Ortiz-deMandojana, 2013). This study used return on assets (ROA) to evaluate financial performance, owing to its stability and reliability, particularly in various circumstances.

#### Operational performance

Operational performance reflects the strategic aspects that a firm uses to compete, including quality, delivery, flexibility, and cost, to improve production efficiency and create high-quality products, thereby increasing sales and profits (Narasimhan & Das, 2001; Ho et al., 2002; Ward et al., 1998). This study uses the scale of Croteau and Bergeron (2001) and Kearns & Sabherwal (2006) to evaluate operational efficiency, with five main criteria such as: sales growth, market share growth, return on investment, net profit, and financial liquidity compared to competitors.

#### Environmental performance

Environmental performance denotes a company's capacity to mitigate waste and adverse environmental effects, encompassing the reduction of emissions, solid waste, and the use of hazardous materials (Zhu et al., 2008; Claver et al., 2007). This can be accomplished by utilizing recycled materials, enhancing energy efficiency, and minimizing pollution (Lindell et al., 2007). Management strategies, including pollution avoidance and resource conservation, have demonstrated efficacy (Sarkis et al., 2001). The research employs methodologies including Life Cycle Assessment (LCA), Multi-Criteria Analysis (MCA), and the Environmental Performance Index (EPI) to assess the ecological impact of enterprises, each method possessing distinct merits and drawbacks, ranging from the thoroughness of LCA to the lucidity of EPI (Guine´e JB, 2001; Zopounidis et al., 2002; Jasch C, 2000).

### 2.3. Hypotheses

#### 2.3.1. Relationship between Proactive Green Innovation and Green Product Innovation

Product development plays an important role for companies in emerging or common markets (Calantone et al., 1995), especially in shaping brand image and diversifying in a rapidly changing environment (Brown et al., 1995). Krishnan and Ulrich (2001) emphasize that product development is the process of converting market opportunities into products or services that meet the needs of consumers and stakeholders. However, integrating environmental issues into product development is challenging, as Loureiro et al. (2002) point out that not all consumers are willing to pay a premium for environmentally friendly products. Chen (2001) argues that green product development is necessary to reduce environmental burden through design and innovation. To be successful, companies need to focus on environmentally friendly products and services, responding to the growing awareness of consumers about environmental protection (Cronin et al., 2011). Therefore, we assume that proactive green innovation is positively related to green product development performance and imply the following hypothesis:

*H1: Proactive green innovation has a positive impact on Green Product Innovation*

#### 2.3.2. Relationship between Reactive Green Innovation and Green Product Innovation

According to Ayag (2005), product development is an important factor that helps businesses connect with the market and achieve success. To compete, businesses must strategically manage product development activities, otherwise they will face risks and losses in the future (Fitzsimmons et al., 1991). Developing green products, whether differentiated or low-cost, provides an important competitive advantage, attracting environmentally conscious customers (Orsato et al., 2006). Lumpkin and Dess (1996) emphasize that reactive innovation misses the opportunity to lead, while reactive innovation is a timely response to competition. Reactive green innovation meets the requirements of customers and governments, helping businesses adjust to and overcome adverse environments. Based on the above analysis, we argue that reactive green innovation is related to green product development performance. Our research hypothesis is as follows:

*H2: Reactive green innovation has a negative impact on Green Product Innovation*

**2.3.3. The Relationship Between Green Human Capital and Green Product Innovation**

Green human capital helps companies accept risks and uncertainties in the green product innovation process. Flexible, risk-taking employees play an important role in generating new ideas and promoting innovation (Madsen and Ulhøi, 2005; Chen et al., 2006). Therefore, developing green human capital is the key to improving green product innovation performance (Chen and Huang, 2009). Therefore, this study assumes that green human capital has a positive impact on green product innovation performance and puts forward the following hypothesis:

*H3: Green human capital has a positive impact on green product innovation performance*

**2.3.4. The Relationship between Green Human Capital and Green Process Innovation**

Green human capital includes employees' knowledge, skills, abilities, and commitment to environmental protection (Chen, 2008b). Human capital is a core factor that drives organizational innovation, as employees' skills and expertise encourage creativity. Human resources also have a strong influence on high-tech projects (Hayton, 2005) and are an important factor in strategic innovation (Bontis et al., 2000). Green human capital, with its diverse knowledge and skills, helps companies develop sustainable competitive advantages and innovate effectively (Coff and Raffiee, 2015). Employees with environmental expertise can improve processes and reduce waste, thereby improving the effectiveness of green process innovation (Russo and Fouts, 1997). Therefore, this study highlights the role of green human capital in business process innovation. Therefore, the research team considers the green human capital factor in the process of business process innovation

*H4: Green human capital has a positive impact on green process innovation.*

**2.3.5. The Relationship between Green Relational Capital and Green Process Innovation**

Strategic relationships, including alliances with customers and suppliers, help firms achieve desired innovation performance (Badir and O'Connor, 2015; Capello and Faggian, 2005). Close relationships with customers provide diverse perspectives and experiences, which promote product and process innovation (Bonner and Walker, 2004; Wimalachandra et al., 2014a/b). At the same time, relationships with suppliers allow firms to leverage resources to improve innovation performance (Walter, 2003). Alliance partners facilitate knowledge sharing and application to enhance innovation performance (Wu et al., 2007). By building relationships on a green basis, companies can promote green production and process innovation, while reducing waste and energy consumption (Borin et al., 2013; Chiou et al., 2011; Sharma and Vredenburg, 1998; Wu, 2013). Therefore, the research team proposes the following hypothesis:

*H5: Green relational capital has a positive relationship with Green process innovation*

**2.3.6. Relationship between Green Organizational Capital and Green Process Innovation**

Organizational capital includes institutionalized knowledge and experience, embedded in the structure and management system of the company, affecting the ability to innovate (Delgado-Verde et al., 2011). Factors such as organizational structure and culture help improve innovation performance (Aramburu and Saenz, 2011). Implementing an environmental management system such as ISO 14001 can promote environmental performance through organizational behavior (Paille et al., 2014). Continuous investment in environmental protection and sharing of best practices help companies improve green processes and reduce emissions (Albort-Morant et al., 2018). Furthermore, sharing of results and best practices across units also helps improve green process innovation performance (Lanoie et

al., 2011). Therefore, we propose the following hypothesis:

*H6: Green organizational capital has a positive relationship with green process innovation.*

**2.3.7. Relationship between Green Transformational Leadership and Green Management Innovation**

Transformational leadership consists of four dimensions: intellectual stimulation, individual consideration, charisma, and inspirational motivation (Bass, 1985). Intellectual stimulation helps followers develop creative cognitive processes (Reiter-Palmon and Illies, 2004). Individual consideration allows leaders to recognize the needs of their followers and advise them, thereby promoting creativity in the group (Gong et al., 2009). Charismatic leadership provides a clear vision, energizes, and creates a creative environment (Avolio et al., 1999). Inspirational motivation stimulates enthusiasm and encourages followers to express their ideas, supporting creative thinking (Gong et al., 2009). These behaviors enhance creativity and innovation in the workplace by providing employees with a shared vision and autonomy (Henker et al., 2015; Garcia-Morales et al., 2012). Based on the above theories, our research team proposes the following hypothesis:

*H7: Green transformational leadership has a positive relationship with green management innovation.*

**2.3.8. Relationship between Green Training and Green Management Innovation**

Green training is an important part of green human resource management, where green leaders organize workshops and seminars to improve their subordinates' knowledge of green management. These activities can take place online to save energy and costs, including training on waste management, recycling, energy efficiency and safety, using online modules instead of printed materials (Chiou et al., 2011). Green management innovation is considered to have a positive impact on the environment, and innovation activities often originate from the top management level, with the environmental management system serving as an environmental audit tool for senior management. The research team proposes the following research hypothesis:

*H8: Green training has a positive relationship with Green Management Innovation*

**2.3.9. The Relationship between Green Innovation and Performance**

Green product innovation and financial performance.

Green product innovation focuses on improving the design of existing products or creating new products using renewable and non-toxic materials, to reduce environmental impacts and improve energy efficiency (Zhang et al., 2019). This innovation not only helps reduce environmental impacts throughout the product life cycle (Christensen, 2011) but also meets consumers' sustainability needs, thereby increasing sales and brand recognition (Cheng et al., 2014). In recent years, green product innovation has been considered an important factor for environmental sustainability (Dangelico & Pujari, 2010) and helps firms avoid environmental protests and open up new market opportunities (Chiou et al., 2011). It also enhances green capabilities, strengthens the firm's green image, and improves financial performance (Ar, 2012; Ilker Murat Ar et al., 2012). Xuemei Xie and team (2019) found that green product innovation has a mediating role between green process innovation and financial performance, with green image moderating this relationship. Although some of the moderating effects of green subsidies have not been demonstrated, green product innovation investment (GPdI) has been found to have a positive impact on firm performance (Wong, 2012; Ar, 2012; Ashraf, 2021). Based on previous studies, we focus first and foremost on the causal relationship between green product innovation and financial performance in Vietnamese firms.

*H9a: A firm's green product innovation is positively related to its financial performance.*

*Green process innovation and financial performance.*

Green process innovation, although requiring more internal resources and higher costs, has been shown to outperform other green practices (Gopalakrishnan, Bierly, & Kessler, 1999). This innovation may include adding a solution such as a chimney scrubber or integrating it into the production process through input substitution, production optimization, and output recovery (Rennings, 2000). Previous research has shown that green process innovation positively affects the competitive advantage and sustainability of enterprises (Chen et al., 2006; Cheng et al., 2014; Sezen & Çankaya, 2013), making investment in green process innovation make business sense (Li et al., 2017). Specifically, green process innovation not only improves the existing production process but also adds new processes to reduce negative environmental impacts and enhance environmental compliance, thereby creating a differentiation

advantage for the company (Cheng et al., 2014). In addition, Xie et al. (2016) suggested that clean technology and end-of-pipe technology are important elements of green process innovation that are positively related to financial performance. Therefore, we hypothesize:

*H10a: A firm's green process innovation is positively related to its financial performance.*

*Green management innovation and financial performance*

Green management innovation aims to improve production processes through the adoption of new management structures, systems, and strategies (Li et al., 2018). Green innovation can be divided into two types: green technological innovation and non-green technological innovation (Evangelista & Vezzani, 2010), and this can improve the financial performance of the firm (Ashraf et al., 2021). Although technological innovation has been widely studied, the literature on non-technological innovation is limited (Li et al., 2018). Innovation positively affects the competitive advantage and performance of enterprises (Azadegan & Dooley, 2010; Kim & Chai, 2017; Ojha et al., 2016). Green and smart ideas proposed by management can enhance brand value and revenue, thereby improving corporate performance (Somjai et al., 2020). Green management innovation not only brings economic benefits but also reduces negative environmental impacts through the adoption of new management systems and improved production processes (Qi et al., 2010).

*H11a: Green management innovation is positively correlated with corporate financial performance.*

*The Relationship between Green Innovation and Environmental Performance*

Environmental performance is considered from many aspects, including management indicators such as water quality, pollutant emissions, solid waste production, and noise, reflecting the environmental legitimacy of enterprises (Boons and Wagner, 2009; Dong et al., 2014). Green process innovation and green product innovation are two parts of green technology innovation, which are positively correlated with environmental performance (Huang and Li, 2017; Du et al., 2019; Mahto et al., 2020). These activities not only minimize negative environmental impacts but also optimize resources and reduce costs, thereby improving financial and social performance (Weng et al., 2015). In addition, linking management activities with the natural environment, such as total environmental quality management and environmental management systems, also contributes to improving the environmental performance of enterprises (Ma et al., 2018; Inoue et al., 2013). Energy management tools can help identify the potential for eco-efficiency and implement measures to improve environmental performance and reduce energy costs (Schaltegger and Synnestvedt, 2002; Fernando and Hor, 2017). Therefore, the research team decided to divide green innovation into green product innovation, green process innovation, and green management innovation. In this paper, the research team will study this issue in more detail to clarify the influence of green innovation factors on the environmental performance of enterprises. From there, the research team proposed the following hypotheses:

*H9b: Green product innovation has a positive relationship with environmental performance.*

*H10b: Green process innovation has a positive relationship with environmental performance.*

*H11b: Green management innovation has a positive relationship with environmental performance.*

*Relationship between Green Innovation and Operational Performance*

Green innovation is an important driver for businesses to improve their performance by addressing environmental issues such as reducing environmental impacts, waste and CO2, while enhancing productivity, reputation and competitiveness (Pujari, 2006; Mu et al., 2009; Porter, 1995). Operational performance is measured through factors such as cost, production cycle time, reliability and product quality (Huckman et al., 2008). Xue et al. (2019) emphasized that integrating a green talent workforce with quality management plans and pollution prevention strategies can improve a company's operational performance. Stakeholders evaluate green operational performance based on many components, including competition, market dynamics, product quality, cost, and customer satisfaction (Zhu et al., 2008). Based on the above literature and opinions, the research team proposes the following hypothesis:

*H9c: Green product innovation has a positive impact on operational performance.*

*H10c: Green process innovation has a positive impact on operational performance.*

*H11c: Green management innovation has a positive impact on operational performance*.

**2.3.10. The Moderating Role of Green Image**

A company's image, including positive environmental impressions or greenness, has a significant impact on consumer and stakeholder satisfaction (AmoresSalvadó, Martín-de Castro, & Navas-López, 2014). Companies that invest in improving their green image can avoid trouble from environmental protests and increase consumers' expectations of environmental friendliness (Chen, 2010). Although many companies in China have made efforts to position themselves as "green," adequate promotion of green product innovation is necessary to receive positive market feedback (AmoresSalvadó et al., 2014). However, consumer pressure and expectations can lead to success (Lin, Zeng et al., 2014), while higher prices for green products can reduce market performance (Rehfeld et al., 2007; Dangelico and Pujari, 2010). Corporate image can increase consumer trust and influence purchase decisions (Chang & Fong, 2010), thereby improving brand loyalty and financial performance (Zhu & Sarkis, 2004). Similarly, when a company implements green process innovation, promoting a green image will help reduce production costs, attract customers, and increase sales, thereby improving financial performance (Chen, 2008).

From there, the research team leads to the following two hypotheses:

*H12a: Green image has a moderating effect on the relationship between green product innovation and financial performance of the company.*

*H12b: Green image has a moderating effect on the relationship between green process innovation and financial performance of the company.*

**2.4. Research method**

The authors conducted quantitative research to evaluate the reliability of the scale using Cronbach's Alpha reliability coefficient to eliminate inappropriate observations based on SPSS software techniques, then tested the value of the scale using the EFA exploratory factor analysis method.

The research hypotheses were then tested and the influence of the mediating variables and independent variables on the dependent variable was assessed by performing SEM linear structural model analysis through the SmartPLS program.

The size of the research sample depends on many different factors such as the required reliability, processing method... To use EFA, a large sample size is required, usually determined based on the minimum size and the number of measured variables included in the analysis (Nguyen, 2013). Hair et al. (1998) estimated that the number of samples needed is 5 times the number of variables. In this study, the sample size was chosen so that the linear structural model is meaningful. There are a total of 69 variables that need to be factor analyzed, so the smallest sample size needed is: 69x5 = 365 observations.

The authors expect the number of research samples to be 553 survey forms to ensure the reliability of the research results. This number of samples is suitable for the requirements as the studies presented above.

Sampling method: Using appropriate sampling methods. The survey was conducted across the three regions of North, Central and South, the survey subjects were small and medium-sized enterprises in Vietnam participating in green innovation, so the authors considered this a reasonable sampling method.

To suit the model and research objectives, the authors developed the scale according to the following steps: (1) Synthesis of related studies; (2) Qualitative research; (3) Preliminary quantitative research; (4) Finalizing the scale to conduct official quantitative research. Questionnaires are based on previously validated survey instruments from the literature.

**III. RESULT AND DISCUSSION**

**Construct reliability and validity**

Evaluating the reliability of the scale on SmartPLS through two main indexes: Cronbach's Alpha and Composite Reliability.

**Table 3.1: Construct reliability and validity**

| | Cronbach's alpha | Composite reliability (rho a) | Composite reliability (rho c) | Average variance extracted (AVE) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **EP** | 0.852 | 0.857 | 0.900 | 0.694 |
| **FP** | 0.953 | 0.954 | 0.970 | 0.915 |
| **GHC** | 0.910 | 0.911 | 0.937 | 0.787 |
| **GI** | 0.959 | 0.971 | 0.965 | 0.776 |
| **GL** | 0.912 | 0.917 | 0.932 | 0.695 |
| **GMI** | 0.927 | 0.928 | 0.945 | 0.775 |
| **GOC** | 0.879 | 0.889 | 0.908 | 0.621 |
| **GPcI** | 0.881 | 0.881 | 0.918 | 0.737 |
| **GPdI** | 0.913 | 0.915 | 0.935 | 0.742 |
| **GRC** | 0.924 | 0.928 | 0.943 | 0.768 |
| **GT** | 0.924 | 0.924 | 0.940 | 0.724 |
| **OP** | 0.919 | 0.928 | 0.940 | 0.758 |
| **PGI** | 0.891 | 0.891 | 0.924 | 0.753 |
| **RGI** | 0.924 | 0.927 | 0.946 | 0.813 |

All variables have high reliability and convergence when the Cronbach Alpha and Construct Reliability indexes are greater than 0.7

Author uses the average variance extracted index (AVE) to evaluate convergence on SmartPLS. All variables ensure convergence because they all have AVE indexes greater than 0.5.

*Discriminant validity*

The distinctiveness of a construct when compared to other constructs in the model is shown by its discriminant validity. Discriminant validity is guaranteed when the square root of the AVE for each latent variable is higher than all the correlations between the latent variables with each other (Fornell and Larcker, 1981). The Fornell and Larcker table results are as shown in Table 3.2 below. The number at the top of each column is the square root of the AVE (0.833; 0.956; 0.887; 0.881; 0.834; 0.880; 0.788; 0.858; 0.862; 0.876; 0.851; 0.871; 0.868; 0.902), and the number below is the correlation between the latent variables. We see that the square root of AVE > Correlation between latent variables (Fornell and Larcker, 1981), ensuring discrimination. With the HTMT index, according to Garson (2016), when the HTMT index is less than 1, the discrimination value between two latent variables is guaranteed when. Meanwhile, Clark and Watson (1995) and Kline (2015) use a more difficult standard threshold of 0.85. The group of authors prioritizes choosing the threshold of 0.85 in the evaluation.

**Table 3.2: Discriminant validity - Fornell and Larcker criterion**

| | **EP** | **FP** | **GHC** | **GI** | **GL** | **GMI** | **GOC** | **GPcI** | **GPdI** | **GRC** | **GT** | **OP** | **PGI** | **RGI** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EP** | 0.833 | | | | | | | | | | | | | |
| **FP** | 0.287 | 0.956 | | | | | | | | | | | | |
| **GHC** | 0.502 | 0.252 | 0.887 | | | | | | | | | | | |
| **GI** | 0.737 | 0.429 | 0.634 | 0.881 | | | | | | | | | | |
| **GL** | 0.603 | 0.328 | 0.494 | 0.754 | 0.834 | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GMI** | 0.548 | 0.491 | 0.539 | 0.711 | 0.577 | 0.880 | | | | | | | | |
| **GOC** | 0.477 | 0.238 | 0.476 | 0.616 | 0.619 | 0.436 | 0.788 | | | | | | | |
| **GPdI** | 0.579 | 0.346 | 0.390 | 0.567 | 0.456 | 0.483 | 0.392 | 0.858 | | | | | | |
| **GPcI** | 0.514 | 0.448 | 0.476 | 0.635 | 0.542 | 0.727 | 0.376 | 0.451 | 0.862 | | | | | |
| **GRC** | 0.525 | 0.263 | 0.449 | 0.672 | 0.657 | 0.525 | 0.588 | 0.472 | 0.452 | 0.876 | | | | |
| **GT** | 0.572 | 0.340 | 0.448 | 0.725 | 0.659 | 0.522 | 0.539 | 0.469 | 0.451 | 0.593 | 0.851 | | | |
| **OP** | 0.600 | 0.433 | 0.498 | 0.778 | 0.651 | 0.586 | 0.540 | 0.509 | 0.551 | 0.550 | 0.586 | 0.871 | | |
| **PGI** | 0.538 | 0.374 | 0.441 | 0.666 | 0.637 | 0.566 | 0.644 | 0.445 | 0.535 | 0.520 | 0.600 | 0.649 | 0.868 | |
| **RGI** | 0.528 | 0.326 | 0.458 | 0.682 | 0.639 | 0.518 | 0.674 | 0.463 | 0.496 | 0.590 | 0.596 | 0.616 | 0.635 | 0.902 |

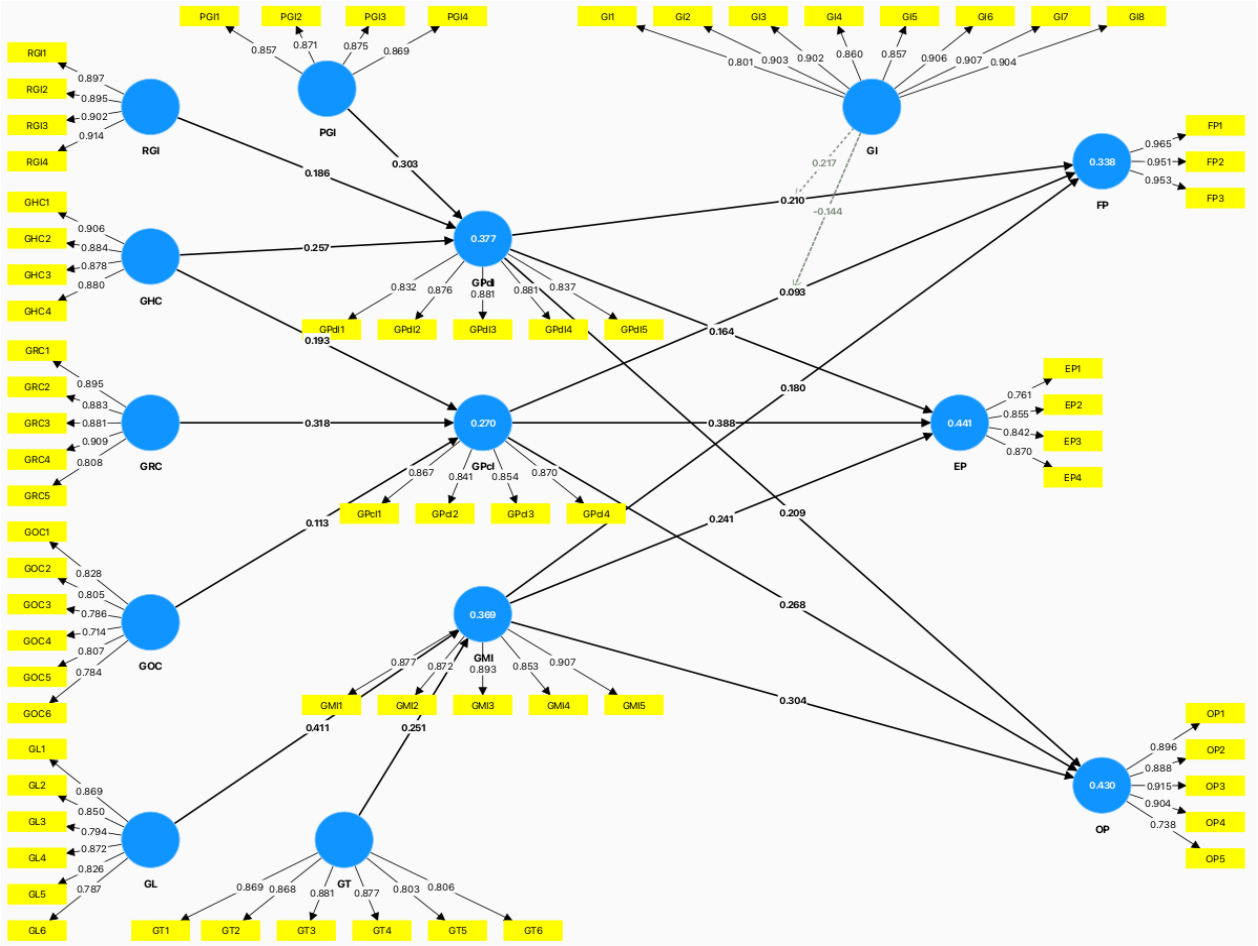



**Fig 3.1 – The result of research model**

**Table 3.3: Path coefficients – Mean, STDEV, T values, p values**

| | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values |
|---|---|---|---|---|---|
| **GHC -> GPcI** | 0.193 | 0.192 | 0.057 | 3.384 | 0.001 |
| **GHC -> GPdI** | 0.257 | 0.256 | 0.038 | 6.770 | 0.000 |
| **GI -> FP** | 0.140 | 0.148 | 0.061 | 2.279 | 0.023 |
| **GL -> GMI** | 0.411 | 0.413 | 0.063 | 6.557 | 0.000 |

| | | | | | |
|---|---|---|---|---|---|
| **GMI -> EP** | 0.241 | 0.242 | 0.050 | 4.818 | 0.000 |
| **GMI -> FP** | 0.180 | 0.174 | 0.072 | 2.509 | 0.012 |
| **GMI -> OP** | 0.304 | 0.306 | 0.047 | 6.474 | 0.000 |
| **GOC -> GPcI** | 0.113 | 0.116 | 0.054 | 2.099 | 0.036 |
| **GPcI -> EP** | 0.388 | 0.388 | 0.047 | 8.256 | 0.000 |
| **GPcI -> FP** | 0.093 | 0.091 | 0.044 | 2.108 | 0.035 |
| **GPcI -> OP** | 0.268 | 0.267 | 0.039 | 6.913 | 0.000 |
| **GPdI -> EP** | 0.164 | 0.165 | 0.063 | 2.587 | 0.010 |
| **GPdI -> FP** | 0.210 | 0.211 | 0.057 | 3.713 | 0.000 |
| **GPdI -> OP** | 0.209 | 0.209 | 0.053 | 3.978 | 0.000 |
| **GRC -> GPcI** | 0.318 | 0.318 | 0.058 | 3.978 | 0.000 |
| **GT -> GMI** | 0.251 | 0.251 | 0.066 | 3.784 | 0.000 |
| **PGI -> GPdI** | 0.303 | 0.305 | 0.063 | 4.791 | 0.000 |
| **RGI -> GPdI** | 0.186 | 0.186 | 0.072 | 2.585 | 0.010 |
| **GI x GPdI -> FP** | 0.217 | 0.218 | 0.032 | 6.705 | 0.000 |
| **GI x GPcI -> FP** | -0.144 | -0.143 | 0.037 | 3.935 | 0.000 |

All P Values of the interactions are < 0.05, so these interactions are statistically significant.

There are 3 variables that affect GPcI: GHC, GOC and GRC. The standardized impact coefficients of these 3 variables are 0.193, 0.113 and 0.318 respectively. In which all 3 variables have a positive impact with the order of strength on GPcI being GRC > GHC > GOC.

There are 3 variables that affect GPdI being GHC, PGI and RGI. The standardized impact coefficients of these 3 variables are 0.257, 0.303 and 0.186 respectively. In which all 3 variables have a positive impact with the order of strength on GPdI being PGI > GHC > RGI.

There are 6 variables that affect FP: GI, GMI, GPcI, GPdI, GI x GPdI and GI x GPcI. Of which, 5 variables have a positive impact. The standardized impact coefficients of these 5 variables are 0.140, 0.180, 0.093, 0.210, and 0.217, respectively. The order of impact of these 5 variables is GI x GPcI > GI x GPdI > GPdI > GMI > GI > GPcI. In addition, there is 1 variable that has a negative impact, GI x GPcI, with O = -0.144.

There are 2 variables that affect GMI: GL and GT. The standardized impact coefficients of these 2 variables are 0.411 and 0.251, respectively. Of which, both variables have a positive impact with the order of strength: GL > GT.

There are 3 variables that affect EP: GMI, GPcI and GPdI. The standardized impact coefficients of these 3 variables are 0.241, 0.388 and 0.164 respectively. In which all 3 variables have a positive impact in the order of strong and weak on GPcI > GMI > GPdI. There are 3 variables that affect OP: GMI, GPcI and GPdI. The standardized impact coefficients of these 3 variables are 0.304, 0.268 and 0.209 respectively. In which all 3 variables have a positive impact in the order of strong and weak on GMI > GPcI > GPdI.

## IV. CONCLUSION

To improve operational efficiency, small and medium-sized firms in Vietnam must concentrate on all facets of green innovation, encompassing product-related aspects, processes, and management capabilities aimed at sustainable and long-term growth objectives.

Initially, the environmental consciousness of enterprises will be pivotal in the green product invention process.

Consequently, organizations must improve collaboration and knowledge exchange with partners and industry communities. Fostering a collaborative and knowledge-sharing environment among enterprises, non-governmental organizations, and communities will facilitate the advancement of green product creation. Consequently, enterprises can cooperate to investigate and devise novel solutions, exchange insights and expertise about eco-friendly production methods, and aid in establishing green product innovation initiatives to foster the industry's sustainable development. Ultimately, small and medium-sized firms in Vietnam must commence investment in, research on, and development of green technologies. By creating and implementing green technology in the production process, firms can augment green product innovation, thereby enhancing environmental performance. Furthermore, new technology like high-efficiency machinery, water recycling systems, and clean production processes can reduce waste and mitigate adverse environmental effects. This entails minimizing production expenses, augmenting competitiveness, and satisfying global market requirements for sustainable products.

Secondly, to execute green process innovation, small and medium-sized firms in Vietnam must prioritize the optimization of production processes and the management of raw resources. Companies can accomplish this by refining and enhancing production methods, as well as successfully overseeing and managing raw material sources. Businesses can eliminate waste, decrease wastefulness, enhance production efficiency, and strengthen environmental protection capabilities. To facilitate the precise implementation of green process innovations, small and medium-sized enterprises in Vietnam should pursue certification and adhere to environmental standards such as ISO 14001 (Environmental Management System) or industry benchmarks like the Higg Index. This not only guarantees that the production process is conducted responsibly but also fosters trust and confidence among clients in the product.

Thirdly, about green management innovation, enterprises must elevate awareness and commitment from the top tier. The dedication to implementing green innovation at the leadership level is a crucial component influencing the success of green management innovation. Consequently, to foster green management innovation, organizations must cultivate a workplace that stimulates creativity and solicits contributions from all tiers of personnel. Leadership support and respect will facilitate the adoption of green management innovation strategies and enhance the environmental performance of the organization. Furthermore, small and medium-sized firms in Vietnam must invest in the training and development of their personnel. Green management innovation necessitates comprehension and expertise from all personnel within the organization. To do this, firms must spend in staff training and development while imparting green management principles and techniques to their workforce. Establishing a learning environment and fostering knowledge exchange will enable firms to ensure that their staff comprehend green management and can implement this information in their everyday tasks.

Fourth, to advance green training within enterprises to improve environmental performance, firms should prioritize the development of tailored green training programs that address the workforce's need for education on green innovation. The United Nations in Vietnam projects that by 2030, green innovation would generate 8.4 million new employment opportunities for youth. According to Ms. Pauline Tamesis, the UN Resident Coordinator in Vietnam, the country has not yet fulfilled the growing demand for green talents. By 2030, 60% of youth may be deficient in the requisite skills to succeed in the green economy. Consequently, the proactive development, design, and delivery of tailored green training programs by enterprises will address the workforce's knowledge deficit concerning green innovation and expedite its implementation, thus enhancing environmental performance.

Fifth, to augment the green capability of small and medium-sized firms in Vietnam and boost environmental performance, it is essential to bolster training and skill development for personnel, particularly in the realm of green innovation. A report from the Ministry of Industry and Trade of Vietnam in early 2022 indicates that over 75% of industrial workers are either untrained or have undergone training for less than three months. The predominant workforce in this sector consists of unskilled laborers engaged in product processing, whereas stages necessitating specialized expertise, such as dyeing, fabric finishing, or product design, remain insufficiently staffed. Consequently, businesses, as the primary agents actively engaged in the advancement of a green industry, must augment training and skill development for employees in green innovation to equip them with the essential knowledge and tools to facilitate the green transition within the organization. The training program must explicitly delineate the challenges and opportunities, the technical environmental regulations, technology, and the reorganization of production and business

frameworks to fulfill the mandates of efficiency and minimal emissions that contribute to pollution, environmental degradation, and the economical and efficient utilization of resources. It may concentrate on domains such as clean production technology, the utilization of recycled materials, waste management and reduction, as well as energy and resource conservation methods.

Sixth, small and medium-sized firms in Vietnam must boost their management of green customer and supplier relationships to improve their green relationship capital. Nielsen Vietnam's 2023 study indicates that 72% of Vietnamese consumers have confidence in brands dedicated to environmental sustainability. Consequently, establishing an eco-friendly business environment is both an ethical imperative and a crucial strategic element for client attraction and retention. To accomplish this, enterprises must invest in cultivating and sustaining environmentally friendly partnerships with clients and suppliers. This may involve formulating environmentally sustainable customer and supplier relationship rules and processes, alongside educating personnel on the company's ecological principles and commitments. Simultaneously, instituting systems to assess and oversee the efficacy of green relationship management initiatives is a crucial measure to guarantee the continuity and durability of this strategy.

Seventh, to sustain and enhance green organizational capital, organizations must implement green technology in their production processes, such as utilizing recycled materials, employing eco-friendly dyes, and adopting energy-efficient technologies. These technologies assist enterprises in reducing environmental impact, improving manufacturing efficiency, and conserving expenses. Faslink Fashion Connection Joint Stock Company has been a pioneer in the utilization of sustainable materials since 2008. The remarkable attributes of the materials utilized by Faslink include their natural provenance, eco-friendliness, safety for human health, ease of processing in fashion production, and their capacity for natural decomposition over time. Faslink prioritizes the utilization of eco-friendly resources while also promoting sustainable production practices, operational methods, and commercial strategies, ultimately aiming to establish a novel industrial framework that integrates green materials with advanced technology. Furthermore, enterprises ought to formulate plans to cultivate a sustainable organizational culture, enhance employee understanding regarding environmental conservation, and coordinate collective ecological initiatives such as afforestation and energy efficiency efforts.

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# FACTORS AFFECTING GREEN INNOVATION ADOPTION IN SMALL AND MEDIUM ENTERPRISES IN THANH HOA PROVINCE, VIETNAM

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**ABSTRACT**

Environmental and social concerns have made green innovation a global trend, especially in developed countries. However, small and medium enterprises (SMEs) are still a significant source of pollution. This paper studies the determinants of green innovation adoption in 389 SMEs in 5 manufacturing sectors in industrial parks in Thanh Hoa province, using a 5-level Likert questionnaire and analyzed by Smart PLS4 software. The results of the study show that Technological factors, including Complexity of green innovation, have the strongest negative impact, while compatibility and relative benefits have positive impacts. Organizational factors, including Organizational support and human resource quality, have significant positive impacts. Environmental factors, including legal pressure and customers, have positive impacts, while environmental uncertainty and government support have no impact. The study provides important basis for managers and policy makers to promote green activities in SMEs.

*Keywords:* "Environment", "Green innovation", "Organization", "SMEs", "Technology".

## I. INTRODUCTION

Environmental degradation is a serious threat to natural ecosystems and sustainable economic growth. It directly affects the performance of manufacturing enterprises (Tseng et al., 2019; Tseng et al., 2013). In response, governments and enterprises have begun to integrate sustainable production processes and methods into their business operations (Huang et al., 2022).

Small and medium-sized enterprises (SMEs), considered the backbone of the economy, play an important role in creating jobs and promoting innovation (Muangmee et al., 2021). However, SMEs are also a major source of industrial pollution, accounting for more than two-thirds of total pollution due to their low attention to environmental protection. In developing countries, SMEs often apply conventional production methods (CPM), which are harmful to environmental health due to the lack of conservation and protection measures (Albort-Morant et al., 2017; Anazonwu et al., 2019). Rapid industrial development has brought about environmental problems such as waste disposal, resource shortages, carbon emissions, and climate change (Asiaei et al., 2022). These challenges require businesses to adopt advanced technology and green practices, combined with social responsibility to achieve sustainability. Current global management policies increasingly emphasize sustainability, especially in large manufacturing companies (Ha, 2022). In this context, SMEs are becoming the focus, with stakeholders pushing for environmental performance analysis and green operational orientation (Nyahuna & Doorasamy, 2022).

Green innovation brings great value to SMEs, helping to improve environmental performance and reduce pollution, while maintaining profitability and social responsibility (Alsmadi & Alzoubi, 2022). SMEs need to proactively improve productivity and competitiveness through green technologies and processes (Voza et al., 2022). The difference between successful and unsuccessful SMEs lies in the adoption of sustainable initiatives (Idris & Mohamad, 2017).

In Vietnam, SMEs account for 99.4% of the total number of enterprises, contribute 40% of GDP and create jobs for 60% of the workforce, becoming an important force in economic development and environmental protection. Understanding the factors affecting the adoption of green innovation by SMEs will support policy makers in developing solutions to promote sustainable economic growth (Lutf et al., 2023). However, SME social responsibility initiatives have not received due attention from researchers and stakeholders (Singh, 2022).

To promote green innovation, it is necessary to fully measure these activities to help managers identify drivers, barriers and establish appropriate policies. This will not only raise environmental awareness in enterprises but also improve business performance. The current study focuses on identifying factors affecting the adoption of green

innovation by SMEs in Thanh Hoa, in order to propose policies to promote sustainable development and more effective environmental protection.

## II. LITERATURE REVIEW

### 2.1 Green innovation

Innovation is the process of introducing new activities in a company, including products, processes, services, and policies to improve efficiency and productivity. Green innovation, a branch of innovation, focuses on reducing negative environmental impacts through improvements in technology, production processes, and management methods (Kemp, 2010). Green innovation is often synonymous with terms such as eco-innovation or environmental innovation, emphasizing the use of environmentally friendly raw materials, eco-design, and emission reduction.

Henriques and Sadorsky (2007) classify green innovation into two groups: administrative innovation, which deals with management and policies, and technical innovation, which involves improving processes and technologies to reduce environmental costs. Green products and processes not only reduce pollution but also improve sustainable performance throughout the entire product life cycle (Tseng et al., 2013).

### 2.2. Impact of Technology Factors (TF) on Green Innovation Adoption

The advancement of science and technology offers convenience but also leads to challenges like environmental damage, climate change, and resource depletion. Green innovation (GI) has emerged as a global solution, leveraging advanced technology to reduce pollution, protect the environment, and optimize resources (Zhao et al., 2022). While technology modernizes life, it also addresses climate change, waste management, and food security (Mai & Phuong, 2021). SMEs, known for their adaptability, have adopted GI initiatives under stakeholder pressure (Aboelmaged & Hashem, 2019). However, studies on technological factors in GI adoption remain limited, despite the significant influence of complexity, compatibility, and relative advantage on decisions (Lin & Ho, 2011).

**Perceived green innovation's complexity**

Complexity is the extent to which a technical innovation is perceived as difficult to understand and use, thereby hindering knowledge transfer and diffusion of the innovation (Rogers, 2003). Green innovation, which combines both tacit and explicit knowledge, often increases ambiguity, creating barriers to innovation transfer within an organization. When complexity is high, especially for technologies that require a lot of tacit knowledge, learning and knowledge sharing are difficult, negatively affecting organizational performance and environmental management effectiveness (Ho & Lin, 2012). Green activities are also often complex due to the need to change many processes (Mohd Rizaimy et al., 2018), leading to difficulties in adopting new initiatives. Conversely, if the green innovation adoption process is simple and easy to implement, implementation will be smoother. Therefore, it can be predicted that perceived complexity has a negative impact on the likelihood of adopting green innovations in SMEs. Therefore, the following hypothesis is proposed:

*H1: The complexity of a green innovation is negatively related to the adoption of green innovations in SMEs.*

**Perceived green innovation's compatibility**

Compatibility is the degree to which an innovation fits with the values, experience, and needs of the firm, which reduces resistance to adopting a new technology (Rogers, 2003). The integration of a green innovation into existing technology is a process of knowledge accumulation, in which compatible innovations are more easily adopted (Etzion, 2007). High compatibility not only facilitates the integration of green innovations but also increases environmental performance (Ho & Lin, 2012). The fit between prior experience and environmental protection measures promotes employees' perception of the benefits of green innovations, which in turn encourages the adoption of new technologies. Therefore, green innovations that fit with existing technologies and processes are positively related to their adoption, especially in SMEs. Therefore, the following hypothesis is proposed:

*H2: The degree of compatibility of green innovations is positively related to the adoption of green innovations in SMEs.*

**Perceived green innovation's relative advantage**

Relative advantage is the extent to which an innovation is perceived to provide superior benefits compared to

alternatives, including economic, social, and convenience benefits (Rogers, 2003). Firms often adopt technologies that provide high performance and financial benefits, such as reduced energy consumption, waste reduction, and improved environmental performance (Etzion, 2007). These benefits motivate firms to implement green innovations, which reduce emissions and toxic waste, and improve ecological efficiency (Konietzko et al., 2020). Despite requiring initial investment, green initiatives often pay for themselves through savings and improved efficiency (Premaratna et al., 2021). Economic and financial advantages are important technological factors that positively influence the adoption of clean technology (Del Rio Gonzalez, 2005). Therefore, the relative advantage of green innovations is expected to promote their adoption in SMEs. The following hypothesis is proposed:

*H3: There is a positive relationship between the relative advantage of green innovations and the adoption of green innovations in SMEs.*

### 2.3. Impact of Organizational Factors on Green Innovation Adoption

The organizational context includes factors and processes that can support or hinder technological innovation. Studies have shown that organizational characteristics such as human resource quality, leadership, organizational support, corporate culture, and firm size have a significant impact on technological innovation and environmental strategy (Etzion, 2007). Abundant resources and strong organizational capabilities play an important role in promoting technological innovation and improving environmental performance (Jeyaraj et al., 2006). Factors such as resource availability, management support, organizational learning capacity, and human resource quality also influence the adoption of green initiatives (Lin & Ho, 2011). This study focuses on three factors: human resource quality, organizational support, and firm size, as these are important factors in studies of technical innovation and environmental management.

#### Quality of Human Resource

Highly qualified human resources are an important factor in promoting green initiatives due to their ability to learn and innovate. Implementing green initiatives requires cross-functional coordination and process changes, requiring significant human resources and specialized skills through training and active employee involvement. However, limited employee learning ability can be a major barrier to the transfer of technical knowledge (Szulanski, 1996). Companies need to invest in intensive training for employees to understand and effectively apply green initiatives. Employees with good learning ability will promote innovation and help organizations implement more advanced environmental strategies (Christmann, 2000). Management commitment and skilled human resources are also important factors in promoting green innovation (Lee, 2008). Therefore, human resource quality not only enhances the ability to adopt green initiatives but also is the main driving force for SMEs to achieve sustainable performance.

*H4: There is a positive relationship between human resource quality and green innovation adoption in SMEs.*

#### Organizational support

Management concern and organizational support play an important role in promoting green innovation. Management with high environmental concern will actively support the adoption of green initiatives, improving economic, environmental and social performance (Qi et al., 2010). Environmental management responsibility is a decisive factor in implementing waste prevention and eco-innovation methods. At the same time, organizational support, including the provision of necessary technology, systems, and resources, helps employees adopt green habits and innovate effectively (Mohd Rizaimy et al., 2018). To be successful, businesses need to build cross-functional collaboration capabilities, change current operations, and train employees to meet the requirements of green initiatives (Ibrahim et al., 2018). Companies with strong support and highly qualified employees will easily achieve an environmental competitive advantage.

*H5: Organizational support positively affects green innovation adoption in SMEs.*

### 2.4. Impact of Environmental Factors (TF) on Green Innovation Adoption

In this study, environmental factors are understood as aspects of the external environment that influence innovation behavior and green strategies of enterprises. Environmental factors such as uncertainty, environmental generosity, government support, competitive pressure and network relationships all have significant impacts on technical

innovation and environmental strategies (Jeyaraj et al., 2006; Etzion, 2007). Among them, uncertainty and the availability of external resources are two prominent factors (Rothenberg & Zyglidopoulos, 2007). The government also plays an important role in providing resources and promoting the adoption of innovation (Lee, 2008). Based on the model of Lin and Ho (2011), this study focuses on the impact of uncertainty, government support, and stakeholder pressure on the innovation process.

**Environmental Uncertainty**

Environmental uncertainty, including changes in customer preferences, technology, and competition, significantly influences firm decisions (Lin & Ho, 2011). To maintain competitiveness, firms must adapt proactively and embrace innovation. In such environments, companies often collect and analyze information to adopt green practices, enhancing environmental performance and reducing risks (Rothenberg & Zyglidopoulos, 2007).

This uncertainty drives measures like green procurement and sustainable internal management (Ibrahim et al., 2018). Market and stakeholder pressures, including from customers, suppliers, and competitors, further fuel innovation (Abdullahi et al., 2018). SMEs, known for their agility, prioritize market intelligence and supply chain flexibility to meet customer needs and improve performance (Federica et al., 2016; Benzidia & Naouel, 2020). Thus, environmental uncertainty presents both challenges and opportunities for promoting green innovation.

*H6: There is a positive relationship between market changes and green innovation adoption of SMEs*

**Government support**

Government policies play an important role in encouraging small and medium-sized enterprises (SMEs) to adopt environmentally friendly production methods, especially in developing countries. Policies such as financial incentives, training programs, pilot projects, and technical assistance help SMEs shift from conventional to green technologies, as seen in Korea and Malaysia (Scupola, 2003). Governments can also provide tax subsidies, low-interest bank financing, and incentives for alternative energy technologies (Aragon-Correa & Sharma, 2003).

Government support not only provides resoGurces but also motivates SMEs to engage in green supply chains and improve environmental performance. Studies by Lee (2008) and Shaharudin et al. (2015) show that government intervention has a positive impact on participation in green initiatives. These policies also help to reduce financial burdens and encourage the adoption of green processes to meet environmental protection requirements (Mohd Rizaimy et al., 2018).

With government support, SMEs can overcome resource barriers and shift to green operations, thereby improving environmental performance and enhancing competitiveness. Therefore, government support is expected to have a positive impact on the adoption of green initiatives in SMEs.

*H7: There is a positive association between government support and the adoption of green initiatives in SMEs.*

**Rule and regulation pressure**

Global companies today face pressure from governments to develop environmentally friendly production activities and comply with legal regulations. Many studies have shown that government regulations and pressure play an important role in promoting enterprises to adopt environmental protection initiatives (Freeman, 2011). Regulatory changes and government enforcement have a great impact on the environmental management activities and business growth of companies (Huang et al., 2009).

The pressure from environmental regulations not only forces enterprises to comply but also promotes green innovation (GI) to improve cost efficiency and productivity (Chan et al., 2016). Small and medium-sized enterprises, facing regulatory burdens, are often under greater pressure to implement green initiatives (Berrone et al., 2013). Environmental protection regulations and strict enforcement of rules have promoted the adoption rate of green innovation (Zeng et al., 2011).

These regulations not only protect the ecosystem but also contribute to promoting green innovation in enterprises (Sanni, 2018). Government pressure, especially on SMEs, has increased commitment and participation in environmental protection initiatives, improving corporate competitiveness and performance.

*H8: There is a positive relationship between Rule and regulation and green innovation adoption of SMEs.*

**Customer Pressure**

In recent decades, customer concern for environmental issues, especially the demand for green products, has been increasing. Customer pressure has become an important factor motivating SMEs to improve and adopt green innovation to meet sustainability requirements and customer satisfaction (Huang et al., 2016). Research shows that customer engagement can help firms recognize and exploit opportunities in green product innovation.

In addition, customer pressure combined with other factors such as legal requirements and ethical issues creates strong incentives for firms to undertake environmental protection initiatives (Yalabik & Fairchild, 2011). To maintain a competitive advantage, firms find it necessary to understand and respond promptly to changes in customer preferences, especially when customers prioritize environmentally friendly products and are willing to pay a premium (Varadarajan, 2020).

As customers demand more green products, SMEs will increase their efforts to invest in green innovation to meet this demand (Lestari et al., 2021). Therefore, a positive relationship between customer demand and eco-innovation in SMEs is clearly predicted.

*H9: There is a positive relationship between customer pressure and green innovation adoption of SMEs*.

From the above research hypotheses, the author builds the following research model

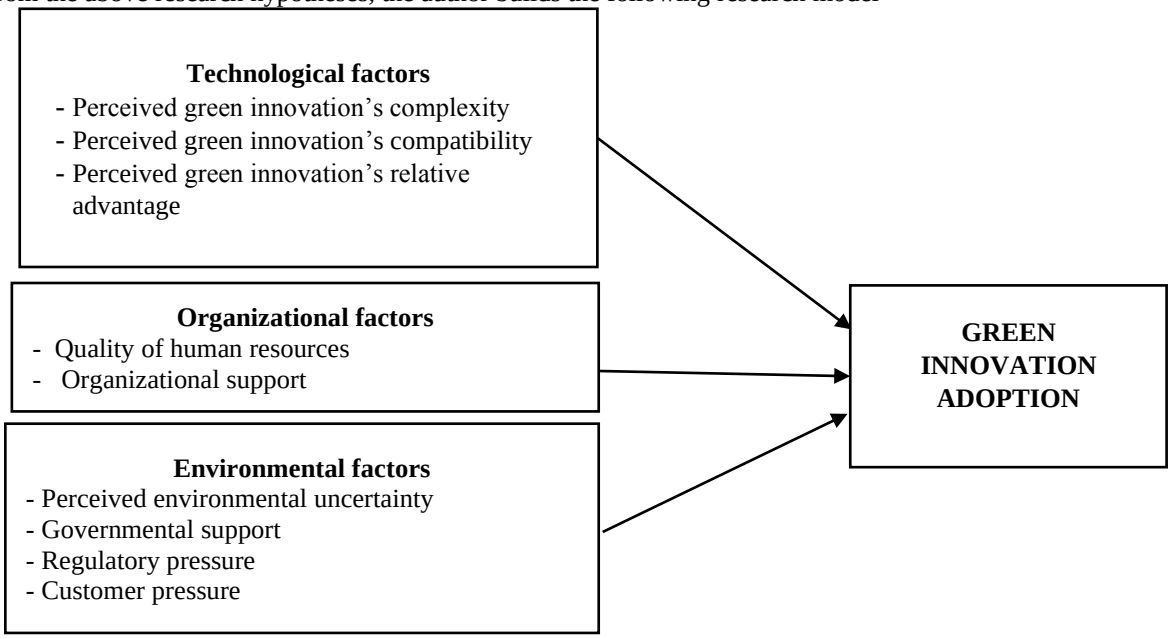



**Figure 1: Conceptual framework**

## III. RESEARCH METHODOLOGY

This study is empirical in nature and uses quantitative methods. To test the hypotheses, the structural equation model using partial least squares (PLS-SEM) was applied and analyzed using SmartPLS 4.0 software. This method was chosen because it is suitable for the explanatory nature of the study (Hair et al., 2010). In addition, according to Hair et al. (2017), PLS is the preferred choice when the sample size is small and the model is complete. Chin & Newsted (1999) recommend the use of PLS-SEM because it is effective in discovering latent factors. The reason is that PLS-SEM does not require the assumption of normal distribution, is capable of handling many dependent and independent variables simultaneously, and is suitable for small sample sizes and handling multicollinearity problems between independent variables. The methodology section is divided into three parts: data and sample size, measures construction, and data analysis.

**Data and sample size**

Research data were collected in two stages. First, semi-structured interviews with five managers and directors of manufacturing SMEs in Thanh Hoa were conducted to identify key factors influencing the adoption of green innovation, based on previous literature. Next, a research questionnaire was developed and distributed to 600 SMEs in five manufacturing sectors in Thanh Hoa's industrial zones, including textiles, chemicals, food and beverages,

construction materials, and pharmaceuticals. These sectors were selected because of their large scale and high level of pollution.

The total number of SMEs registered in the list from the Department of Industry and Trade was 1326. The study applied a random sampling method to ensure that each unit had an equal chance of selection. Using the formula of Yamane (1967), the minimum sample size was determined to be 307.

$$n = \frac{N}{1+Ne^2},$$

where n is the sample size, N is the total population, and e is the significance level (0.05), resulting in the following equation:

$$n = \frac{1326}{1 + 1326 * (0.05) * (0.05)} = 307$$

The author sent 600 questionnaires to various small and medium-sized enterprises (SMEs) online via email and Google form URL. Of the total number of questionnaires sent, 389 were retrieved for analysis. These questionnaires were sent to CEOs, managers, directors, and departments in charge of environmental protection related to production and operations because these people have direct and in-depth information and knowledge about the green innovation application situation of the enterprise and the whole industry.

**Measurement**

The questionnaire for this study is divided into four main parts: company information, influencing factors (Perceived green innovation's complexity (Complex), Perceived green innovation's compatibility (Compa), Perceived green innovation's relative advantage (Advan), Quality of human resources (HR), Organizational support (ORS), Perceived environmental uncertainty (EnUn), Governmental support (GoS), Regulatory pressure (RP), Customer pressure (CP)). Furthermore, a five-point Likert scale was used to measure the items ranging from strongly disagree (1) to strongly agree (5). To ensure validity, the items of the independent factor scale were taken from the available literature in the study of (Ming-Horng Weng & Lin, 2011), the dependent variable (Green Innovation) was inherited from the study of Chiou et al. (2011), Abdullah et al., 2016; Soewarno et al., 2019).

## IV. RESULTS AND DISCUSSION

### 4.1 Demographic characteristics of the survey subjects

Table 2 shows that the majority of respondents are male, accounting for 61.18%. In particular, respondents who are in leadership positions, Third level managers account for 40.87%, Second level managers account for 32.39%, Top level managers account for 22.88% and Employees in charge of green innovation of the enterprise account for 3.86%. These are people who are knowledgeable about the green innovation activities of the enterprise. The working time at the enterprise of the respondents is long enough for them to be knowledgeable about the enterprise's activities, especially green innovation activities. Those who have worked at the company from 5-10 years account for the highest proportion (55.78%), followed by More than 10 years (accounting for 34.70%) and under 5 years account for 9.51%. Regarding the business sector of the enterprise, the highest proportion is food and beverage enterprises (accounting for 32.9%), followed by construction materials enterprises (accounting for 27.76%), pharmaceutical enterprises (accounting for 19.91%), textile enterprises (accounting for 14.65%), and finally chemical enterprises (9.77%). Regarding the duration of operation of the enterprise, the number of enterprises with a duration of operation from 10-15 years accounts for the highest proportion (42.67%), followed by enterprises operating for over 15 years accounting for 30.85%, enterprises operating for 5-10 years accounting for 22.37% and finally enterprises operating for less than 5 years accounting for 4.11%.

**Table 1:Respondent's and SMEs' information**

| | Number | Percentage | | Number | Percentage |
|---|---|---|---|---|---|
| **Gender** | | | **Business sectors** | | |
| Male | 238 | 61.18 | Textiles | 57 | 14.65 |
| Female | 151 | 38.82 | Chemicals | 38 | 9.77 |

| | | | | | |
|---|---|---|---|---|---|
| **Position** | | | Food and beverage | 128 | 32.9 |
| Top level managers | 89 | 22.88 | Building materials | 108 | 27.76 |
| Second level managers | 126 | 32.39 | Pharmaceuticals | 58 | 14.91 |
| Third level managers | 159 | 40.87 | **Time of operation** | | |
| Corporate Green Innovation Officer | 15 | 3.86 | Less than 5 year | 16 | 4.11 |
| **Seniority** | | | From 5 – less than 10 years | 87 | 22.37 |
| Less than 5 years | 37 | 9.51 | From 10- 15 years | 166 | 42.67 |
| From 5- 10years | 217 | 55.78 | More than 15 years | 120 | 30.85 |
| More than 10 years | 135 | 34.70 | | | |

*(Source: Smart PLS data processing results)*

### 4.2 Assessing the quality of the measurement model

**Scale quality**

To assess whether the observed variables are meaningful or not, analyze the PLS-SEM algorithm to get the outer loading results. According to Hair et al. (2022), for the measurement model, the quality of observed variables is reflected through the outer loading. If this coefficient is >= 0.7: Very good, < 0.4: Rejected. The data analysis results of the observed variables in this study show that the outer loadings of all variables are > 0.7 (table 2), thus ensuring the quality of the observed variables for further analysis.

**Table 2. Values of the outer loading factors of the scale and observed variables**

| Factors | Variables | Outer loading | Factors | Variables | Outer loading |
|---|---|---|---|---|---|
| **Complex** | Complex1 | 0.711 | **EnUn** | EnUn1 | 0.828 |
| | Complex2 | 0.723 | | EnUn2 | 0.824 |
| | Complex3 | 0.763 | | EnUn3 | 0.785 |
| | Complex4 | 0.730 | | EnUn4 | 0.792 |
| **Compa** | Compa1 | 0.829 | **GoS** | GoS1 | 0.814 |
| | Compa2 | 0.803 | | GoS2 | 0.845 |
| | Compa3 | 0.818 | | GoS3 | 0.729 |
| **Advan** | Advan1 | 0.860 | **CP** | CP1 | 0.862 |
| | Advan2 | 0.868 | | CP2 | 0.912 |
| | Advan3 | 0.851 | **RP** | RP1 | 0.882 |
| **HR** | HR1 | 0.816 | | RP2 | 0.901 |
| | HR2 | 0.832 | **GIA** | GIA1 | 0.770 |
| | HR3 | 0.816 | | GIA2 | 0.817 |
| | HR4 | 0.856 | | GIA3 | 0.818 |
| **OrS** | OrS1 | 0.757 | | GIA4 | 0.833 |
| | OrS2 | 0.748 | | | |
| | OrS3 | 0.794 | | | |
| | OrS4 | 0.792 | | | |

*(Source: Smart PLS data processing results)*

**Construct Reliability and Validity of the scale**

SmartPLS 4 software provides three indicators to assess scale reliability or internal consistency reliability: Cronbach's alpha, Composite reliability rho_a, Composite reliability rho_c (CR). Hair et al. (2017) proposed to focus on two indicators: Cronbach's alpha and Composite reliability rho_c. (Table 3).

**Table 3. Values of indicators to assess scale reliability**

| Factors | Cronbach's alpha | Composite reliability (rho_c) | Average variance extracted (AVE) |
|---|---|---|---|
| **Advan** | 0.759 | 0.859 | 0.670 |

| | | | |
|---|---|---|---|
| **CP** | 0.702 | 0.870 | 0.771 |
| **Compa** | 0.750 | 0.857 | 0.667 |
| **Complex** | 0.874 | 0.914 | 0.726 |
| **EnUn** | 0.823 | 0.882 | 0.652 |
| **GIA** | 0.825 | 0.884 | 0.656 |
| **GoS** | 0.712 | 0.839 | 0.636 |
| **HR** | 0.850 | 0.898 | 0.689 |
| **OrS** | 0.775 | 0.856 | 0.597 |
| **RP** | 0.743 | 0.886 | 0.795 |

*(Source: Smart PLS data processing results)*

Regarding the reliability test of the scales in the measurement model, also according to Hair et al. (2022), Cronbach's alpha and Composite reliability values ranging from 0.6 to 0.7 are considered acceptable, and values ranging from 0.7 to 0.9 are considered satisfactory. If the construct has a value lower than 0.6, it is considered to lack internal consistency reliability. The results of the reliability test of the scales from the survey data in this study are shown in Table 3. The data analysis results show that both Cronbach's alpha and Composite reliability values are greater than 0.7, thus ensuring the internal consistency and reliability of the scales.

Next, the convergent validity of the scales is examined based on the Average Variance Extracted (AVE) index. According to Hair et al. (2022), when the AVE index is ≥ 0.5 (the latent variable explains at least 50% of the variance of each observed variable), the scales ensure convergent validity. According to the data analysis results in Table 3, the AVE values of all factors are above 0.5, demonstrating the convergent validity of the construct for further analysis.

**Discriminant Validity**

From the results of the PLS-SEM algorithm analysis on SmartPLS 4 software, we have 3 results to evaluate the discriminant validity of the research scale, including: Cross loadings (Table 2), Heterotrait-Monotrait Ratio (HTMT) (Table 4) and Fornell and Larcker table (Table 5).

**Table 4. Heterotrait-Monotrait Ratio (HTMT) Index**

| | **Advan** | **CP** | **Compa** | **Complex** | **EnUn** | **GIA** | **GoS** | **HR** | **OrS** | **RP** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Advan** | | | | | | | | | | |
| **CP** | 0.201 | | | | | | | | | |
| **Compa** | 0.136 | 0.240 | | | | | | | | |
| **Complex** | 0.362 | 0.403 | 0.388 | | | | | | | |
| **EnUn** | 0.044 | 0.107 | 0.250 | 0.275 | | | | | | |
| **GIA** | 0.522 | 0.454 | 0.460 | 0.880 | 0.256 | | | | | |
| **GoS** | 0.235 | 0.320 | 0.238 | 0.312 | 0.131 | 0.365 | | | | |
| **HR** | 0.173 | 0.296 | 0.139 | 0.348 | 0.103 | 0.374 | 0.157 | | | |
| **OrS** | 0.138 | 0.232 | 0.161 | 0.299 | 0.225 | 0.504 | 0.142 | 0.084 | | |
| **RP** | 0.657 | 0.202 | 0.175 | 0.396 | 0.112 | 0.573 | 0.295 | 0.242 | 0.210 | |

*(Source: Smart PLS data processing results)*

Henseler et al. (2015) stated that if the HTMT index of a pair of factors is greater than 0.9, the discriminant quality of the factor is violated. If the HTMT index is below 0.85, the discriminant quality is well guaranteed. Thus, the range from 0.85 to 0.9 will be the acceptable threshold. The data results in Table 5 show that all values are less than 0.9, so the discriminant quality is guaranteed.

**Table 5: Fornell Larcker**

| | **Advan** | **CP** | **Compa** | **Complex** | **EnUn** | **GIA** | **GoS** | **HR** | **OrS** | **RP** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Advan** | **0.819** | | | | | | | | | |
| **CP** | 0.135 | **0.878** | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Compa** | -0.006 | 0.070 | **0.817** | | | | | | | |
| **Complex** | -0.000 | 0.123 | 0.302 | **0.852** | | | | | | |
| **EnUn** | 0.268 | 0.071 | 0.198 | 0.058 | **0.808** | | | | | |
| **GIA** | 0.184 | 0.257 | 0.362 | 0.483 | 0.214 | **0.810** | | | | |
| **GoS** | -0.012 | 0.139 | 0.174 | 0.149 | 0.093 | 0.281 | **0.797** | | | |
| **HR** | 0.121 | 0.142 | 0.112 | 0.235 | 0.084 | 0.315 | 0.126 | **0.830** | | |
| **OrS** | 0.169 | 0.207 | 0.123 | 0.078 | 0.172 | 0.403 | 0.103 | 0.028 | **0.773** | |
| **RP** | 0.210 | 0.152 | 0.130 | 0.209 | 0.088 | 0.450 | 0.214 | 0.194 | 0.161 | **0.892** |

*(Source: Smart PLS data processing results)*

Table 5 shows the correlations of all constructs. In the table, the bold numbers above the diagonal represent the square root of the average variance extracted (AVE) for each variable, while the numbers below the diagonal represent the correlation coefficient between each pair of variables. The comparison shows that the square root of the AVE for each variable is larger than the values in the corresponding rows and columns of the correlation matrix, indicating that the discriminant reliability is satisfactory.

Therefore, the model in this study demonstrates reliability, and the designed scales demonstrate high reliability and stability. The measurement items of the system meet the measurement requirements and are of high quality. All reliability indices meet the established evaluation criteria.

### 4.3 Evaluation of the SEM linear structural model

#### Collinearity of independent variables

According to Hair et al. (2019), gives the following VIF (variance inflation factor) thresholds in assessing collinearity: VIF ≥ 5: very high probability of collinearity, the model is seriously affected, 3 ≤ VIF < 5: the model may have collinearity, VIF < 3: the model does not have collinearity.

**Table 6. VIF value table of commitment, value, trust and communication variables**

| | VIF |
|---|---|
| **Advan -> GIA** | 1.407 |
| **CP -> GIA** | 1.188 |
| **Compa -> GIA** | 1.137 |
| **Complex -> GIA** | 1.362 |
| **EnUn -> GIA** | 1.095 |
| **GoS -> GIA** | 1.128 |
| **HR -> GIA** | 1.136 |
| **OrS -> GIA** | 1.102 |
| **RP -> GIA** | 1.449 |

*(Source: Smart PLS data processing results)*

The data results in Table 6 show that the VIF threshold values are all less than 3, so the research model does not encounter multicollinearity.

#### Research hypothesis analysis

Bootstrapping analysis on SmartPLS gives the Path coefficients results as in Table 7.

**Table 7. Path coefficients**

| Hypothesis | Relationship | Original sample (O) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | Decision |
|---|---|---|---|---|---|---|
| **H1** | **Complex -> GIA** | -0.439 | 0.049 | 9.020 | 0.000 | Accepted |
| **H2** | **Compa -> GIA** | 0.137 | 0.032 | 4.202 | 0.000 | Accepted |
| **H3** | **Advan -> GIA** | 0.159 | 0.041 | 3.887 | 0.000 | Accepted |

| | | | | | | |
|---|---|---|---|---|---|---|
| **H4** | **HR -> GIA** | 0.094 | 0.032 | 2.945 | 0.003 | Accepted |
| **H5** | **OrS -> GIA** | 0.223 | 0.034 | 6.641 | 0.000 | Accepted |
| **H6** | **EnUn -> GIA** | 0.019 | 0.028 | 0.694 | 0.488 | Not Accepted |
| **H7** | **GoS -> GIA** | 0.045 | 0.030 | 1.513 | 0.130 | Not Accepted |
| **H8** | **CP -> GIA** | 0.082 | 0.032 | 2.546 | 0.011 | Accepted |
| **H9** | **RP -> GIA** | 0.145 | 0.043 | 3.366 | 0.001 | Accepted |

*(Source: Smart PLS data processing results)*

The data results in Table 7 show that 7/9 impact relationships are statistically significant (P value < 0.05), so the research hypotheses H1, H2, H3, H4, H5, H8 and H9 are accepted, while hypotheses H6 and H7 are not accepted. Regarding the direction of impact, all impacts are positive (the Original sample (O) path coefficient has a + sign), except for the impact of Complex → GIA which is a negative impact (the Original sample (O) path coefficient has a - sign). The path coefficient value is also the basis for assessing the strength of the impact of the independent variable on the dependent variable, specifically the order from large to small is as follows: Complex → GIA (-0.439) > OrS -> GIA (0.223) > Advan -> GIA (0.159) > RP -> GIA (0.145) > Compa -> GIA (0.137) > HR -> GIA (0.094) > CP -> GIA (0.082).

## V. RESULTS AND DISCUSSION

The study uses regression analysis to examine the impact of technological, organizational, and environmental factors on SMEs' adoption of green innovation. Results show that technological factors significantly influence adoption, with perceived complexity negatively affecting it, while compatibility and relative advantage have positive effects. SMEs are more likely to adopt green innovations when they are simple, compatible with existing operations, and beneficial for economic and environmental performance. To enhance adoption, SMEs should increase environmental knowledge, clarify green initiatives, and align innovations with existing systems. Suppliers should also highlight the relative advantages of green technologies.

Organizational factors, including support from management and high-quality human resources, positively influence adoption. Organizational support motivates employees and ensures the availability of resources for green innovation, while training and knowledge management systems further promote adoption.

Regarding environmental factors, perceived uncertainty and weak government support do not significantly affect green innovation adoption. However, regulatory and customer pressures play crucial roles. Regulatory policies enforce compliance, while growing consumer demand for sustainability drives firms to adopt green standards. To promote green innovation, governments should offer consistent financial and technical support, enforce clear regulations, and enhance transparency. Meanwhile, SMEs should focus on developing sustainable products, leveraging customer demand, and reducing uncertainty to identify opportunities for green innovation.

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# RETURNING HOME TO START A BUSINESS AMONG UNIVERSITY STUDENTS (ICEBD 2025)

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**ABSTRACT**

This study investigates the factors influencing university students' entrepreneurial intentions to return to their hometowns and start businesses, focusing on the roles of attitude, government support, and perceived behavioral control. By applying the Model of Goal-Directed Behavior (MGB), the research highlights the mediating role of desire in shaping intentions. The research utilized a quantitative approach, employing an exploratory survey method to collect data from 311 university students in Vietnam. The findings emphasize that government support plays a pivotal role in fostering entrepreneurial intentions. Attitude, identified as the strongest predictor of desire, underscores the importance of cultivating a positive entrepreneurial mindset among students. However, the study finds that while a positive attitude is essential, it is insufficient without adequate resources and support. Additionally, enhancing perceived behavioral control through initiatives like entrepreneurship workshops and peer networks can further empower students to pursue entrepreneurial goals. The study's insights contribute to understanding how supportive environments and policy measures can motivate young entrepreneurs to participate in rural revitalization and sustainable development. This research underscores the need for comprehensive strategies to bridge the gap between entrepreneurial desire and actionable intention among university students.

*Keywords*: "Entrepreneurial Intention", "Government Suppor"t, "Attitude", "Perceived Behavioral Control", "Rural Development"

## I. INTRODUCTION

### 1.1 Background of the study

Nguyen (2014) suggests that rural Vietnam can be analyzed through three primary dimensions: agriculture, rural development, and rural livelihoods, each encompassing both positive and negative aspects (Powell et al., 2011). Rural development is a complex and multifaceted process that requires diverse resources (Thuy, Thanh et al., 2024). Rural entrepreneurship, in particular, has long been recognized as a key driver of economic growth (Wortman, 1990). According to Steiner and Atterton (2015), rural entrepreneurship significantly benefits local communities by generating employment, advancing local products and services, and creating indirect contributions such as spillover effects and added value from core business activities.

Entrepreneurial learning experiences play a crucial role in shaping the intentions of rural students to return home and start businesses (Li, Li et al., 2024). This not only contributes to rural economic development but also serves as an effective means to address unemployment (Van Praag and Versloot, 2007). Recent data indicates substantial growth potential in rural areas of Vietnam, showing a narrowing gap in development between rural and urban regions (Lê Minh Hoan, 2023). However, while development is occurring, the process remains slow and appears to be decelerating.

Studying the aspirations and entrepreneurial tendencies of recent graduates is especially vital given the competitive job market and the unequal distribution of talent across regions (Chen et al., 2021). The concept of returning home to start a business refers to the intention of rural university students to establish ventures in their hometowns after completing their education. Several factors influence this decision. For instance, rural entrepreneurial behavior is often motivated by a desire to care for family members and contribute to the development of their hometowns (Ren and Shi,

2017). Therefore, identifying the key factors that most influence an individual's decision to pursue entrepreneurship is crucial (Liñán et al., 2011).

Prior research indicated that attitudes, support from the government, and perceived behavioral control had a favorable impact on university students' desire to launch a startup in their hometowns. It's possible that the consequences' full scope won't be investigated. The gaps in literature were addressed in a number of ways by this study. First, the government support variable acted as an external factor, making the model more generalizable. However, this was a self-made variable and there was no study to compare with except He et al (2023). Therefore, we studied and contributed to the source of future comparisons. Second, previous studies were conducted in Western countries or developing countries (He & Ding, 2023; Justice Malebana, 2014; Liñán et al., 2011; Perugini & Bagozzi, 2001). As a result, we contributed by expanding the research to Vietnam, a developing nation. In order to generalize the correlations under study across many cultural and national contexts, this was a crucial step. Finally, because there are numerous cultures in various geographic regions, students may think, feel, and behave differently. We performed the survey at numerous universities and extended its reach to students from various region of Vietnam. As a result, the results were more varied and had broad applicability.

### 1.2 Research Questions and objectives

Research questions: How to create entrepreneurial intention among returning home students from cognitive drivers (e.g., attitude), external factors (e.g., government support), and percevied behavioral control with students' desire as the mediating variable?

Research objectives: To estimate the sequencing relationships from various drivers (attitude, government support, percevied behavioral control), desire as a goal-oriented behavior, to entrepreneurial intention among returning home students.

## II. MATERIAL AND METHODOLOGY

### 2.1. Conceptual Foundation

#### Model of Goal-Directed Behavior (MGB)

According to Perugini et al. (2001) the MGB views intentions to carry out a behavior as primarily driven by the desire to carry out the behavior. This desire is thought to reflect the effects of attitude, perceived behavioral control, and frequency of prior behaviors, and to mediate their influence on intentions.

The four primary components of the The Theory of Planned Behavior are behavioral intention, behavioral attitude, subjective norm, and perceived behavioral control (He & Ding, 2023). In contrast to the Theory of Planned Behavior, MGB emphasizes the mediating function of desire and enhances the capacity to forecast individual behavior and behavioral goals. It does this by taking into account a person's behavioral aptitude from both the cognitive and motivational levels (Perugini & Bagozzi, 2001).

### 2.2. Research method

#### 2.2.1. Attitude

Perugini et al. (2001) defined attitudes as essentially a judgment of conduct expressed with a degree of favoritism or dislike. On the other hand, a desire alone, coupled with the conviction that one can act, is enough to activate an intention and doesn't need to be positively assessed (Bagozzi, 1992).

He et al. (2023) found no evidence that behavioral attitude had a substantial impact on an individual's desire to become an entrepreneur. Behavioral attitude, according to Perugini and Bagozzi (2001), influenced behavioral intention indirectly through desire rather than directly. Thus, the more favorable and positive a person's assessment of and attitude toward entrepreneurship, the more appealing and inspiring it is for that person to pursue entrepreneurship.

*H1: Attitude has a significantly positive impact on desire for returning home to start a business among university students.*

#### 2.2.2. Government support

The government and municipal governments should do more to support and encourage students. These pertinent

resources can be supplied by the government within the framework of a rural revitalization plan. He et al. (2023) discovered that the intention of university students to launch a startup in their home cities is significantly influenced by government support, which also has a major influence through desire. The more clearly university students intend to return home to launch startup and take part in rural revitalization, the more the federal government or local governments can encourage entrepreneurship through loan support programs, more venture capital, and loans.

*H2: Government support has a significantly positive impact on desire for returning home to start a business among university students.*

**2.2.3. Perceived behavioral control**

The term "perceived behavioral control" describes a person's belief in their capacity to carry out a particular conduct (Ajzen, 2005). An individual's perceived control over his behavior is stronger when he believes that he can access more resources and that the predicted impediment is smaller. Although it is also asserted that the concept of perceived behavioral control is similar to that of self-efficacy, or the individual's assessment of their own ability to perform the behavior, it is conceptualized as an estimate of the degree to which the person has control over whether or not they are able to perform the behavior (Ajzen & Madden, 1986).

Research indicated that perceived behavioral control has no discernible effect on desire (He & Ding, 2023), previous MGB studies confirmed that perceived behavioral control has a significant influence on desire. However, the strength of influence of these constructs on intention to perform a behavior occured indirectly through desire (Perugini & Bagozzi, 2001). In addition, the ability of perceived behavioral control as an independent variable to both directly influenced behavioral intention and positively influence it through desire (Meng & Choi, 2016). Thus, the following is the study's hypothesis:

H3: Perceived behavioral control has a significantly positive impact on desire for returning home to start a business among university students.

**2.2.4. Desire and its mediation effect**

Desire is a mediating factor that directly affects behavioral intentions (Perugini & Bagozzi, 2001). The MGB distinguished clearly between intentions and desires. Unlike desires, intentions are more closely linked to results and may entail preparation for carrying out the desired conduct. As it stands, attitude is an evaluation of an action; however, unless the evaluation is coupled with a desire to take action, no action will be taken. A person who finds an act appealing may not want to carry it out and may choose not to do it or may not have any intention at all (Bagozzi, 1992).

Only when self-efficacy is present will a desire result in an intention. In the same way, having an intention indicates self-efficacy, but having a desire does not. As a result, desires and intentions are not the same thing, and they can theoretically have distinct validity (Bagozzi, 1992).

In the MGB, desire acts as a mediator between behavioral determinants and behavioral intention, which in turn influences target behavior performance. Fans' intention to visit places with pop culture features was positively and significantly influenced by desire, according to research by S. J. Lee et al. (2018). Through certain variations in their search, He et al. (2023) demonstrated that desire also directly affects university students' intentions of returning home city and launch a business. Thus, the following is the hypothesis:

*H4: Desire has a significantly positive impact on intention for returning home to start a business among university students.*

**2.3. Research Model**

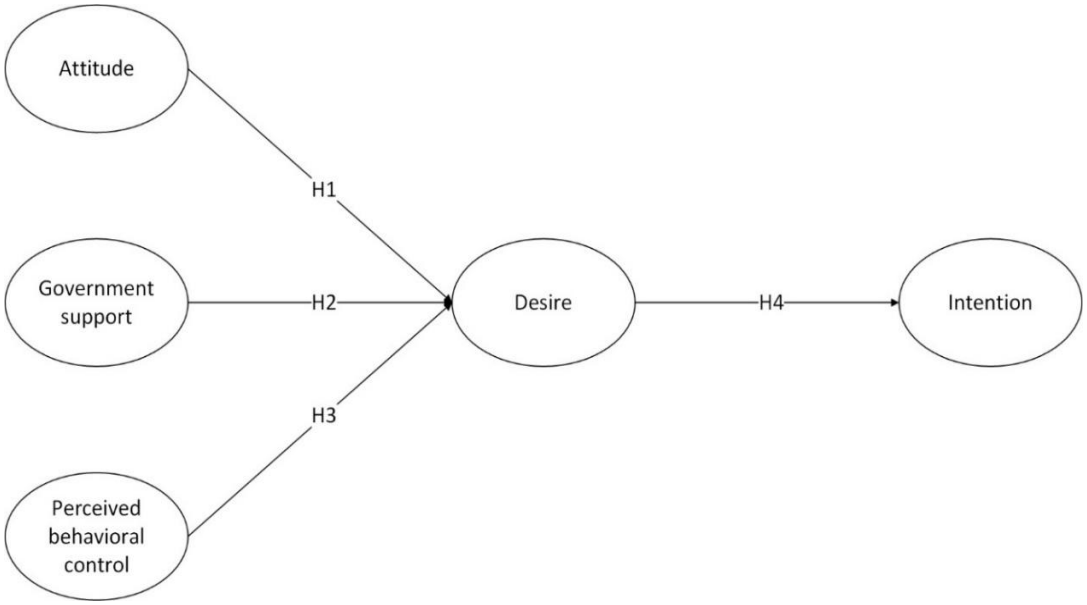
This study indicates that the following factors may have an impact on students' intentions to launch a business in their hometown by returning there, according to the goal-directed behavior model (MGB), which takes into account intentions based on people' levels of cognition and motivation. The following factors influence behavior: Desire; Attitude; Perceived behavioral control; Government support (Perugini & Bagozzi, 2001). He (2023) applied this theory to determine the factors that impact students' intention to start a business in their hometown. Prior research has examined the factors (like attitudes and support policies) that impact university students' intention to start a business in their hometown, as well as the fact that students' desires also impact their entrepreneurial intentions (Lee et al., 2018;

Perugini & Bagozzi, 2001). Furthermore, He (2023) specified that when a person thinks he can access more resources and that the anticipated obstacle is less, he feels more in control of his conduct. Using this idea, we examined how university students' intentions to return to their hometown and launch a business are influenced by their perception of behavioral control, as some earlier research has also shown (Meng & Choi, 2016).

**Figure 8: The conceptual framework adopted from (He & Ding, 2023; Justice Malebana, 2014; Liñán et al., 2011; Perugini & Bagozzi, 2001). (Source: The authors.)**

### 2.4. Sample design

University students between the ages of 18 and 25 were the appropriate respondents chosen to take part in the survey. This age group was chosen because they are part of Generation Z, a large cohort that is developing career




orientations and seeking job opportunities. This group also has a certain degree of education, is youthful, aspirational, and has numerous prerequisites for establishing a future career path.

Additionally, students from provinces outside Ho Chi Minh City who plan to return home and start a business after graduation were included in the survey. Participants must intend to return to their hometowns to start a business after completing their university degree. Their responses should be objective and accurate to ensure reliable research results.

### 2.5. Sample size

For every variable that was measured in the study model, at least five respondents are needed, according to Hair's (1998) EFA analysis theory. From there, the first equation, 17 x 5 = 85, was used to determine the sample size because the research model in this study included 17 items, which corresponded to 17 major survey items in the questionnaire survey. To guarantee the accuracy and diversity of the results, Hair (1998) also recommended that the sample size should not be less than 100 survey participants. To improve the representativeness of the sample, the anticipated sample size for this study was at least 200 respondents.

### 2.6. Questionnaire design and measurement items

#### Questionnaire design

A prior empirical study about entrepreneurship and rural revitalization served as the model for the questionnaire. To make sure the questionnaire was as clear as possible and to prevent any unintended confusion, all questions were further edited by qualified teachers and entrepreneurial experts after being carefully and thoughtfully translated from English to Vietnamese for the target audience. The intended respondents were then given the survey for three months in a row (September to December 2024). The questionnaire's structure was divided into two sections. A few demographic and general questions, such as age, gender, school, year of study, hometown, income, and prior experiences, were asked of respondents in the first section. They were then asked to complete a 5-point Likert scale regarding their attitude, perceived behavioral control, government support, organizational commitment, and entrepreneurial desire and intention in the second section. (See Appendix).

**Measurement items**

Five points Likert-scale was applied to measure the variables in the research model, from 1 representing for strongly disagree to 5 for strongly agree. Each measurement item was modified from earlier empirical studies and had been widely used by many scholars (see Table 7 in Appendix).

Attitude (BA). We adopted 4 items from He et al. (2023). One of these items was "Returning home to start a business can achieve greater value of life".

Government support (GS). This variable was measured using 3 items selected out of study by He et al. (2023), whose research had also adapted questions from Justice Malebana (2014). A sample item was "Government commits to support them with funds for college students home business".

Perceived behavioral control (PBC). We further adopted 4 items from He et al. (2023), whose research had also adapted questions from Justice Malebana (2014). A sample item included "I think I have a good family environment encouraged me to start a business".

Desire (D). We again utilized 3 items from He et al. (2023), whose research had also adapted questions from Perugini et al. (2001). A sample item was "I am eager to return home to start a business".

Intention (I). We adopted 3 items from Liñán et al., (2011) and He et al. (2023). A sample item included "I will make every effort to start and run my own firm".

### 2.7. Data collection

We compiled a list of universities in Ho Chi Minh City, An Giang Province and Can Tho Province. Then we contacted teachers and officials working at the schools to find out the potential survey subjects. The research team went directly to each class, introduced the research project and the research phenomenon, and described the phenomenon being studied in a simple, clear, and engaging manner. Then, we invited them to participate in the survey. We focused on students from the provinces who intended to return home to start a business, or at least students from the provinces, rather than a random selection.

After thorough editing and consultation with professionals, the questionnaires were distributed to the intended respondents via links to Google Forms through online platforms (Facebook, Zalo, etc.).

## III. RESULT AND DISCUSSION

### 3.1 Research subjects

STATA was used to evaluate the collected data and produce descriptive statistics. Next, Smart-PLS was employed to assess validity and reliability and examine the relationships between Government Support, Attitude, Perceived Behavioral Control, Desire, and Intention.

### 3.2. Model results

Of the 311 valid observations, 55.31% were male, 44.05% were female, and 0.64% identified as other gender/identity" or whatever the category was 45.02% were 4th-year students, while 22.83% had studied for more than 4 years, and 25.40% had graduated. Out of the respondents, 94 students (30.23%) were majoring in Science & Engineering, while 217 students (69.77%) were majoring in Social Science & Art, and Economics-Business-Management. In terms of work experience (internship/part-time/full-time), the two groups were quite different: 67.52% of students had experience, while 32.48% did not. Additional demographic details were presented in Table 1 below.

**Table 9: Demographic information**

| Categories | Outcomes | Respondent | Percentage (%) |
|---|---|---|---|
| Gender | Female | 172 | 55.31 |
| | Male | 137 | 44.05 |
| | Others | 2 | 0.64 |

| Categories | Outcomes | Respondent | Percentage (%) |
|---|---|---|---|
| University | VNU-HCM An Giang University | 13 | 4.18 |
| | VNU-HCM University of Technology | 20 | 6.43 |
| | VNU-HCM International University | 78 | 25.08 |
| | VNU-HCM University of Science | 18 | 5.79 |
| | VNU-HCM University of Social Sciences and Humanities | 32 | 10.29 |
| | HCMC University of Technology and Education | 20 | 6.43 |
| | VNU-HCM University of Economics and Law | 14 | 4.50 |
| | University of Economics HCMC | 16 | 5.14 |
| | University of Information Technology | 18 | 5.79 |
| | Ton Duc Thang University | 21 | 6.75 |
| | Can Tho University | 15 | 4.82 |
| | University of Law HCMC | 12 | 3.87 |
| | HCMC Open University | 32 | 10.29 |
| | Saigon University | 1 | 0.32 |
| | HCMC University of Culture | 1 | 0.32 |
| VNU-HCM system | VNU-HCM | 193 | 62.06 |
| | Others | 118 | 37.94 |
| Major | Science & Engineering | 94 | 30.23 |
| | Social Science & Art, Economics-Business-Management | 217 | 69.77 |
| School year | Third year | 21 | 6.75 |
| | Fourth year | 140 | 45.02 |
| | Above fourth year | 71 | 22.83 |
| | Graduated | 79 | 25.40 |
| Monthly income | Below 1 million VND | 16 | 5.14 |
| | 1-5 million VND | 95 | 30.55 |
| | 5-10 million VND | 123 | 39.55 |
| | Above 10 million VND | 77 | 24.76 |
| Family business | Yes | 192 | 61.74 |
| | No | 119 | 38.26 |
| Working experience (internship/part-time/full-time) | Yes | 210 | 67.52 |
| | No | 101 | 32.48 |
| Coming from other provinces /cities (non-HCMC citizen) | Yes | 311 | 100.00 |
| Hometown's geographic region | North Central Coast (Central) | 29 | 9.32 |
| | Northeast (North) | 19 | 6.11 |
| | Mekong River Delta (South) | 49 | 15.76 |
| | Red River Delta (North) | 54 | 17.36 |
| | Southeast (South) | 51 | 16.40 |
| | South Central Coast (Central) | 47 | 15.11 |

| Categories | Outcomes | Respondent | Percentage (%) |
|---|---|---|---|
| | Northwest (North) | 17 | 5.47 |
| | Central Highlands (Central) | 45 | 14.47 |
| **Total** | | **311** | **100.00** |

*Source: The authors.*

### 3.2.1. Measurement model testing

When employing the PLS-SEM technique, certain procedures for data analysis were recommended (F. Hair Jr et al., 2014). In order to assess the measurement model (outer model), the study must first look at the connections between the latent variables and their indicators (validity and reliability testing). The suggested hypotheses between constructs were then examined after the structural model (inner model) had been examined (Caldeira & Kastenholz, 2018).

The Intention concept was removed during the Measurement Model Testing run. Therefore, Intention did not appear in Table 2, Table 3 and Table 4. Also, in the Structural model testing section, H4 was removed, as shown in the model analysis result figure.

In order to achieve indicator reliability for the first stage, which involves assessing the link between latent constructs and observed indicators, the variables' Cronbach α must be greater than 0.6. Furthermore, it was recommended to delete any indications whose outer loadings fall below the 0.7 cut-off value (Henseler et al., 2012). Table 2 showed that the outer loadings for all variables exceed the 0.7 threshold. All factors' Cronbach's α values were more than 0.8 except variable Desire (refer to Table 2). All constructions had composite reliability (Rho_A) over 0.7, indicating strong internal consistency. All factors' AVE values were above the 0.5 threshold existed, demonstrating acceptable levels of convergent validity. Refer to Table 2. Additionally, our study used a collinearity test, which required variance inflated factors (VIF) to be below the 3.3 threshold (Kock, 2015). VIF values above this threshold would suggest the presence of common-method bias and collinearity amongst constructs. CMV was not a serious problem in this investigation, as shown by Table 2, which showed that all VIF values were significantly below the criteria.

**Table 10: Reliability and convergent validity of latent constructs**

| Construct | Code | Factor loading | Cronbach's alpha | CR (rho_a) | CR (rho_c) | AVE | R-squared | Full collinearity VIF |
|---|---|---|---|---|---|---|---|---|
| **Threshold** | | **≥ 0.708** | | **[0.7;0.95]** | **[0.7;0.95]** | **≥ 0.5** | | **≤ 3.3** |
| Attitude | | | 0.803 | 0.805 | 0.871 | 0.629 | | 1.876 |
| | BA1 | 0.799 | | | | | | |
| | BA2 | 0.812 | | | | | | |
| | BA3 | 0.775 | | | | | | |
| | BA4 | 0.785 | | | | | | |
| Government support | | | 0.864 | 0.865 | 0.898 | 0.595 | | 2.167 |
| | GPS1 | 0.782 | | | | | | |
| | GPS2 | 0.764 | | | | | | |
| | GPS3 | 0.774 | | | | | | |
| | GPS4 | 0.789 | | | | | | |
| | GPS5 | 0.744 | | | | | | |
| | GPS6 | 0.775 | | | | | | |
| Perceived behavioral control | | | 0.812 | 0.813 | 0.876 | 0.639 | | 2.069 |
| | PBC1 | 0.815 | | | | | | |

| Construct | Code | Factor loading | Cronbach's alpha | CR (rho_a) | CR (rho_c) | AVE | R-squared | Full collinearity VIF |
|---|---|---|---|---|---|---|---|---|
| **Threshold** | | **≥ 0.708** | | **[0.7;0.95]** | **[0.7;0.95]** | **≥ 0.5** | | **≤ 3.3** |
| | PBC2 | 0.793 | | | | | | |
| | PBC3 | 0.780 | | | | | | |
| | PBC4 | 0.808 | | | | | | |
| Desire | | | 0.781 | 0.781 | 0.872 | 0.695 | 0.660 | 2.446 |
| | D1 | 0.821 | | | | | | |
| | D2 | 0.849 | | | | | | |
| | D3 | 0.831 | | | | | | |

*Notes: CR = Composite reliability, AVE = Average variance extracted.*

*Source: The author.*

The study complied with Fornell & Larcker (1981) criteria for discriminant validity. The first requirement was satisfied because, as Table 3 illustrated, the square roots of the AVE in diagonal of each construct were much higher than the correlation coefficient of that construct with other components. The Monte Carlo simulation analysis demonstrated that HTMT performed better than the Fornell-Larcker criterion and the cross-loadings criterion, with sensitivity and specificity rated of 97% to 99%, compared to 20.82% for the Fornell-Larcker method and 0.00% for cross-loadings. The absence of discriminant validity was shown by HTMT values near 1. Comparing the HTMT to a predetermined threshold was the process of using it as a criterion. If the HTMT value exceeded this threshold, discriminant validity was considered lacking (Ab Hamid et al., 2017). All results in Table 4 were below 1, specifically below 0.95, confirming the presence of discriminant validity.

**Table 11: Discriminant validity (Fornell-Larcker Criterion).**

| | Construct | Fornell-Larcker criterion | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| 1 | Attitude | **0.793** | | | |
| 2 | Desire | 0.721 | **0.834** | | |
| 3 | Government support | 0.751 | 0.752 | **0.772** | |
| 4 | Perceived behavioral control | 0.694 | 0.738 | 0.763 | **0.799** |

*Source: The authors.*

*Note: The square roots of AVEs are in bold on diagonal*

**Table 12: Discriminant validity (Heterotrait-Monotrait Ratio)**

| | Construct | Heterotrait-monotrait ratio (HTMT) | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| 1 | Attitude | **Criteria ≤ 0.95** | | | |
| 2 | Desire | 0.909 | | | |
| 3 | Government support | 0.899 | 0.910 | | |
| 4 | Perceived behavioral control | 0.858 | 0.924 | 0.912 | |

*Source: The authors.*

### 3.2.2. Structural model testing

After the measurement model has been analyzed, the inner model was examined. The suggested hypotheses were then tested using bootstrapping with 10,000 samples to determine significance values in the two-tailed t-test (Caldeira & Kastenholz, 2018). H1, H2, and H3 were supported at the 1% significance level. Furthermore, it was evident that H3 had the greatest influence whereas H1 had the least. Overall, it was said that every suggested association is statistically significant. Figure 4 below provided a visual summary of the path analysis and hypothesis testing results.

In addition, the idea of effect size—which was quantified by the f2 metric—offers important information about

how the model's capacity to explain the variance in endogenous latent variables was impacted when a specific component was eliminated. In essence, f2 values measured how big these effects are; small medium, and large effects are indicated by values of 0.02, 0.15, and 0.35, respectively. An f2 value of less than 0.02 indicated that there was no discernible impact. The f2 values for each latent variable could be fully understood by reviewing Table 5, which showed how each one contributed to the explanatory power of the model. Table 5 further showed that Desire was only slightly impacted by constructions like Attitude, Government support, and Perceived behavioral control. This thorough analysis underscored the importance of evaluating each construct's contribution to the overall explanatory power of the model.

**Table 13: Results of hypothesis testing.**

| Hypothesis | Causal relationship | Estimate | Effect size ($f^2$) | Supported |
|---|---|---|---|---|
| H1 | Attitude -> Desire | 0.272*** | 0.087 (small) | Yes |
| H2 | Government support -> Desire | 0.306*** | 0.089 (small) | Yes |
| H3 | Perceived behavioral control -> Desire | 0.316*** | 0.113 (small) | Yes |

*Note: *** p-value ≤ 0.001; ** p-value ≤ 0.01; * p-value ≤ 0.05.*

*Source: The authors.*

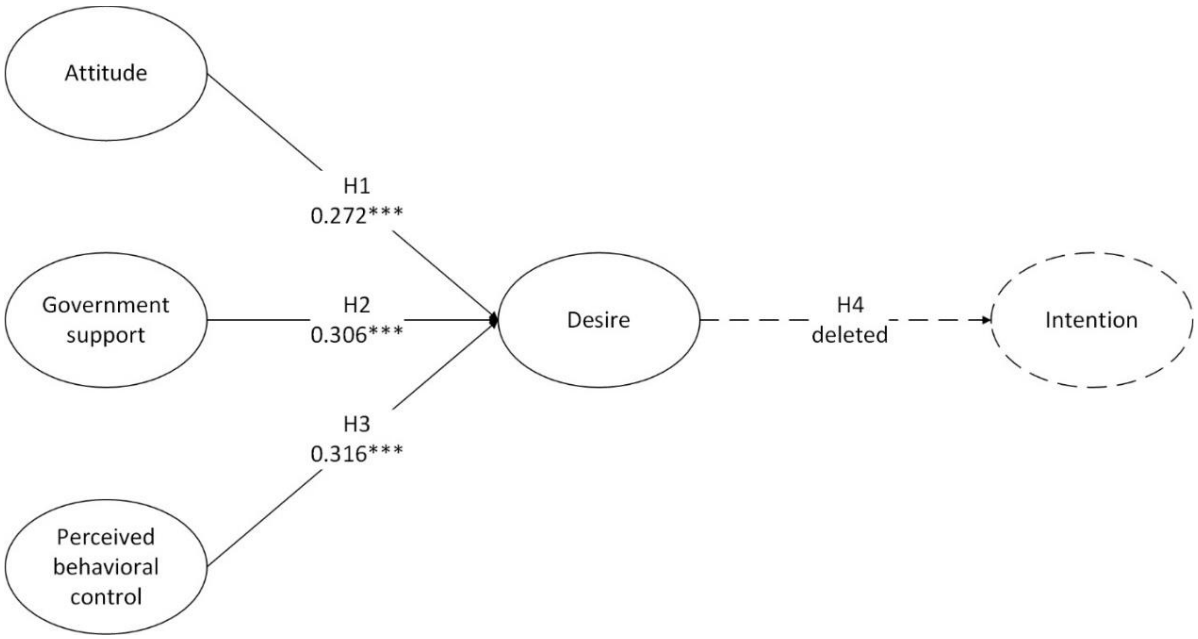



**Figure 9: Theoretical estimation**

*Note 1: *** p-value ≤ 0.001; ** p-value ≤ 0.01; * p-value ≤ 0.05.*

*Note 2: Intention and one hypothesis (H4) were deleted through inferential analysis.*

*Source: The authors.*

Through examining students' desire, our study aims to investigate the relationships between attitude, perceived behavioral control, government support, and entrepreneurial intention. Specifically, we explored how university students' desire to start a business in their home country is influenced by their attitudes, perceived behavioral control, and government support. This desire eventually translated into an intention to start a business back home. By applying the Model of Goal-Directed Behavior (MGB) theory to describe people's intentions and actual behaviors, we further clarified these mechanisms. Overall, our results lent support to the proposed connections.

First, the hypothesis that attitudes have a positive effect on students' desire of starting a business in their home country was supported by our study. This supports Perugini and Bagozzi's (2001) proposed connection between attitudes and desire. Attitude has historically been used to assess a path of action. Students were more inclined to start a business in their hometown if they believed they can succeed at something. This was because their desire to do something demonstrates a motivational commitment to do it. This, however, ran counter to the findings of the He et al. (2023) investigation. According to He et al. (2023), there was no proof that behavioral attitudes significantly influenced

a person's desire to start their own business. The fact that people might not want to do something, had no intention of doing it, or had no intention of doing it at all while they found it attractive could help to explain this. Like attitudes, these assessments do not by themselves reveal motivating commitments.

Second, our findings demonstrated a positive effect between government support and university students' intention of returning home to start a startup. However, there was not much pertinent literature to compare with due to government backing was a self-created variable. The findings were in line with the theory put forth in the earlier empirical study by He et al. (2023), which held that government assistance had a direct impact on university students' desires and was a significant external factor influencing their intention to return home and launch a business. The likelihood of entrepreneurs starting new businesses will increase with their access to and knowledge of entrepreneurial support (Delanoë, 2013).

Finally, our data were not sufficient to support H4 (which has been deleted), which means that we did not demonstrate that attitude, perceived behavioral control, and government support had an impact on university students' intention to return to their hometown to start a business through the mediating variable desire, which was very different from previous studies (He & Ding, 2023; Lee et al., 2018; Perugini & Bagozzi, 2001). The study only demonstrated the links between the variables and the desire variable for university students to establish a business in their hometowns because we stopped the model at the desire variable. Personal desire might really play a major role in determining university students' entrepreneurial intention to launch a firm in their hometown since it encouraged tactics that make the intention more likely to be followed through on. In contrast to desire, intention had a stronger correlation with the result and might necessitate preparation to carry out the desired conduct. Desire did not lead to intention unless self-efficacy was present. Likewise, whereas desire did not signify self-efficacy, intention did. According to Bagozzi (1992), desire and intention were not the same thing, and they might even have different values. Students had a desire of returning hometown to start a startup, but self-efficacy was not sufficient so that desire did not lead to intention.

### 3.3. Theoretical contributions

The current study added to the body of research on university students' desire to start a business in their hometown after graduation, as well as their attitudes and perceived behavioral control over this endeavor. It also examined the ways in which government support influenced this desire. First, although our study did not incorporate new variables, the government support variable which was an external factor, a self-created variable, and there was no study to compare it with except He et al. (2023) It was studied by us and contributed to the source of future comparison. According to the same findings as He et al. (2023), government assistance was unavoidably a factor in the desire of university students to launch a business in their hometown. In other words, people were more inclined to launch a business when they received greater government support. Second, this study was carried out in a developing nation, in contrast to earlier research carried out in Western or developed nations. This was a significant step in generalizing the connections studied in various national and cultural contexts. Desire was not included as an intermediary variable in any of the earlier papers, despite the fact that there were several studies in Vietnam that look at the elements influencing entrepreneurial intention. This study helped to illustrate how desire influences intention in various cultural situations and in a developing nation. The findings, which had not been discovered in other studies, demonstrated that while students may wish to return to their hometown to launch a startup in a developing nation, this desire alone was insufficient to generate the intention. This could be explained by the student's internal or external factors, such as financial constraints or a lack of confidence in their entrepreneurial knowledge. Lastly, students from a wide range of Vietnamese regions participated in this survey, which was carried out across numerous universities. As a result, the findings were more varied and broadly applicable. Students from many regions might find this course useful in advancing their entrepreneurial goals and aspirations. Students could think, feel, and act differently due to the many cultures in various geographic regions. For this reason, students' desires differ from one another.

### 3.4. Practical implications

The findings of the study emphasize the critical role of government support in fostering university students' desire to return to their hometowns and launch businesses after graduation. The strong correlation between government assistance and entrepreneurial desire underscores the need for central and local governments to actively encourage and

support rural entrepreneurship. Policies that provide comprehensive business training, tailored guidance, and accessible venture capital loans with little or no interest can create a more favorable entrepreneurial environment. These initiatives can not only enhance students' entrepreneurial skills but also restore pride in their hometowns, ultimately motivating them to participate in rural regeneration efforts.

Moreover, the study reveals that attitude is the most significant factor influencing entrepreneurial desire. This highlights that an individual's mindset is crucial in shaping their intention to act. However, a positive attitude alone is insufficient to translate desire into action. For instance, despite perceiving the benefits of returning home to start a business, students may hesitate due to external pressures or perceived risks, such as lack of knowledge or inadequate funding. To bridge this gap, policymakers should focus on sustaining and reinforcing the factors that build a positive attitude, such as offering high-quality entrepreneurship courses and practical skill development programs. These measures can instill confidence and equip students with the necessary expertise to pursue their entrepreneurial aspirations.

Finally, enhancing students perceived behavioral control is essential. Governments and universities could encourage participation in entrepreneurship classes, establish dedicated workshops, and facilitate the creation of entrepreneurship-focused clubs. These platforms would allow students to share experiences, address challenges, and exchange ideas, thereby reducing perceived barriers to entrepreneurship. When students feel they have sufficient resources and support to overcome anticipated challenges, their confidence in their ability to act increases. A supportive environment that addresses their concerns and provides actionable knowledge will reduce their anxiety about starting a business, fostering both the desire and intention to return home and contribute to rural economic revitalization. Through these strategic interventions, governments can play a pivotal role in nurturing a generation of entrepreneurs who are empowered to drive sustainable rural development. Considering the function of entrepreneurial ecosystems in sustaining long-term involvement of university graduates in their hometowns can help to improve the practical relevance of this study. Beyond training and financial support, it is imperative to build an innovative culture by means of industry relationships and cooperative networks. Regional entrepreneurial hubs where students may access not only financing but also legal advice, business advising, and mentoring should be supported by governments. Startups can find incubators in these centres, which offer shared resources and co-working environments to lower first expenses for young business owners. Universities should also aggressively incorporate experiential learning through industry collaborations so that students may work on actual business problems and get practical knowledge before starting their businesses. In order to guarantee a support network that goes beyond graduation, policymakers should also create tax incentives for nearby companies that mentor or fund student-led firms. Furthermore, encouraging digital entrepreneurship by means of e-commerce training and online business models will enable students to grow their companies outside of local markets, therefore rendering rural entrepreneurship more feasible. Encouragement of university alumni networks to assist recent graduates with knowledge-sharing platforms, funding possibilities, and networking events would help to increase entrepreneurial sustainability even more. Taken together, these steps can turn entrepreneurial aspirations into profitable long-term companies supporting local economic development and regional advancement.

## IV. CONCLUSION

Our study provided contributions to the existing literature on the relationship between desire and intention and examines the positive effects of attitude, government support, perceived behavioral control on desire or on intention indirectly through desire. The study revealed the beneficial benefits of government support on university students' willingness to return to their hometown to establish a business and rural revitalization, based on 311 responses gathered from students at Vietnamese universities (particularly in Ho Chi Minh City, An Giang). In particular, assistance measures encouraged students' desire. Students will be more motivated and eventually develop a desire to launch a business if they obtain assistance from the government or local authorities (such as low-interest loans, resources, or land for new entrepreneurs). This study also demonstrated that a person's desire to launch a business in their hometown was influenced by their attitude and perceived behavioral control. These findings had implications for creating an environment that encourages and facilitates the sharing of ideas, worries, and entrepreneurial experiences. Furthermore, offering entrepreneurship classes ranging from foundational to advanced helped students become more self-assured,

which in turn boosted their desire to launch their own business in their home city.

The following were some limitations of this study that should be highlighted. First off, only students were the target demographic for our survey. This group could be more optimistic, oblivious to risks and obstacles that come with being an entrepreneur. This could cause some inaccuracy in the study's findings. Since master's and doctoral students might have taken courses or heard of entrepreneurship, the study might broaden its focus to include them. Second, the model's variables lacked sufficient diversity to assess the factors influencing university students' intentions to return home and launch a business based on their desires. To develop a more comprehensive and rigorous model, future research should incorporate not just personal emotional aspects but also external factors like family dynamics or business knowledge. In order to completely comprehend the fundamental mechanisms in the relationship between the intention variable and the mediating variable desire, university students' desire to return to their hometown and launch a business can therefore combine a wide range of additional variables in addition to those listed in the research model. Lastly, while this study demonstrated some disparities between the North, Central, and South areas of Vietnam, the the sample size were insufficient to support the findings. Future studies might examine each region in further detail to analyze the variations in students' intentions to start a business in their hometowns.

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# DETERMINANTS OF ADOPTING OPEN INNOVATION: A STUDY IN SMALL AND MEDIUM-SIZED ENTERPRISES IN THANH HOA PROVINCE

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**ABSTRACT**

Open innovation (OI) is among the vital innovation paradigms for assisting small and medium-sized enterprises (SMEs) to implement innovation initiatives effectively. This study explores the determinants of adopting OI in SMEs in both inbound and outbound OI. Through using partial least squares structural equation modeling (PLS-SEM) with a survey sample of 376 SMEs in Thanh Hoa province, The results show that organizational agility and economic and financial capacity are the two factors that have the most significant influence on OI adoption in SMEs, in which organizational agility is the most important determinant of inbound OI adoption. In contrast, economic and financial capacity is the most significant determinant of outbound OI adoption. The following factors determining the adoption of OI in SMEs are absorptive capacity and corporate strategy, in which absorptive capacity plays a more critical role for inbound OI adoption, and corporate strategy plays a more important role for outbound OI adoption. From the findings, the author has proposed several recommendations for SMEs to promote OI adoption, thereby improving business efficiency for enterprises.

*Keywords*: "Absorptive Capacity", "Economic and Financial Capability", "Inbound open innovation", "Outbound open innovation", "SMEs"

## I. INTRODUCTION

Chesbrough (2003) first defined open innovation (OI) as "the intentional use of inside-out and outside-in knowledge flows to drive internal innovation and expand the corresponding market for external OI adoption." This approach is closely related to the flow of inside-out and outside-in knowledge across all internal and external factors related to the product, such as competitors, internal aspects of the enterprise, cooperation with suppliers, and other agencies such as universities, research centers, academies, and research institutes. The OI approach suggests enterprises should be more flexible and open to innovation processes. This not only helps businesses attract many benefits, such as increasing competitiveness from outside but also helps businesses convert ideas, increase innovation, and develop and promote the transfer of researched technologies within the company to other organizations and businesses (Spender et al., 2017).

OI has become a widely recognized and implemented concept in large corporations to accelerate and enhance the innovation process of organizations and commercialize their innovations (Puriwat & Tripopsakul, 2021). For small and medium-sized enterprises (SMEs), although recent literature suggests that adopting OI can help SMEs increase their innovation performance, SMEs benefit differently from different OI implementation methods and adoption models depending on the size of the enterprise (Sikandar & Abdul Kohar, 2022). Therefore, a better understanding of the conditions and contexts of SMEs will increase the chances of successfully adopting OI methods in enterprises.

In Vietnam, SMEs account for about 98% of nearly 930 thousand enterprises. SMEs play an important role in economic growth and job creation, reducing poverty and improving workers' income. SMEs are also the source of innovation in business and the bridge to bring scientific and technological research results to practical life. In the current trend, it is no longer appropriate for SMEs to rely solely on their resources for development. They must promote their internal strengths and seek support from external resources. In particular, OI is a highly effective solution, helping SMEs solve difficulties in the digital transformation process. However, in applying OI, Vietnamese SMEs still face many barriers, such as limitations in capacity, skills, strategies, and management knowledge of enterprises, business risks, and difficulty in accessing external financial resources (Nhuan & Trang, 2023). Therefore, research on factors affecting the application of OI in SMEs is significant. This is a way to help enterprises identify which factors hinder or promote the application of open OI in enterprises, thereby helping SMEs overcome limitations and difficulties from the

characteristics, capacity, and resources within the internal structure of the enterprises and the external impact environment.

This article focuses on an overview of OI in enterprises and the factors influencing the application of OI in Vietnamese SMEs. It uses the results of empirical analysis from the PLS-SEM model, with a survey sample of 500 SMEs in Thanh Hoa province. The results of this study will be an essential basis for managers and policymakers to develop better solutions and policies to promote OI in Vietnamese SMEs in the coming time.

## II. LITERATURE REVIEW

### 2.1. Open Innovation

According to Chesbrough (2003), OI is the practice of encouraging organizations to use external sources to improve product or service lines while shortening the time needed to bring products to market and commercialize them or to provide OI results that the organization has developed internally that are not yet suitable for the current business model of the enterprise, but can be effectively used elsewhere outside. OI practices will allow organizations to explore and acquire new technologies and knowledge from external sources, while external OI refers to the use of internal ideas or technological knowledge through licensing, patenting, or legal partnerships to obtain financial or non-financial benefits (Popa, Soto-Acosta & Martinez-Conesa, 2017; Rumanti et al., 2021)

Regarding the process and operating mechanisms and specific application of OI, previous studies have suggested two main approaches to OI: the inside-out approach and the outside-in approach (Chesbrough H, 2003; Chesbrough & Brunswicker, 2013). Specifically, OI includes two mechanisms: The first mechanism is the outside-in knowledge flow approach, meaning that the OI activities of the enterprise are related to receiving knowledge flows, ideas, or technology from the outside and applying them in the enterprise. This is how enterprises exploit technology and knowledge from external partners such as suppliers, customers, competitors, suppliers, or research institutes and universities and apply them in the enterprise. OI activities can be carried out through short-term employee exchanges, technology transfer into enterprises, mergers and acquisitions, and outsourcing activities (Rumanti et al., 2021). The second mechanism refers to the flow of knowledge, ideas, technology, and inventions to the market through the sale and transfer of intellectual property from enterprises to partners and separation into subsidiaries. This is the inside-out process, that is, activities such as licensing, selling ideas, technology, and other enterprises' resources to the market to partners (Rumanti et al., 2021). Other studies suggest a third approach, the hybrid process—a combination of external and internal knowledge flows through building alliances within the industry or technology sector (Ahn, Minshall & Mortara, 2015; Mazzola, Bruccoleri & Perrone, 2016).

### 2.2. Factors affecting Open Innovation adoption in enterprises

#### Organizational Agility and OI

Organizational agility is the ability of a firm to respond to unforeseen changes through immediate and innovative responses (Walter, 2021). Previous studies confirm that organizational agility is one of the important capabilities that help firms grasp current market trends (Cai et al., 2019; Walter, 2021). Organizational agility is a multidimensional concept that scholars have classified according to different criteria (Lu & Ramamurthy, 2011). Nafei (2016) suggested three aspects of organizational agility: Sensing Agility, Decision-Making Agility, and Acting Agility/Practicing. Vázquez-Bustelo et al. (2007) classified organizational agility according to five factors: agile human resources, technology, value chain integration, concurrent engineering, and knowledge management. Zandi & Tavana (2011) classified organizational agility into three factors: strategic, operational, and functional agility. Sambamurthy et al. (2003) also identified three dimensions of organizational agility: customer, partner, and operational agility.

According to the concept of dynamic capabilities, organizational agility can arise from integrating strategic resources. Teece et al. (2016) argue that organizational agility is a prerequisite for adopting OI. By allowing flexible access to external knowledge, OI reduces the risk associated with experimentation and stimulates firms' innovation motivation, allowing flexibility when attempting radical innovation (Liao et al., 2019). Using external resources helps firms continuously communicate and share knowledge, enhancing the diffusion of know-how (Scuotto et al., 2017). From the research overview, the author proposes the following hypothesis:

*H1a: Organizational agility has a positive impact on adopting inbound OI;*

*H1b: Organizational agility has a positive impact on adopting outbound OI.*

**Organizational absorptive capacity and OI**

According to Overby et al. (2006), absorptive capacity is a set of processes and routines through which firms acquire, transform, and use knowledge to create a dynamic organization. According to Arias-Pérez et al. (2020), absorptive capacity is divided into four dimensions: (1) the ability to acquire, identify, evaluate, and utilize external knowledge about operations; (2) assimilation, understanding of knowledge acquired from outside; (3) transformation, the ability to integrate old knowledge with newly acquired and assimilated knowledge; (4) exploitation, the ability to combine acquired, assimilated, and transformed knowledge into usable organizational routines. Previous literature confirms that adopting OI in a firm requires the firm to acquire, disseminate, and utilize external and internal knowledge (Arias-Pérez et al., 2020). Successful innovation processes are influenced by the skills and capabilities of leaders to access internal and external knowledge sources (Aboelmaged et al., 2019). Absorptive capacity is a prerequisite for any knowledge management activity involving the deliberate management of knowledge flows beyond the organization's boundaries to generate innovation (Spithoven et al., 2010). It represents the presence of a knowledge base that facilitates the adoption of innovation, where context is key to inspiring the creation of new concepts and finding new ways to use the knowledge of external partners (Aboelmaged et al., 2019). The absorptive capacity allows firms to collaborate actively in a proactive manner rather than passively observing. In the long term, absorptive capacity allows for consolidation of high success rates in co-innovation projects, high reputation in the virtual environment, and positive valuation by external partners, enhancing collaborative work ( Arias-Pérez et al., 2020; Aboelmaged et al., 2019; Tsou & al., 2019). From the above studies, the author proposes the following hypothesis on the relationship between organizational absorptive capacity and the adoption of OI in SMEs as follow:

*H2a: Organizational absorptive capacity has a positive impact on adopting inbound OI;*

*H2b: Organizational absorptive capacity positively impacts adopting outbound OI.*

**Economic and financial capacity and OI**

The ability of enterprises to apply internal research and development projects will depend mainly on financial and economic potential factors. Strong financial capacity will help enterprises have investment potential, achieve superior knowledge resources to develop products and services, promote innovation activities faster, and respond faster to market needs (Chesbrough H, 2003). Many previous studies have identified financial capacity as the driving force for OI. SMEs apply OI to access external financial and economic resources (Van de Vrande et al., 2009). The article in the research work of Praest Knudsen & Bøtker Mortensen (2011) shows that OI is costly and leads to more expensive product development projects than the traditional closed OI model, so it requires businesses to have strong financial capacity. There are also similar views cited by Oduro (2020) & Brunswicker (2009) that investment costs for ensuring and enforcing intellectual property rights and limitations in research and development activities can hinder SMEs' application of OI. According to Binh & Cuong (2015), financial capacity is one of the fundamental issues determining the success of OI due to the increasing scale and integration of technology in innovative solutions, requiring linkages in financial investment. The issue of intellectual property trading in OI requires promotion into an important market. That forces managers to continue to improve research on business models and relationships in the context of multiple ownership, intellectual property transfer, profit sharing, and reinvestment. From the above theoretical foundations, the study proposes the following hypothesis:

*H3a: Economic and financial capacity has a positive influence on adopting inbound OI;*

*H3b: Economic and financial capacity positively influences adopting outbound OI.*

**Business strategy and OI**

Huston & Sakkab (2006) point out that OI efforts must at least be consistent with the firm's strategy and preferably be an integral part of each firm's strategy. According to Schilling (2015), when choosing a partner, two factors need to be carefully considered: resource compatibility and strategic compatibility. "Resource compatibility refers to the extent to which potential partners possess resources that can be effectively integrated to create a value-creating strategy," and "strategic compatibility refers to the extent to which potential partners share similar goals and styles/strategies." This view is agreed upon by several scholars, including Chesbrough & Crowther (2006). These authors argue that similarity

in resources and strategies between partners is an indispensable requirement for effectively pursuing, implementing, and managing an OI strategy. The model developed by Crema & Verbano (2013) demonstrates that the strategy influences the openness toward the external environment; this approach is followed especially when firms want to achieve radical innovation. Crema, Verbano, & Venturini (2014) confirmed helpful indications on how to define competitive strategy and coherent level of OI to pursue improved firm performance. Results highlighted that firms that pursue an innovative strategy invest more in technical skills and core competencies. Companies that choose a diversification strategy are likely to use exclusively managerial practices of OI. At the same time, firms focused on a strategy of efficiency are inclined toward OI practices and, to a lesser extent, to the development of core competencies. From the above studies, hypothesis H4 is proposed as follows:

*H4a: Firm strategy has a positive influence on adopting inbound OI;*

*H4b: Firm strategy has a positive influence on adopting outbound OI.*

Based on an extensive literature review, the author has developed a research model to examine the determinants of adopting OI in Thanh Hoa SMEs **(** Figure 2.1). This model is structured to explore the influence of factors including organizational agility, absorptive capacity, economic and financial, and corporate strategy on applying OI in two aspects: inbound OI and outbound OI.

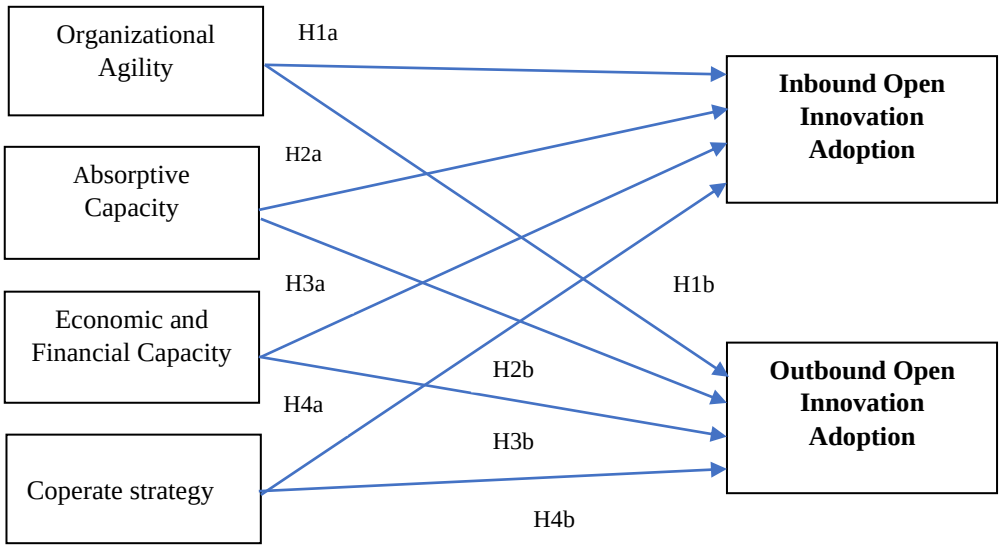



**Figure 2.1. Proposed research model**

## III. METHODOLOGY

The study uses quantitative research methods through PLS-SEM analysis to test the research hypotheses regarding the relationships between factors and OI adoption. To apply OI of SMEs in Thanh Hoa City.

The study sample size was determined based on the minimum sample size for quantitative analysis. This includes the required sample size for regression analysis following the formula 50+8m, where m represents the number of independent variables (Tabachnick & Fidell, 1996). The proposed research model includes four independent variables and two dependent variables with 25 observed variables, so the minimum sample size required to be surveyed is 50 + 8.25 = 250 observations. In addition, according to Hair et al. (2022), the Sample size for EFA analysis is at least 5 times the number of observed variables (75 observations). The author selected a formal quantitative sample of 400 questionnaires to ensure objectivity and reliability. After the survey, the author collected 376 valid questionnaires, meeting the requirements for analysis.

Data collection process: Surveys were administered in person and via email, depending on the respondents' accessibility. Survey questionnaires were sent to managers in SMEs (key actors in the innovation process) from August to October 2024. The 5-point Likert scale expressed their agreement with the given statements. The data collection period spanned three months, allowing ample time for responses.

The collected data were processed and analyzed by SMART PLS 3.0 software, using several techniques to ensure

robust results. The following methods were applied: Reliability testing of the scales through Cronbach's alpha and Composite reliability (CR) coefficients; Convergent and discriminant validity testing through Average Variance Extracted (AVE) and Heterotrait-Monotrait Ratio (HTMT) matrix; Collinearity testing of the observed variables through outer Variance Inflation Factor (VIF) / inner VIF; and evaluation of the PLS-SEM to test the research hypotheses.

The questionnaire includes two main sections: (1) typical information related to respondent demographics and (2) measurement items on a five-point Likert scale ranging from strongly agree (5) to disagree (1) strongly. This study measures six constructs: Organizational Agility (OA), Absorptive Capacity (AC), Economic and Financial Capacity (EFC), Outbound OI Adoption (OOI), and Inbound OI Adoption (IOI).

**Table 3.1. Scales of variables in the research model**

| Code | Scales | Source |
|---|---|---|
| **OA** | **Organizational Agility** | |
| OA1 | The business always responds to customer needs quickly. | Puriwat & Tripopsakul (2021) |
| OA2 | Businesses can quickly adjust production scale to meet changing customer needs. | |
| OA3 | Businesses can quickly make internal adjustments when there are changes from suppliers. | |
| OA4 | Businesses are constantly innovating to serve customers and the market better and better. | |
| OA5 | Businesses can manage relationships well with stakeholders. | |
| **AC** | **Absorptive Capacity** | |
| AC1 | Businesses can find and use relevant information easily. | Puriwat & Tripopsakul (2021) |
| AC2 | Businesses can communicate information to departments quickly. | |
| AC3 | The company's employees can absorb new knowledge quickly. | |
| AC4 | Businesses can adapt technology to new knowledge. | |
| **EFC** | **Economic and Financial Capacity** | |
| EFC1 | Enterprises have enough financial resources to start implementing OI projects. | Puriwat &Tripopsakul (2021) |
| EFC2 | Enterprises with external partners have full technology and modern infrastructure conditions for OI projects. | |
| EFC3 | Enterprises have full labor conditions to implement OI projects initially. | |
| EFC4 | Enterprises have full conditions in terms of capital and land to carry out OI projects. | Nhuan & Trang (2023) |
| **CS** | **Corporate strategy** | |
| CS1 | Applying OI is a goal in enterprises' business strategies. | Huston & Sakkab (2006) |
| CS2 | Collaboration with outsiders in innovation is a part of the enterprise's business strategy. | |
| CS3 | Potential business partners share similar goals and strategies | Schilling (2015), |
| CS4 | Enterprises choose diversification strategies to suit the application of OI. | Crema, Verbano & Venturini (2014) |
| **OOI** | **Outbound OI Adoption** | |
| OOI1 | Businesses seek to gain additional benefits from the internal innovations that have been implemented. | Rumanti et al. (2021) |
| OOI2 | Businesses adopt innovative methods learned from other organizations. | |
| OOI3 | Businesses willing to sell product licenses to other organizations | |
| OOI4 | Businesses are willing to sell patents outside. | |
| **IOI** | **Inbound OI Adoption** | |
| IOI 1 | External organizations are directly involved in enterprises' innovation activities. | Rumanti et al. (2021) |
| IOI2 | External organizations such as governments, research institutes, universities, | |

| | | |
|---|---|---|
| | consultants, etc., support business innovation activities. | |
| IOI3 | Businesses use the latest tools and materials to enhance internal innovation. | Rumanti, Rizana & Achmad (2023) |
| IOI4 | Enterprises are willing to buy copyrights and patents from outside to carry out internal innovation. | |

*Source: compiled from the author*

## IV. RESULTS AND DISCUSSION

### 4.1. Measurement Model Evaluation

According to Hair et al. (2022), for the measurement model, the quality of observed variables is reflected through the outer loading coefficient. Suppose this coefficient is >= 0.7: Very good, < 0.4: Rejected. The data analysis results of the observed variables in this study show that the outer loading coefficients of all variables are > 0.7 (Table 2), thus ensuring the quality of the observed variables for further analysis.

Regarding the reliability test of the scales in the measurement model, according to Hair et al. (2022), Cronbach's alpha and Composite reliability values ranging from 0.6 to 0.7 are considered acceptable, and values ranging from 0.7 to 0.9 are considered satisfactory. If the construct has a value lower than 0.6, it is supposed to lack internal consistency reliability. The results of the reliability test of the scales from the survey data in this study are shown in Table 4.1. The data analysis results show that both Cronbach's alpha and Composite reliability values are more significant than 0.7, thus ensuring the internal consistency and reliability of the scales.

In addition, the convergent validity of the scales is examined based on the Average Variance Extracted (AVE) index. According to Hair et al. (2022), when the AVE index is ≥ 0.5 (the latent variable explains at least 50% of the variance of each observed variable), the scales ensure convergent validity. The results in Table 2 show that AVE values of all factors are above 0.6, demonstrating the convergent validity of the construct for further analysis.

**Table 4.1. The outer loadings, Composite Reliability (CR), Cronbach's alpha, and Average Variance Extracted (AVE)**

| Latent variables | Item Code | Item loadings | CR | Cronbach's Alpha | AVE |
|---|---|---|---|---|---|
| Organizational Agility (OA) | OA1 | 0.816 | 0.889 | 0.841 | 0.623 |
| | OA2 | 0.882 | | | |
| | OA3 | 0.853 | | | |
| | OA4 | 0.850 | | | |
| | OA5 | 0.773 | | | |
| Absorptive Capacity (AC) | AC1 | 0.765 | 0.893 | 0.842 | 0.677 |
| | AC2 | 0.834 | | | |
| | AC3 | 0.827 | | | |
| | AC4 | 0.862 | | | |
| Corporate strategy (CS) | CS1 | 0.867 | 0.893 | 0.841 | 0.678 |
| | CS2 | 0.858 | | | |
| | CS3 | 0.802 | | | |
| | CS4 | 0.760 | | | |
| Economic and Financial capability (EFC) | EFC1 | 0.854 | 0.926 | 0.894 | 0.760 |
| | EFC2 | 0.920 | | | |
| | EFC3 | 0.905 | | | |
| | EFC4 | 0.802 | | | |
| Outbound OI Adoption (OOI) | OOI1 | 0.905 | 0.930 | 0.899 | 0.767 |
| | OOI2 | 0.893 | | | |
| | OOI3 | 0.855 | | | |
| | OOI4 | 0.850 | | | |
| Inbound OI Adoption | IOI1 | 0.856 | | | 0.773 |

| | | | | |
|---|---|---|---|---|
| (OOI) | IOI2 | 0.858 | | |
| | IOI3 | 0.869 | 0.931 | 0.902 |
| | IOI4 | 0.930 | | |

*Source: Data processing results*

The discriminant validity of the scales in this study is examined through the Heterotrait-Monotrait Ratio (HTMT). If the HTMT value is high, it indicates a discriminant validity issue. According to Henseler et al. (2015), the threshold value is 0.90. If the construct value is greater than 0.9, it indicates a lack of discriminant validity. The data analysis results in this study show that all HTMT values in Table 4.2 are lower than the threshold value of 0.9. Therefore, all scales ensure discriminant validity.

**Table 4.2. Discriminant Validity- Heterotrait- monotrait ratio (HTMT)- Matrix**

| | AC | CS | EFC | IOI | OA | OOI |
|---|---|---|---|---|---|---|
| AC | | | | | | |
| CS | 0.174 | | | | | |
| EFC | 0.190 | 0.251 | | | | |
| IOI | 0.316 | 0.313 | 0.536 | | | |
| OA | 0.179 | 0.160 | 0.253 | 0.558 | | |
| OOI | 0.287 | 0.326 | 0.524 | 0.579 | 0.399 | |

*Source: Data processing results*

### 4.2. Evaluation of PLS-SEM Structural Model

#### Multicollinearity checking and model fit

For the structural model, the study first examines the multicollinearity of the independent variables (Inner VIF). If the VIF value is > 5, it indicates the possibility of collinearity between the independent variables, and the model is no longer reliable for testing the research hypotheses. If the VIF value remains low < 5 or > 3.3, it indicates a potential multicollinearity issue ( Hair et al., 2022). In this study, all VIF values are less than 3. Therefore, there is no multicollinearity between the variables in the structural model.

The explanatory power of the independent variables on the dependent variables was assessed through the R-square of the model. The data analysis results show that the R-square of the Inbound OI Adoption model is 0.433. This means that independent variables in the model explain 43.3% of the variance in the Inbound OI Adoption of SMEs, while the R-square of the Outbound OI Adoption model is 0.346. This means that independent variables in this model explain 34.6% of the variance in SMEs' Outbound OI Adoption. Thus, it can be seen that four factors in this model determine the Inbound OI Adoption more than the Outbound OI Adoption in Thanh Hoa SMEs.

#### Structural Model and Hypotheses Testing

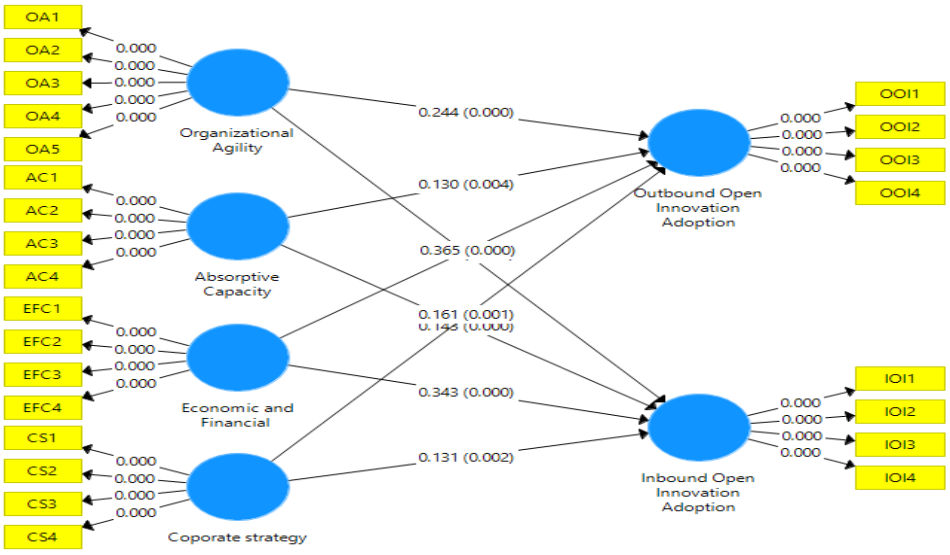



**Figure 4.1. PLS-SEM Estimation Results**

After assessing the measurement model, the structural model was developed. Figure 4.1 demonstrates outcomes for the path model, illustrating an adequate model fit to the data. This study estimates the structural model at 5000 iterations and the stopping criterion of 0.00000001. The estimation result shows the regression coefficients and p-values for testing the statistical significance of the regression coefficients.

The results of the hypothesis testing of the models are shown in Table 4.3. Compromising, all eight hypotheses are supported at the 5% significance level after testing with the PLS-SEM model. The results show that at a 5% significance level (95% confidence level), Organizational Agility, Absorptive Capacity, Corporate strategy, and Economic and Financial Capability all affect both Outbound OI Adoption and Inbound OI Adoption in SMEs (The p.value values in the paths in the structural model are <0.05).

**Table 4.3. Results of Hypothesis Testing**

| Hypothesis | Relationship | Original Sample | P Values | Test results |
|---|---|---|---|---|
| H1a | Organizational Agility -> Inbound OI Adoption | 0.381 | 0.000 | Supported |
| H2a | Absorbent Capacity -> Inbound OI Adoption | 0.143 | 0.001 | Supported |
| H3a | Economic and Financial Capability -> Inbound OI Adoption | 0.343 | 0.000 | Supported |
| H4a | Corporate strategy -> Inbound OI Adoption | 0.131 | 0.002 | Supported |
| H1b | Organizational Agility -> Outbound OI Adoption | 0.244 | 0.000 | Supported |
| H2b | Absorbent Capacity -> Outbound OI Adoption | 0.130 | 0.004 | Supported |
| H3b | Economic and Financial Capability -> Outbound OI Adoption | 0.365 | 0.000 | Supported |
| H4b | Corporate strategy -> Outbound OI Adoption | 0.161 | 0.001 | Supported |

*Source: Data processing results*

**4.3. Discussion**

Inbound OI of SMEs is demonstrated through the fact that external organizations such as the government, research institutes, universities, consultants, etc., support the innovation activities of enterprises and directly participate in the innovation activities of enterprises; at the same time, enterprises use the latest tools and materials to enhance internal innovation and are willing to buy copyrights and patents from outside to carry out internal innovation. The research results show that the factors determining inbound OI adoption include organizational agility, followed by economic and financial capability, absorptive capacity, and finally, corporate strategy, in which the most significant influence is organizational agility, with an influence coefficient of 0.381, meaning that the agility of enterprises towards customers, suppliers, markets and stakeholders are the factors that have the most substantial impact on SMEs' inbound OI. This result is also similar to the conclusion shown in Teece et al.'s (2016) study that organizational agility acts as a prerequisite for the adoption of OI and is also similar to the result from Scuotto et al.'s (2017) study that using external resources helps firms to communicate and share knowledge continuously, thus enhancing the diffusion of know-how.

Organizational agility is the second most influential factor for outbound OI adoption after economic and financial capability. The influence of organizational agility on outbound OI adoption is explained by the fact that by allowing flexible access to external knowledge, OI reduces the risk associated with experimentation and stimulates the innovation motive of the enterprise, allowing flexibility when attempting radical and radical innovation (Liao et al., 2019). The research results show that among the four factors included in the model, economic and financial capability is the most significant determinant of enterprises' adoption of innovation methods learned from other organizations. This is a rather costly process in terms of money and other resources. This conclusion is similar to the research results of Binh & Cuong (2015) when it stated that financial capacity is one of the fundamental issues determining open OI's success due to the increasing scale and integration of technology in innovative solutions, requiring linkages in financial investment. Economic and financial capability is the second factor determining inbound OI adoption. This study shares the same view as Puriwat & Tripopsakul's (2021) research. Thus, it can be seen that organizational agility and the economic and financial capacity of enterprises are the two factors that significantly influence the application of OI in SMEs in Thanh Hoa province.

The following factors that determine the adoption of OI in SMEs are an absorptive capacity and corporate strategy, in which an absorptive capacity is the third most influential factor on inbound OI adoption and the fourth most

influential factor on outbound OI adoption. Meanwhile, corporate strategy determines outbound OI adoption at the third level and is the fourth most influential factor in inbound OI adoption. Adopting inbound OI will be easier and faster when a business can search for and use relevant information, absorb new knowledge quickly, and adapt technology to new knowledge. This result is similar to the conclusion of Arias-Pérez et al. (2020), who states that adopting OI in a business requires the business to collect, disseminate, and use external and internal knowledge. Similarly, Aboelmaged et al. (2019) also confirmed that the successful innovation process is influenced by the skills and capabilities of leaders in accessing internal and external knowledge sources. In addition, the research results also show that corporate strategy, the enterprise's goal of OI with external cooperation in the enterprise's business strategy, and the choice of diversification strategy to suit the application of OI are decisive factors for the successful application of OI.

Although the results from this study are limited to 376 SMEs surveyed in Thanh Hoa province, they have also shown the role of factors in the application of OI in two directions: (1) Receiving knowledge, ideas, and technology sources from outside the organization to combine with internal resources (inbound OI), and (2) Commercializing knowledge, ideas, and technology sources outside (outbound OI). These factors include organizational agility, economic and financial capability, absorptive capacity, and corporate strategy. These are also real factors that have influenced the successful application of OI from enterprises in Vietnam and around the world. An example in the world is the OI ecosystem of Samsung with the highlight of the ability to coordinate with external organizations to create new values by linking knowledge, information, and technology resources. With IBM, Samsung has established a cross-licensing agreement, allowing both parties to use each other's patents to innovate since 2011. In addition, Samsung also cooperates with universities and research institutes to provide expert human resources, research expertise and infrastructure, and also acquires and merges with technology companies. OI strategies are integrated into the overall corporate strategy of Samsung and are implemented with organizational agility, while technology absorption is always the top goal.

In Vietnam, the story of the OI of Viettel Telecommunications and Technology group with both inbound OI and outbound OI directions is also a typical example of successful OI coming from the agility and absorption capacity of the organization. Viettel regularly participates in annual Mobile World Congress events to seek cooperation opportunities in the technology field, and organizes the Innovative Me contest to encourage employees to share their creative messages; has an information portal to manage initiatives and topics so that domestic and foreign units can register their initiatives. Viettel also has two Innovation Labs facilities with full equipment to meet 4.0 technology to nurture new technology ideas and connect the domestic and foreign information technology community. In addition, Viettel has cooperated with Qualcomm to bring 5G technology to the world. Another example is from Phuc Sinh Joint Stock Company - Vietnam's leading agricultural product exporter established in 2001. With the agility of the leadership team, Phuc Sinh has considered OI as a vital strategy to enhance the Company's competitiveness. Phuc Sinh has chosen the form of OI combining experimental research with innovation with Rainforest Alliance and cooperating with advertising media partners to improve the effectiveness of customer access and product advertising. In addition, Phuc Sinh also organized a national innovation contest to seek ideas from young people and consumers.

From the above practical examples, it can be seen that although the research results are only within the scope of SMEs in Thanh Hoa province, reality has shown that for enterprises that have successfully implemented OI, organizational agility, absorptive capacity, corporate strategy as well as enterprise capacity are factors that directly affect the successful application of OI. Thus, these findings might apply to other regions or industries as well. Vietnam currently has an OI ecosystem, where the business community and startups have many opportunities when joining hands with other enterprises, aiming to promote internal innovation and expand the corresponding market. However, for SMEs in Thanh Hoa, the application of OI still faces many difficulties, especially for outbound IO because the majority of SMEs are small and micro enterprises, with limited economic and financial capacity, the absorption capacity of enterprises, especially the ability to absorb technology, is difficult. In addition, many business leaders are afraid of change and lack agility, which are also barriers leading to not applying OI.

This study is limited to SMEs in Thanh Hoa province as well as potential biases in self-reported data or challenges in accessing financial resources for OI. Therefore, the future research direction is to expand the scope of research across regions as well as add secondary data on the current status of OI adoption in enterprises to have more basis for

comparing the differences in OI adoption between regions as well as between industries, thereby drawing more appropriate general conclusions.

## V. CONCLUSION AND RECOMMENDATION

OI is an inevitable approach in the current context of enterprises, especially SMEs, to implement innovation initiatives to enhance their competitiveness. This study explores the determinants of adopting OI in SMEs in both inbound and outbound OI. Accordingly, a comprehensive research model based on the concepts of organizational agility, absorptive capacity, economic and financial capacity, and corporate strategy has been proposed to examine and evaluate the factors affecting the adoption of innovation by SMEs. The research results through the PLS-SEM model with a survey sample of 376 SMEs in Thanh Hoa province show that organizational agility and the economic and financial capacity of enterprises are the two factors that have the most significant influence on the application of OI in SMEs in which organizational agility has the most significant impact on inbound OI adoption. In contrast, economic and financial capacity impacts outbound OI adoption the most. The following factors that determine the application of OI in SMEs are an absorptive capacity and corporate strategy, in which an absorptive capacity plays a more important role for inbound OI adoption, and corporate strategy plays a more important role for outbound OI adoption.

From the findings, the author proposes recommendations for SMEs to apply OI. Firstly, to apply OI in an organization, entrepreneurs and leaders of SMEs must foster an agile culture for all employees. Moreover, nurturing the organization's absorptive capacity is also necessary for SMEs to promote OI. Business leaders need training sessions, sharing sessions, and specialized training programs for employees to improve their knowledge and develop their capacity to effectively absorb internal and external knowledge, which are also urgent initiatives to achieve the orientation of OI. Secondly, SMEs need to enhance their access to capital sources and make the most of the government's support programs to promote SMEs' business development in general and innovation projects in particular. In addition, it is necessary to enhance the ability to cooperate with partners through the core competitive advantages of the enterprise itself. Third, SMEs need to increase adaptability and flexibility, consider adjusting the overall business strategy, and try to balance internal strategic factors with external partners to enhance the effectiveness of cooperation. Furthermore, to avoid the opportunistic behavior of innovation partners, SMEs need to establish precise mechanisms and contracts to ensure satisfactory rights for both parties in the cooperation process. Finally, SME leaders must build an open corporate culture, create easy connections, and share knowledge inside and outside the enterprise. In addition to maintaining the current R&D system, it is advisable to consider establishing a separate team/department specializing in supporting the development of innovation projects with external partners. OI can sometimes encounter obstacles from employees in the enterprise, so it is necessary to have appropriate communication activities about the benefits of OI to employees. At the same time, it is essential to raise awareness and knowledge to form a culture of adaptation and readiness for innovation for all employees in the enterprise.

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# FACTORS AFFECTING THE SUSTAINABILITY AND GROWTH OF SMALL AND MEDIUM ENTERPRISES IN VIET NAM

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**ABSTRACT**

Small and medium enterprises are recognized as playing an important role in the socio-economic development of a country. In Vietnam, they are considered a way to create jobs, alleviate poverty, ensure food security and promote private sector development. Although there are a number of government support programs and plans to empower SMEs to be more competitive and sustainable, many businesses continue to fail at an alarming rate. This study aims to identify and assess the impact of factors on sustainability and growth of SMEs in Vietnam. To achieve the research objective, the author conducted a survey of 419 SMEs in Vietnam using a structured questionnaire on a 5-point likert scale. The data collected was analyzed using SPSS 20.0 software. The research results show that all 5 factors proposed in the research model, including: Financial factors, Infratructural factors, Political- Legal factors, Owner/ Manager personal characteristics, Technological factors all have an impact on the sustainability and growth of SMEs in Vietnam, in which Infratructural factors have the greatest impact and Owner/ Manager personal characteristics have the least impact. Based on the research results, the author proposes recommendations to promote the usability and growth of SMEs in Vietnam in the coming time.

*Key words: SMEs, sustainability, growth, social- economic development.*

## I. INTRODUCTION

Small and medium-sized enterprises (SMEs) play an important role in creating jobs, promoting economic growth and sustainable development, which is recognized worldwide. As the "home" of entrepreneurship, SMEs are often the starting point for many large enterprises, gradually developing through capital accumulation and management experience. In particular, SMEs are an important driving force for socio-economic empowerment, supporting start-ups, developing new technologies and replacing imports.

The importance of SMEs for long-term growth has attracted global attention due to their role in poverty reduction, job creation, increasing self-sufficiency, promoting production and exports, and contributing greatly to GDP. In developing countries, including Vietnam, SMEs and the informal sector are the main source of income, contributing to local economic development and serving as a basic means of survival. SMEs are an important part of the private economic sector, present in most regions, localities, and areas and accounting for a large proportion of the Vietnamese business community. According to the General Statistics Office, by the end of 2023, Vietnam currently has about 900,000 enterprises, of which SMEs account for about 97%, employ 51% of the workforce and contribute more than 40% to the value of the gross domestic product (GDP). However, an obvious phenomenon is that the SME economic sector develops unsustainably (Trang & Thu, 2023).

The concept of sustainability of MSEs has no common definition. Hubbard (2009) views sustainability as the ability to meet the needs of stakeholders without affecting the future. Savitz and Weber (2006) emphasize that sustainable enterprises must both generate profits, protect the environment and improve community life. Thus, sustainability requires balancing economic, environmental and social benefits, bringing value to all stakeholders.

Currently, the challenges for SMEs are on both sides: (i) At the macro level, national policies still have institutional barriers; (ii) At the micro level, SMEs are limited by endogenous capacity, low competitiveness of goods and services, difficulty in accessing financial capital, and lack of management and operation experience. In this context, the problem is that Vietnamese SMEs, with their inherent flexibility, need to develop sustainably to promote economic growth, trade and investment, increase state budget revenue, create jobs for workers and contribute to improving national competitiveness. Therefore, it is necessary to study the factors affecting the sustainable development of

Vietnamese SMEs, contributing to proposing solutions to help SMEs develop sustainably in the coming time.

## II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### 2.1. Literature review

The development and sustainability of SMEs are influenced by a group of internal factors such as: human resources, financial resources, technological and technical level of the enterprise, management and operation capacity of business leaders, marketing strategy and a group of external factors such as: Policies, macroeconomic environment and infrastructure factors (Ngo Kim Thanh, 2013). Empirically, there have been many studies on factors affecting the sustainability of SMEs both domestically and internationally. A recent study by Dang Thi Mai Huong et al., (2021) demonstrated that there are 10 factors that influence the development of SMEs, namely production technology level, government policies, raw materials, labor, management capacity, local support policies, access to finance, corporate social responsibility, green growth orientation and global pandemic, in which production technology level and access to finance have the greatest impact on the business results of SMEs in Vietnam. Tan Trinh Le's (2019) study of SMEs in Da Nang showed that factors such as government policies, financial capital, cultural factors, social factors and human capital affect the business results of SMEs, especially startups. Nguyen Van Thich (2018) also identified seven factors affecting the business performance of SMEs in Ho Chi Minh City: technological resources, management skills, products and services, marketing strategies, cooperation and business methods, financial resources and external environment. A study conducted by Cherkos et al. (2018) also demonstrated that due to poor working conditions, lack of access to finance, infrastructure problems and lack of business capacity, the dropout rate is 50% in MSEs in Amhra Region, Ethiopia.

Based on the findings of previous studies, the factors affecting the success of small and medium enterprises are classified into the following categories: (1) Characteristics of Entrepreneurs, (2) Financial factors, (3) Government support, (4) external environment, (5) infrastructure factors, (6) technological factors, (7) cultural factors, (8) social factors, (9) marketing strategies, (10) customers and markets. However, within the framework of this study, we only focus on 5 factors based on their suitability to the context of Vietnam, including: Financial factors, Political-Legal factors, Infrastructural factors, Personal characteristics of the manager or owner, Technological factors

### 2.2 Hypothesis development

Based on previous studies as well as business practices in Vietnam, the author proposes the following research hypotheses:

**Financial factors**

In Vietnam, only 30% of SMEs have access to bank capital, while 70% have to use their own capital or borrow from outside with high interest rates (15–18%) (Vietnam Association of Small and Medium Enterprises). Limited access to credit due to complicated procedures, high credit requirements and high transaction costs make banks prioritize larger projects. At the same time, the lack of collateral, weak accounting systems and ineffective financial management make it difficult for SMEs to access the necessary capital to expand their scale (Vo Thanh Danh et al., 2013; Nguyen Van Thich, 2018).

According to research by Kassa (2021) and Meressa (2020), access to finance has a significant impact on SME growth. Enterprises with access to finance from financial institutions have a 13.475 times higher chance of expansion than those without access to credit. In contrast, enterprises with poor financial management have a 5.49 times higher risk of bankruptcy (Worku, 2009). In addition, higher initial investment is also an important factor, helping enterprises grow faster and more sustainably (Radzi et al., 2017; Meressa, 2020).

In summary, access to finance, together with effective financial management and appropriate initial investment, play a key role in the development of SMEs. Thus, the author proposes the following research hypothesis:

*H1: Financial factors have a positive impact on the sustainability and growth of small and medium enterprises in Vietnam*

**Political-Legal Factors**

Political and legal factors have a strong impact on the production and business activities of enterprises, including

the policy system, laws, diplomatic trends, and domestic and international political developments. Enterprises must comply with regulations related to labor, tax, safety, environmental protection, and other business conditions. In particular, in the context of Vietnam participating in new-generation free trade agreements (FTAs), these factors have a profound impact on business operations.

Political stability creates a favorable environment, ensures investment safety and ownership rights, thereby promoting confidence and attracting domestic and foreign investment. An effective and transparent legal mechanism not only supports enterprises to adapt to changes but also creates growth opportunities. However, the level of government intervention in the economy can create both advantages and challenges, requiring businesses to quickly identify opportunities and risks to adjust their operations and avoid major disruptions (Le et al. 2022).

Political-legal variables such as lack of government support, high taxes, and lack of transparency about regulations are major barriers to the sustainable development of small and medium-sized enterprises (MSEs) (Ismanu & Kusmintarti, 2020). Despite efforts to improve the policy and institutional environment, there is still a gap between issued policies and implementation practices, along with issues such as inadequate business support services and unreasonable tax requirements. Collaboration with business support organizations and related organizations can help businesses access the necessary services and expertise, improving their long-term survival and growth.

From the above observations, the author proposes the following research hypothesis:

*H2: Political-legal factors have a positive impact on the sustainability and growth of small and medium enterprises in Vietnam*

**Infrastructural factors**

Infrastructure is an important factor in promoting economic growth, improving productivity and efficiency, and contributing to solving social problems. A synchronous and modern infrastructure system helps to easily circulate resources, optimize logistics costs, and facilitate businesses to process information, shortening customer service time (World Bank, 2018). On the contrary, infrastructure shortages and weaknesses, such as power outages, poor transportation services, lack of clean water, and limited information technology, will cause "bottlenecks" that slow economic growth and reduce business efficiency. Failure to carefully study infrastructure conditions before starting a business also causes businesses to face unsuitable business locations, leading to increased costs and reduced profits. In particular, owning a private office or a convenient business location helps businesses grow faster, while high rental costs or a poor business environment are major barriers to expansion and diversification (Abay et al., 2014; Tarfasa et al., 2016). Therefore, access to adequate infrastructure, from transportation, information technology to workplaces, plays a decisive role in the sustainability and growth of businesses, especially in developing countries like Vietnam.

From the above observations, the author proposes the following research hypothesis:

*H3: Infrastructural factors has a positive impact on the sustainability and growth of small and medium enterprises in Vietnam*

**Personal characteristics of the manager or owner**

Business success is influenced by many factors, but the most important factor is the entrepreneur behind the business (Olakitan & Ayobami, 2011). Entrepreneurial characteristics, such as education, experience, managerial ability, and entrepreneurial motivation, play a key role in business performance and growth (Wodajo et al., 2020). Entrepreneurs with higher levels of education and experience tend to own and operate businesses with superior financial performance and growth rates (Alene, 2020). Businesses with a high proportion of educated and skilled workers also expand significantly faster, consistent with the theory of change in business and technical education.

Business education helps entrepreneurs improve their skills, providing the information needed to improve performance and competitiveness. SMEs with access to business information tend to expand faster, thanks to their ability to strengthen customer relationships, promote market connections, and enhance corporate image (Batisa, 2019). In Vietnam, management efficiency and entrepreneurial skills are decisive factors for the survival and sustainable growth of SMEs (Le et al, 2022).

Owner motivation is also an important factor. Entrepreneurs who start their own businesses out of passion and

volunteerism tend to perform better than those who consider it a last resort (Alemayehu & Gecho, 2016). Conversely, lack of training and access to information often leads to poor performance, slowing down the growth of the business (Kanbiro & Bekele, 2020). In summary, factors such as qualifications, experience, management capacity, and personal motivation play an important role in the development and success of enterprises.

From the above observations, the author proposes the following research hypothesis:

*H4: Personal characteristics of managers have a positive impact on the sustainability and growth of small and medium enterprises in Vietnam*

**Technological factors**

Technology is an important factor, bringing both opportunities and challenges to businesses. The emergence of new technology can increase the competitive advantage of alternative products, pushing traditional products into the risk of obsolescence, forcing businesses to innovate to maintain competitive advantage. Research has shown that small and medium enterprises (SMEs) that innovate technology achieve higher performance than those that do not apply technology (Subrahmanya et al., 2010). The application of information and communication technology (ICT) also helps to improve the competitiveness and sustainability of SMEs, especially in developing countries (Apulu & Latham, 2011). However, lack of technological capacity remains a major barrier to the development of SMEs, especially when faced with expensive hardware and software costs, lack of IT experts, and limited access to the internet (Hashim, 2015).

In Vietnam, technology adoption is a vital factor for SMEs, with a direct impact on business performance. Research also shows that low IT skills and limited internet usage are factors that reduce the performance of SMEs (Hashim, 2015). In addition, maintaining outdated working techniques and lack of willingness to continuously improve are also major challenges to the competitiveness and growth of businesses (Batisa, 2019). To overcome these barriers, SMEs need to commit to innovation and continuously improve technology and work processes to improve their adaptability and competitiveness in the market.

From the above observations, the author proposes the following research hypothesis:

*H5: Technological factors have a positive impact on the sustainability and growth of small and medium enterprises in Vietnam*

From the above research hypotheses, the author proposes the following research model:

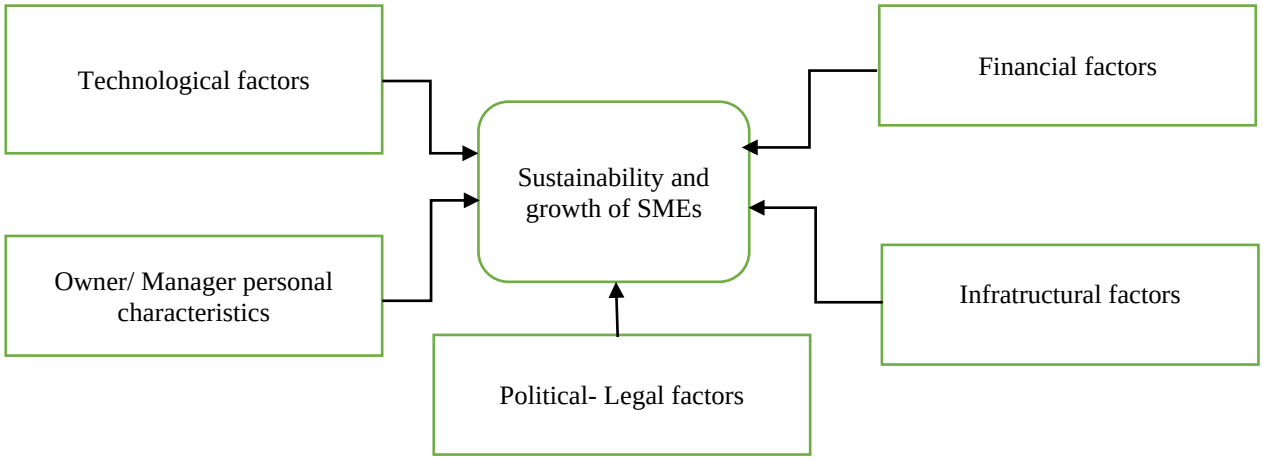



**Figure 1: Conceptual framework**

## III. RESEARCH METHODOLOGY

### 3.1. Population and Sample

The population of this study is the SMEs registered in the General Statistics Office. Then, the sample was selected by stratified sampling method. The selected SMEs are represented by their managing owners. A total of 1500 questionnaires were distributed. After two reminders, 435 responses were successfully collected. However, 16 responses were considered inappropriate (due to incomplete information or filling in all questions with the same

answer). Therefore, this paper achieved a response rate of 27.93% with 419 usable responses.

### 3.2. Measurement scale

This study is quantitative in nature and uses a questionnaire survey method to collect the desired data. The items in the questionnaire were adapted from many previously established studies. Specifically, the financial factor scale (5) is inherited with adjustments from the research of Nuong & Anh (2017) and Loan (2018); The administrative-legal scale (5) is inherited from the research of Phan Thi Minh Ly (2011), the infrastructure scale (6) is inherited from the research of Zamberi Ahmad & Xavier (2012), the technological factor scale is inherited from the research of (Do Tuan Vu, 2023), the business owner scale (6) is inherited from the research of Man et al. (2002), Mitchelmore & Rowley (2013); the scale of business existence and development (4) is inherited from the research of (Do Tuan Vu, 2023). All items used a 5-point Likert-type rating scale (1 = "strongly disagree" to 5 = "strongly agree").

## 4. Analysis and discussion of research results

### 4.1. Scale evaluation

#### 4.1.1. Scale reliability testing

According to Peterson (1994), any scale with a Cronbach's Alpha coefficient less than 0.6 will be eliminated from the research model and observed variables with a total item correlation coefficient less than 0.3 are considered junk variables and will also be eliminated from the scale (Nunnally & Burnstein, 1994). The test results for the scales and observed variables that meet the criteria are shown in the following Table 1.

**Table 1. Cronbach's alpha test**

| Varibales | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|
| **Financial factors** | | |
| **Fin1**- The enterprise has a good financial foundation and sufficient cash resources | .723 | .861 |
| **Fin2**- A stable financial structure ensures the enterprise's business operations | .718 | .862 |
| **Fin3**- The enterprise can access alternative external financial sources if needed | .721 | .862 |
| **Fin4**- The enterprise's current capital is long-term capital | .705 | .866 |
| **Fin5**- The enterprise has good financial management capabilities | .754 | .854 |
| **Cronbach's Alpha** | .886 | |
| **Political- Legal factors** | | |
| **Pol1**- Enterprises receive much support from state agencies in receiving and training workers | .672 | .829 |
| **Pol2**- Enterprises receive much support from state agencies in supporting loans with low interest rates | .660 | .832 |
| **Pol3**- Enterprises receive much support from state agencies in supporting trade promotion | .648 | .835 |
| **Pol4**- Enterprises receive much support from state agencies in supporting funding for technological innovation | .685 | .825 |
| **Pol5**- The government has many attractive tax incentives for enterprises. | .702 | .821 |
| **Cronbach's Alpha** | .858 | |
| **Infrastrutural factors** | | |
| **Inf1**- the physical infrastructure (roads, utilities, communications, waste disposal) provides good support for new and growing firms. | .650 | .855 |
| **Inf2**- It is not too expensive for a new or growing firm to get good access to communications (phone, internet, etc.) | .670 | .852 |

| | | |
|---|---|---|
| **Inf3**- We can get good access to communications (telephone, internet, etc.) in about a week | .719 | .843 |
| **Inf4**- We can afford the cost of basic utilities (gas, water, electricity, and sewer) | .688 | .849 |
| **Inf5**- We can get good access to utilities (gas, water, electricity, and sewer) in about a month | .683 | .850 |
| **Inf6**- We can rent business premises in the area we desire. | .635 | .858 |
| **Cronbach's Alpha** | .873 | |
| **Technology factor** | | |
| **Tech1**- Enterprises regularly update and apply new technology to production and business activities. | .701 | .823 |
| **Tech2**- Businesses apply modern technology in marketing and brand promotion | .697 | .825 |
| **Tech3**- Enterprises always attach importance to investing in research and development of new technologies. | .719 | .815 |
| **Tech4**- The level of technology in production of the enterprise is high compared to the average. | .705 | .822 |
| **Cronbach's Alpha** | .860 | |
| **Owner/ Manager personal characters** | | |
| **OPC1**- The business owner's ability to recognize business opportunities is high. | .667 | .826 |
| **OPC2**- The business owner's ability to effectively coordinate business resources is highly appreciated. | .736 | .813 |
| **OPC3**- The business owner is highly dedicated to the business. | .723 | .815 |
| **OPC4**- The business owner's ability and business management skills are well suited to the role of a business leader. | .736 | .814 |
| **OPC5**- The business owner is a very hard-working person. | .680 | .824 |
| **OPC6**- The business owner always has patience and high determination to pursue goals. | .340 | .884 |
| **Cronbach's Alpha** | .855 | |
| **Sustainability and growth of business** | | |
| **Sus1**- Businesses with the potential for long-term revenue growth | .594 | .786 |
| **Sus2**- Businesses have the ability to attract potential customers. | .669 | .751 |
| **Sus3**- Business with long-term profitability | .632 | .768 |
| **Sus4**- Businesses have the ability to increase expansion and develop market share in the long term. | .642 | .764 |
| **Cronbach's Alpha** | .815 | |

The test results show that from 30 observed variables belonging to 6 initially proposed scales (5 independent scales and 1 dependent scale), the remaining 29 observed variables belonging to 6 scales meet the requirements. Of which, 1 observed variable was eliminated, which is the observed variable OPC6 (Owner/Manager Personal Characteristics scale) because this variable has a Cronbach's Alpha coefficient if the variable is eliminated greater than the Cronbach's Alpha coefficient of the scale, so this variable is considered a garbage variable and is eliminated from the scale (Nguyen Dinh Tho, 2011).

*4.1.2. Convergent value and discriminant value analysis*

The factor analysis process is carried out through 4 testing steps as follows: (1) The factor loading coefficient of the observed variables in the factor rotation matrix is all greater than 0.5, proving that these observed variables are reliable; (2) KMO coefficient > 0.5 satisfies the suitability of factor analysis if $0.5 \leq KMO \leq 1$ (Hair et al., 2010); (3) Sig.

coefficient with value < 0.005 of Bartlett's test indicates that there are statistically significant correlations between observed variables in the population, so the observations are suitable for factor analysis; (4) The extracted variance value or cumulative variance indicates the percentage of total variance explained by factors or the change of factors explained by observed variables and according to Gerbing and Anderson (1988), this cumulative variance is greater than 50% suitable for factor analysis. Table 2 below summarizes the results of factor rotation for 25 observed variables that meet the standards.

**Table 2. Results of EFA analysis**

| Variables | Factors | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Inf5 | .757 | | | | |
| Inf4 | .756 | | | | |
| Inf3 | .740 | | | | |
| Inf6 | .697 | | | | |
| Inf1 | .693 | | | | |
| Inf2 | .675 | | | | |
| Fin5 | | .819 | | | |
| Fin3 | | .811 | | | |
| Fin1 | | .803 | | | |
| Fin4 | | .786 | | | |
| Fin2 | | .786 | | | |
| OPC2 | | | .793 | | |
| OPC5 | | | .767 | | |
| OPC4 | | | .749 | | |
| OPC3 | | | .723 | | |
| OPC1 | | | .690 | | |
| Pol5 | | | | .799 | |
| Pol4 | | | | .798 | |
| Pol1 | | | | .780 | |
| Pol2 | | | | .778 | |
| Pol3 | | | | .763 | |
| Tech3 | | | | | .829 |
| Tech2 | | | | | .814 |
| Tech1 | | | | | .811 |
| Tech4 | | | | | .803 |
| Eigenvalues | 7.788 | 4.208 | 2.681 | 1.889 | 1.551 |
| Extracted variance (%) | 25.959 | 14.028 | 8.938 | 6.29 | 5.169 |
| Total variance extracted (%) | | | | | 65.462 |
| KMO | | | | | 0.904 |
| Sig. | | | | | 0.000 |

The results of the exploratory factor analysis in Table 2 show that the criteria satisfy the 4 tests mentioned above and 5 new factors are formed. Thus, these 5 newly formed factors will be included in the regression model to analyze and test the correlation with the dependent variable Y.

#### 4.1.3. Results of the regression analysis

The results of the regression of factors affecting sustainability and growth of SMEs are shown in the following Table 3.

**Table 3: Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | -.158 | .172 | | -.918 | .359 | | |
| | Fin | .120 | .022 | .200 | 5.522 | .000 | .814 | 1.228 |
| | Pol | .187 | .026 | .254 | 7.074 | .000 | .833 | 1.200 |
| | Inf | .247 | .030 | .328 | 8.152 | .000 | .663 | 1.508 |
| | Tech | .154 | .022 | .258 | 7.159 | .000 | .822 | 1.216 |
| | OPC | .130 | .025 | .175 | 5.170 | .000 | .935 | 1.070 |
| Sig. F | | 0.000 | | | | | | |
| Adjusted R Square | | .553 | | | | | | |

**a. Dependent Variable: Sus**

The analysis results in Table 3 show that the observed significance level is very small (Sig. = 0.000), indicating that the model is statistically significant at the 1% level. The adjusted R2 value = 0.553 means that 55.3% of the impact on sustainability and growth of SMEs is explained by the linear correlation between the dependent variable and the independent variables included in the research model. In addition, the variance inflation factor (VIF) of the variables in the model is much smaller than 10, so we conclude that the variables included in the model do not have multicollinearity.

The regression results show that, of the 5 factors included in the research model, all 5 factors have a statistically significant impact on sustainability and growth of SMEs. These factors include Financial factors, Infratructural factors, Political- Legal factors, Owner/ Manager personal characteristics, Technological factors. All of these factors have a positive correlation with sustainability and growth of SMEs. Infratructural factors have the greatest influence (β= 0.328), followed by Technological factors (β= 0.258), Political-Legal factors (β= 0.254), Financial factors (β= 0.200), and finally Owner/Manager personal characteristics (β= 0.175).

With the highest impact coefficient, infrastructure factors play a leading role in promoting the sustainability and growth of SMEs. This can be explained by the dependence of businesses on basic infrastructure such as transportation, telecommunications, energy, and information technology to maintain efficient operations, optimize supply chains, and connect with markets. Good infrastructure will reduce operating costs, improve production efficiency, and help businesses access business opportunities more easily.

Technology plays a role in promoting innovation and improving productivity for SMEs. This coefficient reflects that investment in technology, digital transformation, and the use of modern digital solutions are important factors that help businesses increase competitiveness, improve products/services, and access larger markets, especially in the context of the 4.0 industrial revolution.

Political and legal factors have a great influence because they create a stable and transparent business environment. A clear legal system, appropriate support policies, and political stability help SMEs minimize risks and increase confidence in the market. Support from the government, such as financial incentive programs or tax incentives, is also a factor that promotes growth.

Financial factors play an essential role, but their influence is lower than the above factors. This may stem from the fact that SMEs often have difficulty accessing capital, but when available capital is combined with effective financial management, it will be an important tool for businesses to expand their scale, invest in technology, and improve product quality.

The personal characteristics of the business owner or manager have a significant impact, but do not play a dominant role. This may indicate that although their vision, experience, and leadership capacity are important, they need to be supported by other factors such as infrastructure, technology, and policy environment to maximize their effectiveness.

This research results emphasize that the sustainable development and growth of SMEs depends on the effective coordination of many factors. In particular, improving infrastructure and taking advantage of modern technology are top priorities. At the same time, businesses also need to take advantage of a favorable legal environment, strict financial management, and improving leadership capacity to achieve comprehensive development.

## V. CONCLUSION

Small and medium-sized enterprises (SMEs) play a pivotal role in a country's long-term economic growth, driving rapid and sustainable economic development. In Vietnam, many national development plans have emphasized the role of SMEs in broad-based economic transformation. Despite the government's efforts to support them, SMEs still face many challenges: many do not sustain their operations or survive long without innovation, producing similar and substandard products (Cherkos et al., 2018).

This study aims to provide inputs to policy makers and development agencies, and assess the key factors affecting the sustainability and growth of SMEs in Vietnam. Both internal and external factors are empirically examined, including: Financial factors: Exploring ways to improve access to capital, strengthen financial management practices, enhance credit knowledge, and optimize working capital. Political-legal factors: Identifying opportunities to leverage government support, simplify policy frameworks, and ensure clear, accessible legal guidance. Infrastructure: Highlighting strategies to improve access to essential resources such as electricity, water, and suitable business locations, while fostering a more supportive business environment. Characteristics of business owners: Empowering business owners through targeted initiatives to enhance management skills, expand business knowledge, and cultivate innovative thinking. Technological factors: Encouraging the adoption of modern technology by building awareness, improving access to advanced tools, and fostering a proactive mindset toward technological advancements.

## VI. RECOMMENDATIONS

To improve sustainability and growth, suggested solutions include:

*Finance*: Encourage banks and financial institutions to provide more accessible credit support policies. Microfinance institutions (MFIs) should develop product portfolios suitable for each stage of development of SMEs, combining post-loan support and raising awareness of savings. The government can establish venture capital organizations to support capital for potential startups.

*Marketing and training:* Develop business skills training programs, technology support, and market connections to help SMEs improve their marketing and management capabilities.

*Linking and sharing resources*: Develop a business support network to share information and resources.

*Internal self-improvement*: SMEs are recommended to focus on addressing internal factors such as improving management skills, business thinking, and technological innovation instead of relying on external solutions.

This study not only provides information for policy makers but also serves as a reference for future studies, contributing to promoting economic progress and enhancing the competitiveness of SMEs in Vietnam.

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# EMPOYEE'S GREEN AWARENESS AT 5-STAR HOTELS IN HA LONG (QUANG NINH)

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**ABSTRACT**

This study investigates and evaluates employees' green awareness in 5-star hotels in Ha Long and its potential influence on their workplace practices and daily behaviors. The research was conducted among employees at six 5-star hotels in Ha Long, using a Google Forms survey to collect 200 responses. The collected data was analyzed using SPSS software, with results statistically processed and presented in a descriptive format. The findings reveal that employees generally have an initial awareness of green, express support for green human resource management initiatives, and are practicing certain green behaviors both at work and at home. However, based on the majority of respondents' feedback, the study includes discussions assessing employees' awareness of green and provides recommendations for fostering greater awareness and implementation of green practices in the workplace.

*Keywords: "*awareness", "green", "green human resource management", "employee", "hotel"

## I. INTRODUCTION

Greening businesses and maintaining environmental sustainability have become top priorities for decision-makers in the 21st century, leading to the exploration of innovative alternatives to traditional human resource management practices. Among various workgroups, employees play a critical role in advancing corporate greening initiatives by adopting environmentally friendly and socially responsible behaviors. Human resource management (HRM) has proven to be a powerful mechanism for fostering green and sustainable practices, particularly when environmental sustainability becomes a central focus of research on green human resource management (GHRM) (Jose et al., 2019). In Vietnam, research on GHRM within the tourism and hospitality sector remains limited, despite the sector's significant environmental footprint and dependence on ecological sustainability. This gap underscores the need to study and enhance awareness of green among those working in the tourism industry. Employee environmental awareness is increasingly seen as critical to a company's sustainability and performance. Studies have shown that employee environmental awareness, knowledge, and skills have a positive impact on a company's ability to implement green practices. In the hospitality industry, employee environmental awareness contributes significantly to overall environmental performance.

Environmental sustainability is becoming more and more important to the hospitality sector. Businesses, especially hotels, are expected to implement sustainable practices as environmental deterioration and climate change become more widely recognized. This change is a reflection of a larger social need for businesses to adopt environmentally conscious practices, not only a reaction to customer demand. Employees are crucial in promoting green activities in their workplaces in this context. Their knowledge of and dedication to sustainability can have a big impact on how well their companies' environmental initiatives work.

Employees' knowledge of environmental issues and how they affect the workplace and society at large is referred to as their "green awareness." This knowledge is crucial for developing a sustainable culture in hotels because it encourages staff members to take an active role in green projects and embrace eco-friendly practices. According to research, employees are more likely to engage in good green behaviors, including cutting back on waste or using less energy, when they believe their companies are sincerely devoted to sustainability (Khan et al., 2022). In the hotel industry, leadership has a significant impact on how environmentally conscious staff members are. Employees' psychological green climate can be improved by ethical leadership that prioritizes environmental responsibility, which will encourage them to engage in green behaviors (Khan et al., 2022) (Zheng et al., 2021). Additionally, by

incorporating sustainability into the corporate culture and guaranteeing that all staff members support the organization's environmental objectives, the adoption of Green Human Resource Management (GHRM) techniques helps speed up this process (Gulakdeniz & Karadas, 2024).

This study aims to evaluate the awareness of green among employees at six 5-star hotels in Ha Long. It emphasizes the importance of cultivating appropriate awareness, as this serves as the foundation for fostering the right attitudes and behaviors towards sustainable practices in the workplace and beyond.

## II. MATERIAL AND METHODOLOGY

### Green Awareness (GA)

According to (Partanen-Hertell et al., 1999), awareness is the combination of Motivation, Knowledge and Skills. Green awareness has recently emerged as a prominent topic of discussion in different fields. In terms of state behavior, (Shao, 2019) found that the state has increased its attention to the environment, green consumption, and other aspects as well as publicity efforts to promote the adoption of green low-carbon behavior. (Liao et al., 2022) explored how social green preferences influence individual green behavior. High social green preferences, especially when transmitted by high-status individuals, significantly boost green motivation and actions, revealing important social dynamics in promoting sustainable practices. (Conte et al., 2024) explored interdisciplinary approaches to nature-based solutions and environmental awareness. The Aula Verde Aniene project in Rome, combining ecology, urban forestry, and various art forms, engaged the community through art and citizen science, enhancing the perception of ecosystem services and fostering a sense of belonging to nature. (Bae et al., 2022) investigated the influence of awareness regarding social and environmental sustainability practices on impulse buying. They found that social and environmental sustainability awareness positively influences green trust, which in turn enhances impulse buying. The study strongly advises that policymakers and marketers prioritize efforts to enhance awareness of environmental and social sustainability, along with fostering green altruism.

Green awareness refers to individuals' understanding and awareness of environmental and sustainability issues, influencing their behaviors, attitudes, and knowledge to support sustainable practices and reduce environmental damage, influencing their decision-making and behavior. (Kollmuss & Agyeman, 2002; Ottman et al., 2006)

Research based on the resource-based theory (RBV) and social learning theory (SLT): Resource-based theory clarified that resources were formed in the early 1980s and widely recognized in the 1990s, this theory plays an important role in the practice of green human resource management, which is valuable when they help a company implement and form approaches to improve the performance of the company. Social learning theory is understood as the influence of cognition and environment on human understanding, behavior, and education.

### Green human resource management

The term “green” in Green Human Resource Management (Green HRM) signifies the integration of environmentally conscious policies and practices into human resource management. While it often refers to environmental sustainability, it also represents the broader awareness businesses have of their ecological impact.

Green HRM encompasses all HR activities aimed at making employees environmentally conscious, supporting the organization’s environmental goals, and contributing to sustainability. (Renwick et al., 2013) define it as the degree of integration between HRM activities and environmental management. Similarly, (Jabbour, 2011) views it as embedding environmental management into HR processes. (Mandip, 2012) and (Ahmad, 2015) describe Green HRM as utilizing HR policies to promote sustainable resource usage in organizations and further environmental sustainability efforts. (Gupta, 2018) added that Green HRM supports sustainable resource use, environmental awareness, and employee commitment to environmental challenges.

### Research method and hypothesis development

*Research method*

To assess employees' green awareness, the research team designed a structured questionnaire. The questionnaire included items directly related to the research objectives, with a 5-point Likert scale used for responses (1 = Strongly Disagree, 2 = Disagree, 3 = Unsure, 4 = Agree, 5 = Strongly Agree).

A simple, convenient random sampling method was employed, and data was collected through an online survey. This approach was chosen for its suitability given the employees' working conditions, allowing the questionnaire to be distributed via email, text messages, and group communications. A total of 250 questionnaires were distributed, resulting in 200 valid responses.

The survey was developed based on scale criteria derived from established studies by (Tang et al., 2018), (Mukherjee & Chandra, 2018); (Suki, 2013). The sample size determination followed the guidelines for exploratory factor analysis (EFA), where the minimum sample size is calculated as: Sample size = Number of observed variables × 5. With 27 observed variables in this study, the minimum sample size required was 135 (5 × 27). However, to ensure sufficient data for analysis and to account for potential non-responses or invalid responses, the team distributed 250 questionnaires.

Both primary and secondary data sources were utilized in this study. Primary data was collected through the questionnaire, while secondary data was obtained from previous research on GHRM, particularly studies by international authors and articles published in reputable scientific journals. Quantitative research methods were applied, with the collected data analyzed using SPSS software. The results were presented as descriptive statistics to explore and understand employees' awareness of GHRM.

*Hypothesis Development*

Green Training (GT)

Green training is a practice that enables workers to learn environmental conservation capabilities and environmental protection, both of which are critical to achieving environmental objectives (Jabbour, 2011) Green training practices include raising workers' environmental awareness, instilling green values, and improving their ability to implement green working practices (Zoogah & Peng, 2011). It heightens their understanding of the connection between their activities and the environment.

Green training involves educating employees about the importance of environmental management and equipping them with skills to save energy, reduce waste, and enhance environmental awareness within the organization. This training also provides opportunities for employees to engage in solving environmental challenges. By fostering creativity and innovation, green training not only enhances employees' knowledge but also encourages active participation in addressing environmental issues. Organizations increasingly recognize the significance of green training as environmental concerns grow. It equips employees with the skills needed to address these issues effectively, contributing to the organization's sustainability goals.

*H1: Green training positively impacts employees' green awareness.*

Green Rewards (GR)

Green rewards are a strategic tool used to motivate employees to align with an organization's environmental goals by offering financial and non-financial incentives. These rewards not only drive employees toward eco-friendly practices but also help retain talented individuals and attract new recruits familiar with green methodologies.

Research highlights that organizations can achieve improved environmental performance by providing diverse incentives. Examples include thank-you letters, promotions, job changes, monetary bonuses, gifts, and more (Ahmad, 2015; Arulrajah & Opatha, 2016; Prasad, 2013; D. W. S. Renwick et al., 2013b). While green rewards significantly enhance employees' environmental awareness, their implementation remains limited and underexplored, especially within the hospitality sector.

*H2: Green rewards positively impacts employees' green awareness.*

Green participation (GP)

Green participation involves employees working collaboratively to address environmental challenges, generate innovative ideas, resolve conflicts in environmental management, and foster environmental learning (Jabbour, 2011)

Employees should be encouraged to contribute to pollution control and realize environmental benefits by allowing them to participate in green activities within the organization (Renwick et al., 2008). (Tseng et al., 2012) concluded that improving the effectiveness of green human resource management practices is important for attracting employees to

participate in green functions. (Renwick et al., 2008) stated that green learning environments, clear green visions, multiple communication channels that provide green activities, and encouragement of green participation are necessary components to measure green employee participation.

*H3: Green participation positively impacts employees' green awareness.*

Green performance management (GPM)

Green performance appraisal system is a framework to determine the performance behavior of employees in the process of environmental management (Jabbour, 2011). Jabbour identified that this activity ensures the incorporation of green issues into the daily routine of individuals. The organization must determine a structured method to implement environmental performance management as this will enhance and stimulate more employees to be environmentally responsible.

*H4: Green performance management positively impacts employees' green aw*

Green culture (GC)

Organizational culture is the set of norms and expectations for how people behave and work within a corporation (Upadhyay & Kumar, 2020). Understanding and putting into practice green culture helps organizations better commit to their people, green projects, and business goals (Ramasamy, 2017). A company without a green culture will find it difficult to realize the green potential, incentives, and possibilities of its personnel. The main characteristics of a green culture in an organization are the creation of formal and informal communication channels for the development of a green culture (Tang et al., 2018), the support of senior executives for green initiatives (Masri & Jaaron, 2017), and organizational support for a mission that prioritizes environmental issues (Gupta, 2018); (Paillé et al., 2020).

*H5: Green culture positively impacts employees' green awareness.*

**Research model**

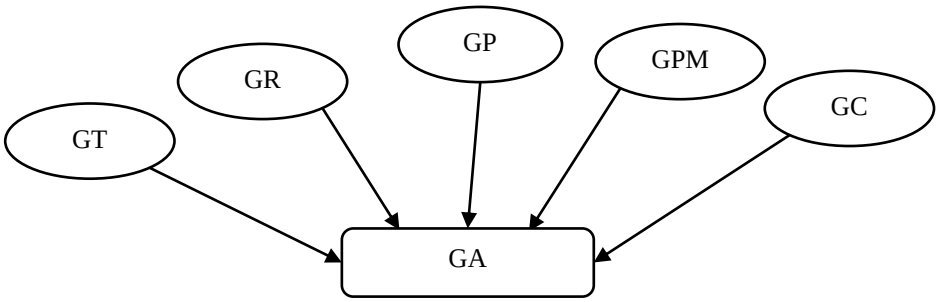



**Figure 1. Research model**

According to the model, there are 5 variables considered as independent variables: Green training, Green rewards, Green participation, Green performance management, Green culture; 01 dependent variable is Green awareness. The questionnaire was designed into 3 parts, including questions about general information, questions related to awareness of green human resource management activities, and questions about general Green awareness. It was sent to employees at six 5-star hotels in Ha Long, collecting 200 valid responses. To increase the reliability and value of the data, a pilot study was conducted. After receiving the results of the pilot, there were some minor changes in the questionnaire, and some criteria were reduced due to duplication in expression and investigation to obtain the current results.

## III. RESULT AND DISCUSSION

*Criteria of green human resource management activities were surveyed:*

Green human resource management activities are divided by the authors into 5 groups of criteria belonging to each green human resource management activity to study the opinions and perceptions of hotel employees: (1) Green training (with 5 measurement variables); (2) Green rewards (with 4 measurement variables); (3) Green participation (with 5 measurement variables); (4) Green performance management (with 5 measurement variables); (5) Green culture (with 5 measurement variables). And the group of criteria Green awareness (with 3 measurement variables). The scale used to evaluate the criteria is a 5-level Likert scale: (1) Strongly disagree; (2) Disagree; (3) Neutral; (4) Agree; (5) Strongly agree.

*Cronbach's Alpha reliability test*

Before conducting data analysis, the study conducted a reliability test of the scale. The reliability of measurement criteria was tested through Cronbach's Alpha coefficient to eliminate irrelevant variables (Garbage Items) before conducting EFA. If the composite reliability and Cronbach's α score are greater than 0.70 (Nunnally, 1994), it is called a strong structure.

**Table 1. Results of Cronbach's Alpha reliability coefficient analysis**

| Criteria | Total variable correlation | Cronbach's Alpha if this variable is excluded |
|---|---|---|
| **Green Training** (GT): Cronbach's Alpha = 0.884 | | |
| GT1 | 0.753 | 0.852 |
| GT2 | 0.830 | 0.832 |
| GT3 | 0.522 | 0.902 |
| GT4 | 0.711 | 0.861 |
| GT5 | 0.800 | 0.840 |
| **Green Rewards** (GR): Cronbach's Alpha = 0.805 | | |
| GR1 | 0.615 | 0.759 |
| GR2 | 0.528 | 0.797 |
| GR3 | 0.642 | 0.746 |
| GR4 | 0.704 | 0.713 |
| **Green participation** (GE): Cronbach's Alpha = 0.886 | | |
| GE1 | 0.501 | 0.908 |
| GE2 | 0.695 | 0.867 |
| GE3 | 0.766 | 0.852 |
| GE4 | 0.843 | 0.831 |
| GE5 | 0.827 | 0.835 |
| **Green performance management** (GPM): Cronbach's Alpha = 0.914 | | |
| GPM1 | 0.808 | 0.889 |
| GPM2 | 0.878 | 0.874 |
| GPM3 | 0.648 | 0.920 |
| GPM4 | 0.777 | 0.896 |
| GPM5 | 0.795 | 0.892 |
| **Green culture** (GC): Cronbach's Alpha = 0.874 | | |
| GC1 | 0.770 | 0.830 |
| GC2 | 0.792 | 0.824 |
| GC3 | 0.641 | 0.862 |
| GC4 | 0.621 | 0.867 |
| GC5 | 0.701 | 0.848 |
| **Green awareness** (GA): Cronbach's Alpha = 0.770 | | |
| GA1 | 0.602 | 0.694 |
| GA2 | 0.620 | 0.673 |
| GA3 | 0.591 | 0.705 |

*Source: Authors synthesize SPSS processing results*

The study used Cronbach's Alpha reliability coefficient test to evaluate the consistency of the criteria. The results of the reliability assessment showed that all factors met the reliability requirements (0.6 < Cronbach's Alpha) and the total correlation coefficient of the observed variables was greater than 0.3, indicating that these variables had a good correlation with the overall scale. Thus, through the results of the reliability test, 24 observed variables of 5 independent variable scales will be included in the EFA exploratory factor analysis, these observed variables remain the same as the original observed variables included in the model.

*Exploratory factor analysis EFA*

To apply factor analysis, it is necessary to test the suitability of the data for the factor analysis method. This test is performed through two quantities: KMO (Kaiser-Meyer-Olikin Meansure of Sampling Adequacy) and Barlett's Test of Sphericity.

The KMO coefficient in EFA is an index used to examine the appropriateness of factor analysis. The KMO coefficient is applied to the analysis as follows: $0.5 \leq KMO \leq 1$: Qualified for factor analysis; $KMO < 0.5$: Factor analysis is not suitable for the data.

**Table 2. Results of KMO and Bartlett's Test**

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | ,761 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3793,373 |
| | Df | 276 |
| | Sig. | ,000 |

*Source: According to SPSS processing results of the author group*

KMO coefficient = 0.761 > 0.5, thereby showing that the analysis is suitable for the research data. The significance level Sig. in the Bartlett test is less than 0.05, proving that the collected research data used for analysis is completely suitable.

**Table 3. Factor rotation results**

| Rotated Component Matrix | | | | | |
|---|---|---|---|---|---|
| | Component | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| GPM2 | ,865 | | | | |
| GPM4 | ,826 | | | | |
| GPM5 | ,826 | | | | |
| GPM1 | ,821 | | | | |
| GPM3 | ,736 | | | | |
| GT2 | | ,887 | | | |
| GT5 | | ,871 | | | |
| GT1 | | ,840 | | | |
| GT4 | | ,815 | | | |
| GT3 | | ,671 | | | |
| GE4 | | | ,922 | | |
| GE5 | | | ,868 | | |
| GE3 | | | ,838 | | |
| GE2 | | | ,804 | | |
| GE1 | | | ,514 | | |
| GC2 | | | | ,908 | |
| GC1 | | | | ,888 | |
| GC5 | | | | ,755 | |
| GC3 | | | | ,708 | |
| GC4 | | | | ,659 | |
| GR4 | | | | | ,826 |
| GR3 | | | | | ,782 |
| GR1 | | | | | ,770 |
| GR2 | | | | | ,727 |

*Source: According to SPSS processing results of the author group*

Through the processing results, it shows that 24 variables included in the EFA analysis all have factor loadings greater than 0.5, so they are retained in the model and used for subsequent testing.

**Table 4. Results of factor analysis of independent variables**

| Total Variance Explained | | | | | | |
|---|---|---|---|---|---|---|
| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 6,721 | 28,006 | 28,006 | 6,721 | 28,006 | 28,006 |
| 2 | 3,422 | 14,260 | 42,266 | 3,422 | 14,260 | 42,266 |
| 3 | 2,518 | 10,494 | 52,760 | 2,518 | 10,494 | 52,760 |
| 4 | 2,347 | 9,777 | 62,537 | 2,347 | 9,777 | 62,537 |
| 5 | 1,848 | 7,701 | 70,238 | 1,848 | 7,701 | 70,238 |
| 6 | ,898 | 3,741 | 73,980 | | | |
| 7 | ,895 | 3,727 | 77,707 | | | |
| 8 | ,714 | 2,975 | 80,682 | | | |
| 9 | ,634 | 2,641 | 83,323 | | | |
| 10 | ,580 | 2,415 | 85,737 | | | |
| 11 | ,525 | 2,189 | 87,926 | | | |
| 12 | ,494 | 2,058 | 89,984 | | | |
| 13 | ,435 | 1,811 | 91,796 | | | |
| 14 | ,380 | 1,583 | 93,378 | | | |
| 15 | ,335 | 1,396 | 94,774 | | | |
| 16 | ,313 | 1,305 | 96,079 | | | |
| 17 | ,220 | ,916 | 96,995 | | | |
| 18 | ,182 | ,759 | 97,754 | | | |
| 19 | ,149 | ,619 | 98,373 | | | |
| 20 | ,126 | ,523 | 98,896 | | | |
| 21 | ,117 | ,489 | 99,385 | | | |
| 22 | ,068 | ,284 | 99,669 | | | |
| 23 | ,047 | ,195 | 99,864 | | | |
| 24 | ,033 | ,136 | 100,000 | | | |

*Source: According to SPSS processing results of the author group*

According to the processing results, the total variance extracted was recorded as 70.238% > 50%, factor analysis was appropriate, therefore it can be stated that the factors in the study explained 70.238% of the variation in the research data. In which:

Green Training (GT) includes 5 variables GT1, GT2, GT3, GT4, GT5

Green Rewards (GR) consists of 4 variables GR1, GR2, GR3, GR4

Green participation (GE) includes 5 variables GE1, GE2, GE3, GE4, GE5

Green Performance Management (GPM) includes 5 variables GPM1, GPM2, GPM3, GPM4, GPM5

Green Culture (GC) includes 5 variables GC1, GC2, GC3, GC4, GC5

*KMO test and Bartlett's Test of dependent variable*

**Table 5. Results of KMO and Bartlett's Test of dependent variable**

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | ,699 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 154,519 |
| | Df | 3 |
| | Sig. | ,000 |

*Source: According to SPSS processing results of the author group*

The conditions for testing KMO and Bartlett's Test for the dependent variable are similar to the conditions for testing the independent variable. After analyzing the 3 observed variables for the dependent variable "Green awareness", the results showed that the KMO index was 0.699 (0.5 < 0.699 <1) and Bartlett's Test gave a Sig. value = 0.000 < 0.05, so the collected data met the conditions for conducting factor analysis.

**Table 6. Results of factor analysis of dependent variable**

| Communalities | | |
|---|---|---|
| | Initial | Extraction |
| GA1 | 1,000 | ,683 |
| GA2 | 1,000 | ,703 |
| GA3 | 1,000 | ,670 |

*Source: According to SPSS processing results of the author group*

The results of the exploratory factor analysis extracted one factor, which was created from three observed variables that the topic had proposed before. Thus, the research model after the EFA exploratory factor analysis did not have any significant changes compared to the original, no observed variables were removed from the model during the process of testing the reliability of the scale and the exploratory factor analysis.

*Building a linear regression model*

After conducting exploratory factor analysis (EFA) to discover factors affecting the dependent variable "Green awareness", the authors built a linear regression model to determine the direction and level of influence of these factors on hotel employees' green awareness. The regression model was built including the dependent variable and independent variables extracted from the exploratory factor analysis (EFA). The regression model was built as follows:

$$GA = \beta0 + \beta1.GT + \beta2.GR + \beta3.GE + \beta4.GPM + \beta5.GC$$

In there:

Green awareness (GA) as the dependent variable.

The independent variables include: Green training (GT), Green Rewards (GR), Green Engagement (GE), Green Performance Management (GPM), Green Culture (GC).

The corresponding Beta coefficients are: β0. β1, β2, β3, β4, β5.

*Evaluation of linear regression model*

**Table 7. Results of model fit test and ANOVA test**

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 32,632 | 5 | 6,526 | 11,788 | ,000b |
| | Residual | 107,412 | 194 | ,554 | | |
| | Total | 140,044 | 199 | | | |

*Source: According to SPSS processing results of the author group*

The ANOVA analysis results show that the F value has a significance level of Sig.= 0.000 (less than 0.05), which means that the regression model is suitable for the collected data and the included variables are all statistically significant at a significance level of 5%. Thus, the independent variables are related to the dependent variable, and it is appropriate to use them.

*Regression model analysis*

**Table 8. Regression analysis results**

| Coefficients[a] | | | | | | | |
|---|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | Correlations |
| | | B | Std. Error | Beta | | | Zero-order |
| 1 | (Constant) | ,688 | ,326 | | 2,110 | ,036 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | GTtb | ,124 | ,059 | ,134 | 2,092 | ,038 | ,165 |
| | GRtb | ,184 | ,066 | ,183 | 2,788 | ,006 | ,294 |
| | GEtb | ,149 | ,068 | ,154 | 2,184 | ,030 | ,316 |
| | GPMtb | ,159 | ,073 | ,161 | 2,185 | ,030 | ,346 |
| | GCtb | ,165 | ,071 | ,167 | 2,335 | ,021 | ,316 |

**Coefficients[a]**

| Model | | Correlations | | Collinearity Statistics | |
|---|---|---|---|---|---|
| | | Partial | Part | Tolerance | VIF |
| 1 | (Constant) | | | | |
| | GTtb | ,149 | ,132 | ,965 | 1,036 |
| | GRtb | ,196 | ,175 | ,916 | 1,092 |
| | GEtb | ,155 | ,137 | ,795 | 1,258 |
| | GPMtb | ,155 | ,137 | ,724 | 1,381 |
| | GCtb | ,165 | ,147 | ,775 | 1,290 |

*Source: According to SPSS processing results of the author group*

The results of the multiple linear regression analysis show that the VIF magnification coefficients of the independent variables are all < 10, so there is no multicollinearity between the independent variables, so the model is accepted. The Sig. values of the independent variables are all < 0.05 and the T value is positive, so we can say that all the influencing factors are significant in the model and have a positive impact on employees' green awareness. The standardized regression values of the independent variables in the model are respectively: Green training (GT) 0.134, Green rewards (GR) 0.183, Green participation (GE) 0.154, Green performance management (GPM) 0.161, Green culture (GC) 0.167. Through the results of the regression analysis, we have the following standardized regression equation:

$$GA = 0.134*GT + 0.183*GR + 0.154*GE + 0.161*GPM + 0.167*GC$$

From the above regression results we see:

– *Green Reward (GR)* is the factor that has the greatest influence on employees' awareness of green human resource management (because it has the largest Beta coefficient). The positive sign of Beta shows that the relationship between green rewards and green participation and employees' green awareness is in the same direction (correlated with each other). The regression results show that the Beta coefficient is 0.183 and Sig. = 0.006 (< 0.05).

– *Green culture (GC)* is the second most influential factor on employees' perception of green human resource management. The positive sign of Beta *shows* the relationship between Green culture and employees' green awareness are positively related (correlated). The regression results show that the Beta coefficient is 0.167 and Sig. = 0.021 (< 0.05).

– *Green Performance Management (GPM)* is the third most influential factor on employees' green awareness. The positive sign of Beta shows the relationship between Green performance management and employees' green awareness are positively related (correlated). The regression results show that the Beta coefficient is 0.161 and Sig. = 0.030 (< 0.05).

– *Green engagement (GE)* is the fourth most influential factor on employees' green awareness. The positive sign of Beta shows the relationship between Green participation and employees' green awareness are positively related (correlated). The regression results show that the Beta coefficient is 0.154 and Sig. = 0.030 (< 0.05).

– *Green Training (GT)* is the factor that has the smallest influence on employees' green awareness. However, green training is still the factor that influences employees' green awareness. The positive sign of Beta shows that the relationship between green training and employees' green awareness is in the same direction (correlated). The regression results show that the Beta coefficient is 0.134 and Sig. = 0.038 (< 0.05).

**Table 9. Evaluation results**

| Observation variable | Max | Min | Mean |
|---|---|---|---|
| **Green Training (GT)** | | | 2,893 |
| GT1 | 5 | 1 | 3,075 |
| GT2 | 5 | 1 | 2,770 |
| GT3 | 5 | 1 | 2,885 |
| GT4 | 5 | 1 | 2,685 |
| GT5 | 5 | 1 | 3,155 |
| **Green Reward (GR)** | | | 2,793 |
| GR1 | 5 | 1 | 2,830 |
| GR2 | 5 | 1 | 2,750 |
| GR3 | 5 | 1 | 2,700 |
| GR4 | 5 | 1 | 2,890 |
| **Green participation (GP)** | | | 3,113 |
| GP1 | 5 | 1 | 3,180 |
| GP2 | 5 | 1 | 3,055 |
| GP3 | 5 | 1 | 3,070 |
| GP4 | 5 | 1 | 2,905 |
| GP5 | 5 | 1 | 3,355 |
| **Green performance management (GPM)** | | | 3,447 |
| GPM1 | 5 | 1 | 3,280 |
| GPM2 | 5 | 1 | 3,325 |
| GPM3 | 5 | 1 | 3,525 |
| GPM4 | 5 | 1 | 3,605 |
| GPM5 | 5 | 1 | 3,500 |
| **Green culture (GC)** | | | 3,210 |
| GC1 | 5 | 1 | 2,955 |
| GC2 | 5 | 1 | 2,935 |
| GC3 | 5 | 1 | 3,520 |
| GC4 | 5 | 1 | 3,455 |
| GC5 | 5 | 1 | 3,185 |

*Source: Authors synthesize SPSS analysis results*

*Results of Green awareness of hotel emloyees*

**Table 10. Descriptive statistics**

| Items | 1 | | 2 | | 3 | | 4 | | 5 | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SL | % | SL | % | SL | % | SL | % | SL | % | |
| GA1 | 10 | 5.0 | 40 | 20.0 | 81 | 40.5 | 54 | 27.0 | 15 | 7.5 | 3,120 |
| GA2 | 17 | 8.5 | 39 | 19.5 | 79 | 39.5 | 51 | 25.5 | 14 | 7.0 | 3.030 |
| GA3 | 16 | 8.0 | 27 | 13.5 | 83 | 41.5 | 58 | 29.0 | 16 | 8.0 | 3,155 |

*Source: Authors synthesize SPSS analysis results*

According to the analysis results, total 34,5% of employees agree and strongly agree that green awareness is very important, while 40.5% rated it at a normal level, and total 25% disagreed and strongly disagree that it is very important. Although the percentage of employees who agreed was relatively high, the number of employees who rated it as normal or disagreed was not small, which is noteworthy.

At the same time, the percentage of employees who agreed that green human resource management is important also correlates with those who believe it is necessary in the training process and those who will implement it in the future. Specifically, 32.5% of employees find green human resource management necessary in the training process,

while a large proportion, 39.5%, rated it as normal, and 28% disagreed. Similarly, 37% of employees stated they would implement green human resource management, but a significant percentage (41.5%) rated it at the normal level, and 21.5% disagreed.

The average score evaluation results also showed that while employees' green awareness is good, the level of awareness is not very high. This highlights the need to raise employees' awareness of green and green human resource management.

**Discussion of research results**

This study found that while the majority of hotel employees were aware of green, their understanding was primarily at an initial level. However, most respondents expressed willingness to participate and commit to a green organization, workplace, and green culture. Renwick et al. (2013) concluded in their study on GHRM that compensating and rewarding employees for their participation in green activities, combined with green training and employee empowerment, are critical for achieving the overall environmental management goals (Gupta, 2018).

The findings suggest that green training should be a primary focus to enhance environmental awareness and the adoption of green human resource management practices by employees. Through training, employees can develop a deeper understanding of the organization's environmental strategies and sustainable development goals. Regarding green rewards, the study showed that when employees perceive that green rewards are tied to their work, it boosts morale and commitment to the organization. These incentives encourage employees to work harder toward green goals and exhibit both task-related and voluntary green behaviors. Organizations may consider various reward forms, such as offering hybrid vehicle loans or holding gratitude meetings, to motivate employees to engage more in environmental management. The study also highlights the significance of green participation in shaping employees' voluntary green behaviors. When employees are aware of green participation, they develop a better understanding of the organization's goals, missions, and green policies. This contributes significantly to improving the hotel's long-term green performance. Research on green performance management shows that it is crucial for fostering a sense of responsibility among employees to effectively implement green human resource management practices. The hotel can achieve its green and sustainable goals through employees' awareness of green performance management, as their evaluations and commitment to those criteria motivate them to pursue organizational rewards. The results regarding green culture underline the vital role of organizational culture in implementing green human resource management within hotels. A strong green culture helps the organization achieve environmental sustainability and improve green performance. Therefore, hotel managers should institutionalize and promote green culture, emphasizing the organization's commitment to environmental issues and sustainable development, which will further raise employees' awareness of the company's green practices.

## IV. CONCLUSION

Human resources are the most valuable assets of an organization and play a crucial role in management activities. With the growing emphasis on greening organizations and businesses, modern human resource managers are tasked with integrating green human resource concepts, green human resource management (GHRM) activities, and green initiatives into the organization's mission statement and HR policies. Employees' voluntary, green-related behaviors stem from an awareness of green practices, which are essential for adapting to job requirements.

This study has some limitations. First, the research relied on a questionnaire survey via Google Forms, without combining other methods such as in-depth interviews or group discussions, which could offer deeper insights into green human resource management practices. Second, the research area and field were not representative of the entire region or other industries. Third, certain aspects of green human resource management, such as employee health and safety, job analysis, and compensation, were not covered in this study. Future research could address these limitations to offer a more comprehensive understanding.

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# EMPLOYER BRANDING AND EMPLOYEE RETENTION IN THE MILITARY BANKING INDUSTRY IN HO CHI MINH CITY: MEDIATING EFFECT OF RELATIONAL PSYCHOLOGICAL CONTRACTS

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**ABSTRACT**

The main purpose of this study is to determine the impact of employer branding on employee retention and the mediating role of relational psychological contracts in the military banking industry (MB Bank) in Ho Chi Minh City. This study uses qualitative and quantitative research methods, using SPSS 26.0 and AMOS 24.0 software to analyze data collected from empirical surveys. The study collected 219 valid survey forms from managers and employees working in MB Bank in Ho Chi Minh City, aiming to detect factors of employer branding that have positive and significant impacts on relational psychological contracts and employee retention. The results indicate that, in order to retain qualified and skilled employees, organizations need to focus on factors that enhance employee retention through employer branding strategies. An employer branding strategy is affirmed to include: (1) A healthy working environment; (2) Training and development; (3) Work-life balance; (4) Corporate social responsibility; (5) Compensation and benefits, have a positive impact on employee retention. As a result, employees are more likely to stay with the organization for a longer period of time. This study also provides empirical evidence that employer branding can positively influence employee retention through psychological contracts with employees.

*Keywords: "employer branding", "relational psychological contract", "employee retention", "banking industry"*

## I. INTRODUCTION

Globalization, technological advancements, and demographic changes are driving businesses to look for innovative ways to improve their competitiveness (Junça Silva & Dias, 2023). The labor market is impacted by competition between organizations to attract and retain talent, and competition to maintain employment (Pollock et al., 2019; Dineen & Allen, 2016). These challenges force businesses to constantly promote themselves to attract employees and strengthen the trust of stakeholders. Employer branding (EB) has become an important tool to promote the organization to employees (Biswas & Suar, 2016), and helps reduce turnover rates (Tumasjan et al., 2020). Talent management emerged in the 1990s and remains a priority in human resource management (Maurya & Agarwal, 2018). Building on brand marketing, EB integrates human resource management to build a transparent image of an attractive employer (Lievens & Slaughter, 2016).

In modern organizations characterized by ambiguity and uncertainty, it is necessary to build and attract a qualified workforce (Amarakoon & Colley, 2022; Jaiswal et al., 2022). Rapid advances in digitalization and technological innovation have prompted organizations and HR professionals to pay more attention to the role of human resources (HR) in ensuring corporate sustainability. Research by Menz et al. (2021) asserts that a skilled workforce with decision-making capabilities plays a key role in a company's competitive advantage. Employees possessing the necessary skills become an intangible source of sustainable competitive advantage (Bharadwaj & Yameen, 2020). However, attracting and retaining talent is a major challenge for business sustainability (Guchait et al., 2015; Botella-Carrubi et al., 2021).

Therefore, organizations strive to attract and retain experienced personnel (Bharadwaj & Yameen, 2020). Many studies emphasize that the most important human resource strategy to maintain a sustainable competitive advantage is to attract and retain talent (Maheshwari et al., 2017; Chawla, 2019; Tanwar et al., 2019). One of the strategies that has attracted the attention of scholars and experts is employer branding. An employer branding model that emphasizes the role of psychological contract in influencing employee retention has been identified by Tanwar & Prasad (2016), Poisat

et al. (2018) and Deemah & Dukhaykh (2023). The development of a nation depends on the positive contribution of the banking sector (Serhan & Gazzaz, 2019).

In Vietnam, the banking system has affirmed the important role of the banking network in participating in the country's overall economic achievements in all four macroeconomic indicators: Economic growth, monetary stability, unemployment reduction and improvement of the international balance of payments (Nguyen Dai Lai, 2024). In particular, the Military Bank (MB Bank) is developing rapidly, creating a competitive and dynamic environment, increasing the demand for talented personnel. MB Bank leaders in Ho Chi Minh City assessed that in digital transformation, the core factor determining success is people, not technology, hardware or finance (CEO - Luu Trung Thai, 2022). Therefore, to thrive in the banking industry, managers need to recognize the importance of employer branding in attracting and retaining employees. Therefore, this study will examine the impact of employer branding on employee retention, and consider the mediating role of relational psychological contract in the military banking industry (MB Bank) in Ho Chi Minh City.

## II. MATERIAL AND METHODOLOGY

### 2.1. Conceptual Foundation

#### Employer Branding

Research by Deemah & Dukhaykh (2023), indicates that employer branding is a strong predictor of employee retention, building a strong organizational brand can support employers' employee retention efforts. Since the term "Employer Branding" emerged, originating from the application of branding principles to human resource management to attract and retain current and potential employees (Backhaus & Tikoo, 2004; Rai & Nandy, 2021), the concept has evolved over time from a basic description of the features offered by an organization to a process of identifying what makes a company unique. According to Backhaus & Tikoo (2004), employer branding is a process of promoting the unique and distinctive characteristics of an organization to differentiate itself as an employer from other competitors. Edwards (2009) also argued that employer branding involves building an image and identity for the organization as a "Best Place to Work" among current competitors by promoting and managing unique aspects of the organization, such as tangible and intangible services. Furthermore, Wahba & Elmanadily (2015) stated that employer branding is a strategy to externally and internally communicate the unique attributes of the organization, defining the organization's identity as an employer, to attract and retain potential and current employees.

In addition, studies by Tanwar & Prasad (2017) and Deemah & Dukhaykh (2023) identified five dimensions of employer branding, including: (1) Healthy work environment; (2) Training and development; (3) Work-life balance; (4) Ethics and corporate social responsibility (CSR); (5) Compensation and benefits. In which, CSR is assessed as the impact of an organization taking into account the interests of society in how its activities affect stakeholders (Tanwar & Kumar, 2019; Abd Rahim et al., 2011). A healthy work environment reflects a positive and welcoming team spirit, as well as decent and respectful relationships among colleagues (Hadi & Ahmed, 2018). Employee training and development represent the development value of employer branding (Berthon et al., 2005). Furthermore, the competitiveness of compensation and benefits packages provided to employees helps organizations maintain their competitiveness in the market and attract and retain talent (Tanwar & Prasad, 2017). This study applies the five dimensions of Tanwar and Prasad (2017), as they consider a comprehensive measurement of employer branding (Gupta et al., 2021). This study also inherits the scales from Deemah & Dukhaykh (2023) and has adjusted and supplemented the observed variables to suit the management situation of MB Bank in Ho Chi Minh City.

#### Employer Branding and Employee Retention

In a competitive labor market where employees receive multiple job offers, organizations must differentiate themselves by investing in an employer branding strategy to attract and retain talent (Tanwar & Kumar, 2019). Das & Baruah (2013) define employee retention as maintaining or encouraging employees to stay with the organization for a long time. Hadi & Ahmed (2018) argue that a strong employer brand helps businesses retain talent by building a positive image of the work environment. Bharadwaj & Yameen (2020) also emphasize that an employer branding strategy with unique elements provides a competitive advantage in retaining employees. In addition, Easa & Bazzi (2020) also point out that to retain highly skilled employees, organizations need to focus on factors that increase

engagement, reflected in the characteristics and attributes of the employer brand.

According to social exchange theory, when reciprocal exchanges occur, the relationship between employers and employees becomes stronger, creating positive emotions such as trust, loyalty, and commitment (Cropanzano & Mitchell, 2005). This theory is based on the principle of give and take, leading to mutually beneficial exchanges (Chawla, 2019). Studies show that when organizations provide attractive benefits and attributes, employees' intention to leave is reduced. For example, corporate social responsibility (CSR) and work-life balance are important predictors of employee retention (Tanwar & Prasad, 2016; Chawla, 2020). In addition, employers' reward strategies also have a significant impact on employee retention (Matongolo et al., 2018). Research by Deemah & Dukhaykh (2023) identified employer branding as a strong predictor of employee retention. Furthermore, according to the social exchange theory (Cropanzano & Mitchell, 2005), an effective employer branding strategy that includes: Healthy work environment; Attractive compensation; Work-life balance; CSR; Training and development can positively impact employee retention (Guchait et al., 2015; Holland & Scullion, 2019; Deemah & Dukhaykh, 2023).

**Employer Branding and Relational Psychological Contract**

Rousseau (1989) defines the psychological contract as "an individual's belief about the terms and conditions of an exchange agreement between him or her and another party." This contract includes expectations and beliefs about the performance of mutual obligations in an employment relationship. Employer obligations may include training, career development, fair pay, rewards, and commitment (Rousseau, 1995; Pimentel et al., 2021). The psychological contract is considered a set of unwritten expectations based on the exchange relationship between an employee and an organization (Chambel & Alcover, 2011). Since the introduction of the term by Argyris (1960), scholars have continuously studied the antecedents and effects of the psychological contract (Shaheen et al. 2019). Psychological contracts are often classified into two types: transactional and relational (Rousseau, 1995). Transactional psychological contracts are short-term, based on economic value and tangible rewards, while relational psychological contracts are long-term, incorporating both economic and socio-emotional benefits (Binu Raj, 2020; Rahman et al., 2017).

Festing & Schäfer (2014), organizations that invest in human resource management to attract and retain employees can establish a relational psychological contract by meeting the expectations of talented employees. These expectations are often reflected in an employer branding strategy with unique attributes (Tanwar & Prasad, 2016). Research by Ruchika & Prasad (2017) and Millward & Hopkins, (1998), also indicates that employee expectations and beliefs are core elements of the psychological contract (Rousseau, 1989), which can be formed through the organization's brand attributes. Unlike the transactional psychological contract which is short-term and limited, the relational psychological contract emphasizes the continued commitment, stability in the organization, and personal well-being of employees (Rahman et al., 2017; Ruchika & Prasad, 2017).

When employees perceive that the employer brand represents enduring and distinctive characteristics (Lievens & Slaughter, 2016), the relational psychological contract can be strengthened by the organization meeting these expectations (Festing & Schäfer, 2014). Social exchange theory can provide a theoretical basis for establishing a positive association between the employer brand and the relational psychological contract. According to social exchange theory, employees exhibit positive behaviors as a result of positive actions provided by the employer and vice versa (Shaheen et al., 2019).

**The Mediating Role of the Psychological Contract in the Relationship between Employer Branding and Employee Retention**

Researchers have increasingly focused on the mediating role of psychological contract between employer branding and employee retention. Tanwar & Prasad (2016) conducted a qualitative study to explore the factors that shape employer branding from the perspective of employees at a large IT company in India. The results showed that factors such as work environment, work-life balance, corporate social responsibility (CSR), and training and development have a positive impact on employee psychological contract, which in turn impacts employee retention. However, there has been little research that has systematically assessed the mediating role of psychological contract in the relationship between employer branding and employee retention. This suggests that further empirical studies are needed to determine the extent of psychological contract influence in this relationship, thereby providing theoretical and practical

basis for organizations in building strategies to attract and retain talent (Deemah & Dukhaykh, 2023).

Social exchange theory may explain the mediating role of the relational psychological contract between employer branding and employee retention (Deemah & Dukhaykh, 2023). Scholars argue that the psychological contract is based on the principles of social exchange theory (Cropanzano & Mitchell, 2005; Jha et al., 2019), in which the relationship between two parties is strengthened through a reciprocal process, based on economic and socio-emotional exchanges (Blau, 1964; Cole et al., 2002). Since the relational psychological contract emphasizes a long-term commitment between an employer and an employee, including both monetary and non-monetary benefits, employees tend to be more loyal to the organization in exchange for long-term benefits such as job stability, organizational recognition, and career development opportunities (Rahman et al., 2017). When an employer brand creates an attractive work environment with consistent human resources policies, employees can feel a stronger commitment to the organization, thereby reducing their intention to leave the company.

This suggests that organizations can enhance employee retention by building a strong employer brand, while maintaining and strengthening the relational psychological contract with employees through appropriate human resource policies (Deemah & Dukhaykh, 2023). Studies have provided ample evidence of the positive impact of the relational psychological contract on employee behaviors and attitudes, including contextual performance and job satisfaction (Dechawatanapaisal, 2018), work engagement (Soares & Mosquera, 2019), and employee retention (Moquin et al., 2019).

The relational psychological contract is formed when employees perceive positive organizational behaviors, such as autonomy, fair compensation, organizational support, trust, and a challenging yet supportive work environment (Shaheen et al., 2019; Moquin et al., 2019; Deemah & Dukhaykh, 2023). These factors not only enhance employee satisfaction and engagement but also promote their long-term commitment to the organization. Therefore, the relational psychological contract plays an important role in retaining talented employees, as it strengthens their trust and loyalty to the organization (Guchait et al., 2015; Holland et al., 2019). This highlights the importance of building and maintaining a strong employer brand, in order to create positive employee experiences and thereby improve employee retention rates (Deemah & Dukhaykh, 2023).

### 2.2 Research method

The study used a mixed research design that included qualitative and quantitative methods.

#### Qualitative research

The study collected domestic and foreign documents to find data related to this study, including reports and research results published in domestic and international scientific journals. Based on the theory of employer branding, psychological contract and social exchange theory, the study systematized the concepts, components and meanings of employer branding, psychological contract and employee retention. At the same time, the study found out the components of employer branding.

The study sought some information about MB Bank branches in Ho Chi Minh City that have built employer branding, combined with a survey of management experts and group discussions to propose a proposed research model. The expert method according to Delphi conducted a survey of five experts, including three management experts in MB Bank and two academic experts. As a result of the discussion, the research team inherited the scales and adjusted and supplemented the observed variables to suit the practice of building the employer brand of MB Bank in Ho Chi Minh City.

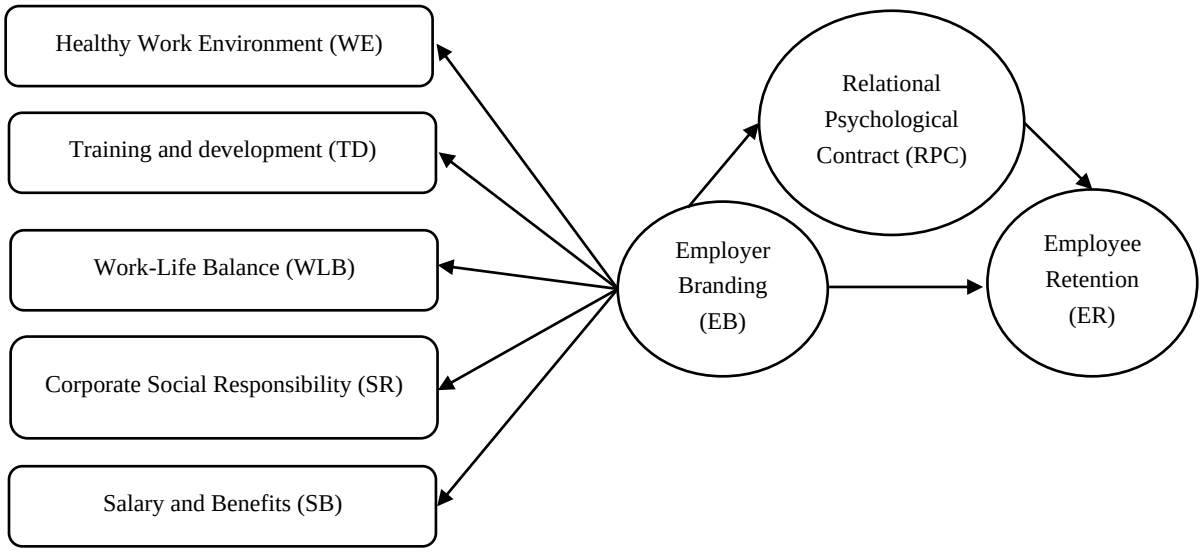
#### Quantitative research

The survey was sent to managers and employees of MB Bank in Ho Chi Minh City. Data were collected through both face-to-face and online surveys. The study used exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) techniques, as Hair et al. (2006) detailed the sample size calculated using the formula N = 5*m, where m represents the number of observed variables. With 35 observed variables in the conceptual scales, the required sample size was calculated as 175, to ensure the results have high reliability, the sample size was chosen as 250.

The sampling technique used was convenience sampling. Valid questionnaires were collected from 219 samples

representing 47 transaction offices of MB Bank in Ho Chi Minh City. The scales in the model were assessed for reliability using Cronbach's Alpha coefficient, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and structural equation modeling (SEM). Quantitative analysis was performed using SPSS 26.0 and AMOS 24.0 software.

**2.3 Research Model**




*Source: Research team proposed*

**Fig 1. Proposed Conceptual Model**

**III. RESULT AND DISCUSSION**

**3.1 Cronbach's Alpha Test**

According to Hair et al. (2006), a Cronbach's alpha coefficient of 0.6 or higher is considered acceptable. After conducting the Cronbach's alpha test, all observed variables showed a total correlation coefficient greater than 0.3 and the Cronbach's alpha coefficient of all factors exceeded the threshold of 0.6. The total correlation coefficient of observed variables was greater than 0.5, indicating a close correlation between the variables. Therefore, all variables met the criteria for inclusion in the EFA analysis.

**3.2 Exploratory Factor Analysis (EFA)**

The study used principal axis analysis for extraction and Promax rotation for matrix rotation, applying these techniques to all 35 variables. The results are summarized as follows:

**KMO and Bartlett's test**

**Table 1. KMO and Bartlett's test results**

| | | |
|---|---|---|
| KMO value (Kaiser-Meyer-Olkin of Sampling Adequacy) | | .958 |
| Bartlett's statistic (Bartlett's Test of Sphericity) | Approx. Chi-Square | 8403.820 |
| | Df | 595 |
| | Sig. | .000 |

*Source: Quantitative data results*

Table 1 shows that the KMO value is 0.958, which is greater than 0.5, indicating that the EFA is well-suited to the actual data. Additionally, the significance value for Bartlett's test is 0.000, which is less than 0.05, suggesting that the observed variables are linearly related to the representative factor.

*Rotated matrix of factors, eigenvalue coefficients, and extracted variance criteria*

The analysis results show that all observations have factor loadings greater than 0.5 and 35 observed variables are extracted into 07 factor groups with eigenvalues of all factors > 1. The total extracted variance is 78.770%. Therefore, the 07 extracted factors reflect 78.770% of the variation in the original data.

**3.3 Confirmatory Factor Analysis (CFA)**

EFA extracted 07 factors, each factor corresponding to a group of scales, which were then used to develop a measurement model of the concepts. This model was analyzed by CFA to assess its suitability to the research data. The results of CFA are summarized as follows:

**Model fit testing**

**Table 2. Indexes assessing the model's suitability to the research data**

| Measure | Estimate | Threshold | Interpretation |
|---|---|---|---|
| CMIN | 810.408 | -- | -- |
| DF | 539.000 | -- | -- |
| CMIN/DF | 1.504 | Between 1 and 3 | Excellent |
| CFI | 0.967 | >0.95 | Excellent |
| SRMR | 0.039 | <0.08 | Excellent |
| RMSEA | 0.048 | <0.06 | Excellent |
| PClose | 0.656 | >0.05 | Excellent |

*Source: Quantitative data results*

Table 2 shows that 1 < CMIN/DF = 1.504 < 3; CFI, SRMR, RMSEA, and PClose are all suitable. Therefore, the model is suitable compatible with the market research data.

*Scale reliability assessment*

A scale is deemed reliable if the composite reliability (CR) exceeds 0.5 and the average variance extracted (AVE) is above 0.5 (Hair et al., 2006). According to the results in Table 3, all CR values are greater than 0.5, and the AVE for all scales also exceeds 0.5. Thus, the measurement scales are considered reliable.

**Table 3. Composite reliability and total variance extracted for factors**

| Latent Variable | Cronbach's Alpha | Composite Reliability | Average Variance |
|---|---|---|---|
| **WE** | 0.938 | 0.913 | 0.679 |
| **TD** | 0.925 | 0.902 | 0.649 |
| **WLB** | 0.937 | 0.893 | 0.625 |
| **SR** | 0.958 | 0.895 | 0.589 |
| **SB** | 0.965 | 0.894 | 0.628 |
| **RPC** | 0.949 | 0.877 | 0.590 |
| **ER** | 0.938 | 0.894 | 0.585 |

*Source: Quantitative data results*

*Convergent validity test*

A scale demonstrates convergent validity when the standardized weights of the scales exceed 0.5 and are statistically significant (Hair et al., 1992). Additionally, convergent validity is assessed by the average variance extracted (AVE), with Fornell and Larcker (1981) suggesting that an AVE of approximately 0.5 or higher is indicative of convergent validity. According to the results in Table 3, all coefficients exceed 0.5, and the AVE values are either above or near 0.5. Thus, it can be concluded that the factors demonstrate convergent validity.

The correlation coefficients among the concepts indicate that the AVE for each concept exceeds the square of its correlation coefficients with other concepts. Consequently, these findings confirm that each concept or scale demonstrates discriminant validity. The correlation matrix for the concepts is presented in Table 4 below.

**Table 4. Correlation matrix between concepts in the study**

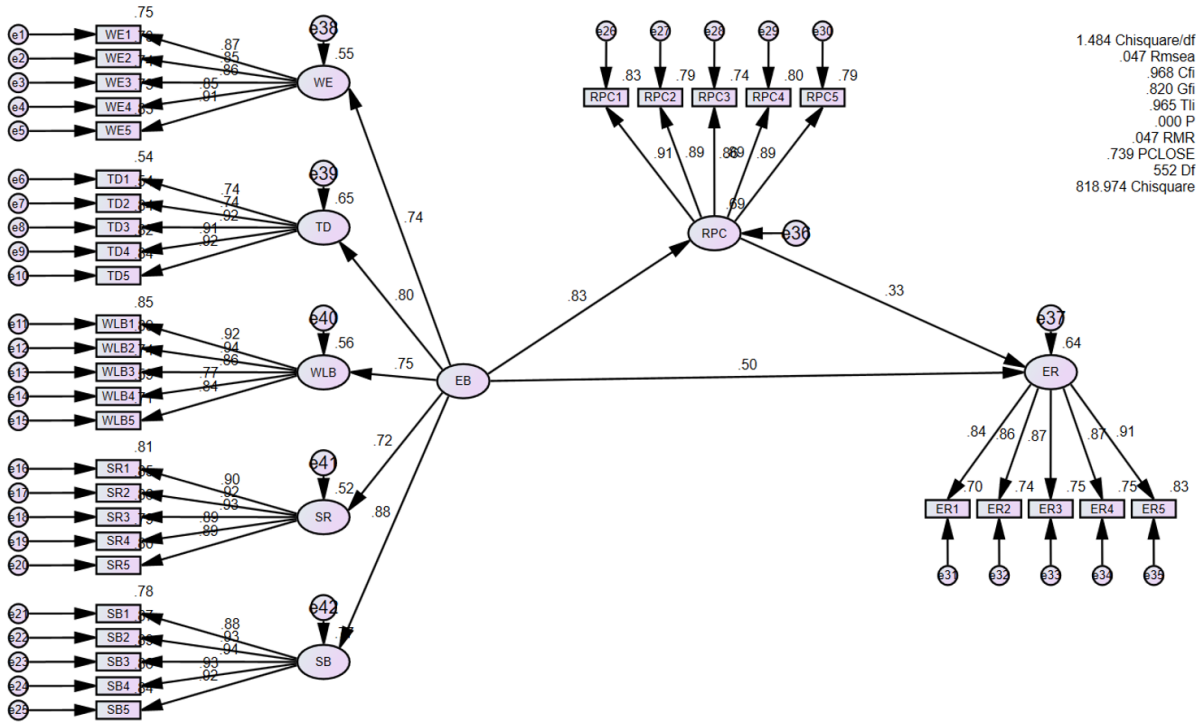
| | AVE | MSV | WE | TD | WLB | SR | SB | RPC | ER |
|---|---|---|---|---|---|---|---|---|---|
| **WE** | 0.755 | 0.417 | **0.869** | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **TD** | 0.717 | 0.514 | 0.566*** | **0.847** | | | | | |
| **WLB** | 0.754 | 0.433 | 0.557*** | 0.631*** | **0.868** | | | | |
| **SR** | 0.821 | 0.417 | 0.545*** | 0.544*** | 0.539*** | **0.906** | | | |
| **SB** | 0.848 | 0.535 | 0.646*** | 0.717*** | 0.658*** | 0.646*** | **0.921** | | |
| **RPC** | 0.790 | 0.558 | 0.617*** | 0.666*** | 0.610*** | 0.617*** | 0.731*** | **0.889** | |
| **ER** | 0.754 | 0.558 | 0.629*** | 0.641*** | 0.567*** | 0.549*** | 0.662*** | 0.747*** | **0.868** |

*Source: Quantitative data results*

### 3.4 Structural equation analysis

After the CFA, the study used SEM to determine the relationship between the factors in the research model, presented in Figure 2 below.




*Source: Quantitative data results*

**Figure 2. SEM linear structural model analysis results**

Figure 2 shows that the model fits the research data with 1 < CMIN/DF = 1.484 < 3; CFI, SRMR, RMSEA, and PClose are all suitable. The results of the SEM analysis show that 07 extracted factors explain 78.770% of the data variation. Accordingly, all hypotheses stated in the proposed model are accepted at a 95% confidence level.

**Table 5. SEM linear structural model analysis results**

| Relationship/Link (Paths) | | | Unstandardized | S.E. | C.R. | P-value | Standardization |
|---|---|---|---|---|---|---|---|
| **RPC** | <--- | EB | 1.245 | 0.123 | 10.107 | *** | 0.831 |
| **ER** | <--- | RPC | 0.274 | 0.086 | 3.2 | 0.001 | 0.329 |
| **ER** | <--- | EB | 0.627 | 0.141 | 4.453 | *** | 0.503 |
| **WE** | <--- | EB | 1 | | | | 0.742 |
| **TD** | <--- | EB | 0.971 | 0.112 | 8.645 | *** | 0.804 |
| **WLB** | <--- | EB | 1.119 | 0.119 | 9.399 | *** | 0.75 |
| **SR** | <--- | EB | 1.11 | 0.123 | 9.002 | *** | 0.722 |
| **SB** | <--- | EB | 1.332 | 0.128 | 10.382 | *** | 0.879 |

*Source: Quantitative data results*

Table 5 shows that the hypotheses in the model are all accepted and the factors in the model all have positive effects. Therefore, the model is suitable and compatible with the market research data.

## IV. CONCLUSION

The research results show that employer branding has a positive impact on employee engagement through employee psychological contracts. At the same time, this research also shows that employer branding has a positive relationship with relational psychological contracts. The research results show that, in order to retain qualified and skilled employees, organizations need to focus on factors that enhance employee retention through the characteristics and attributes of employer branding. As a result, employees who consider their organization as a strong brand are more likely to stay with the organization for a long time. The research results also show that employer branding is a strong factor in employee retention. Therefore, an employer branding strategy is affirmed to include: (1) Healthy working environment; (2) Training and development; (3) Work-life balance; (4) Corporate social responsibility; (5) Compensation and benefits have a positive impact on employee retention.

The results of the study also suggest that the relational psychological contract plays an important role as an antecedent to employee engagement. Previous studies have argued that the relational psychological contract can influence employee engagement (Tanwar & Prasad, 2016; Tanwar & Kumar, 2019; Chawla, 2020; Deemah & Dukhaykh, 2023). These results are consistent with similar studies that have found evidence supporting the positive effect of the relational psychological contract on positive employee attitudes and behaviors. Therefore, employees will demonstrate a longer-term commitment to the organization in exchange for employers fulfilling their relational psychological contract. This result supports the notion that employees who demonstrate positive efforts will be rewarded appropriately (Tanwar & Prasad (2017; Deemah & Dukhaykh, 2023).

In addition, the study results support the social exchange theory, which suggests that employees will form positive and lasting relationships with their employers as a result of an exchange process that includes both economic and socio-emotional exchanges (Deemah & Dukhaykh, 2023). This study also provides empirical evidence that employer branding can positively influence employee engagement through psychological contracts with employees.

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# SESSION 4: FINANCE & ACCOUNTING

# DEVELOPING GREEN CREDIT AT COMMERCIAL BANKS IN VIETNAM

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**ABSTRACT**

Banks are not only the primary channel for capital provision in the economy but also play a pivotal role in "greening" investment flows, thereby contributing to green growth and sustainable development. As challenges related to energy security and environmental protection become increasingly urgent, the importance of green credit has grown significantly. In recent years, commercial banks in Vietnam have actively implemented green credit programs to support enterprises investing in environmentally friendly sectors such as renewable energy, clean energy, and sustainable development projects. However, green credit in Vietnam remains underdeveloped, with significant untapped potential and persistent challenges. This paper provides a theoretical overview of green credit, analyzes its current implementation within commercial banks, and proposes solutions to foster the development of green credit in Vietnam in the near future.

*Keywords: "*Green credit", "green banking", "sustainable development".

## I. INTRODUCTION

The greening of the economy has become a global trend and is increasingly prioritized in international agendas, aiming to mitigate the adverse impacts of economic growth on the environment and society. Most green projects require significant long-term investment capital. In addition to other funding sources such as state budget funds, green bonds and equities, investment funds, and foreign direct investment (FDI), bank credit plays a crucial role in financing these projects. Banks not only serve as the most significant capital providers in the economy but also contribute to "greening" investment flows, thereby fostering green growth and sustainable development.

Green credit has long been developed globally, financing projects focused on energy efficiency, renewable energy, and clean technologies, with the dual objective of achieving economic growth while protecting the environment (Bos & Gupta, 2019). In terms of trends, green credit will undoubtedly continue to grow robustly as environmental concerns gain increasing prominence. Nations worldwide, including Vietnam, are under mounting pressure from the international community to reduce greenhouse gas emissions and protect the environment. Consequently, green credit will become a vital tool in promoting sustainable projects and fulfilling international commitments on environmental protection. Furthermore, with the advancement of technology and innovative financial initiatives, green credit is expected to become even more widespread.

Given this context, developing green credit is an essential solution for transitioning the economy towards green and sustainable growth objectives. This paper provides a theoretical overview of green credit, analyzes the current status of green credit in commercial banks, and proposes recommendations to further develop green credit in these banks in Vietnam in the near future.

## II. THEORETICAL BASIS OF GREEN CREDIT

### 2.1. Theories on Green Banking – Green Credit

Green banking is understood as the provision of banking services that aim to support activities that have a positive impact on the environment, reduce carbon emissions, conserve natural resources, and promote sustainable development (Lalon, 2015). Broadly speaking, green banking refers to banks that build sustainable business strategies, providing banking services that meet environmental and social responsibility criteria. In addition, green banks are considered sustainable banks (Mustafizur et al., 2013). Green banking refers to activities that encourage environmental practices and reduce carbon emissions, such as promoting the use of green products and services; applying environmental standards to approve loans or providing preferential credit for CO2 reduction projects (UNESCAP, 2012).

Chao et al. (2021) and Anderson & Zylicz (1999) define green credit as credit provided by banks to projects that

pose no significant environmental risks or are explicitly designed to protect the environment. The green credit model is viewed as a unique financial tool, playing a critical role in controlling environmentally responsible behavior among enterprises and preventing the uncontrolled development of polluting businesses that harm the environment (Xu & Li, 2020; S. Zhang et al., 2022). Green credit activities, particularly for corporate clients, are implemented by banks through specialized funding groups for large-scale renewable energy projects, clean energy, and debt portfolios committed to financing all or part of these initiatives (Xie & Liu, 2019; Uchida, 2011).

Green credit influences the structure of long-term and short-term credit ratios for businesses, which, in turn, impacts the investment structure and efficiency of heavily polluting enterprises (Wang et al., 2019). During the green credit approval process, banks utilize project and borrower information as lending criteria to assess and determine loan decisions (Yao et al., 2021). In other words, green credit refers to loans provided to support production and business projects that have no or minimal environmental risks, contributing to ecological preservation and reflecting a financial system oriented toward sustainable development.

According to the Green Loan Principles (GLP 2018), issued in 2018 by the Loan Market Association and the Asia Pacific Loan Market Association, green credit is defined as any type of loan exclusively provided to finance or refinance, in whole or in part, new and/or existing eligible green projects. The categories under GLP 2018 include: renewable energy, energy efficiency, green transportation, environmentally friendly products and production technologies adapted to a sustainable economy, sustainable water management and wastewater treatment, green buildings, sustainable agriculture and forestry, as well as pollution prevention and control (Thuy Ha, 2023). In Vietnam, according to Article 149 of the Law on Environmental Protection No. 72/2020/QH14, approved by the 14th National Assembly on November 17, 2020, green credit is credit provided for investment projects that: (i) use natural resources efficiently; (ii) respond to climate change; (iii) manage waste; (iv) treat pollution and improve environmental quality; (v) restore natural ecosystems; (vi) conserve nature and biodiversity; and (vii) create other environmental benefits.

In summary, green credit can be understood as loans provided by banks for “green” production and business projects with low environmental risks to address environmental and social challenges.

**2.2. Characteristics of Green Credit**

Green credit is a credit activity provided by commercial banks; however, it has some distinct characteristics.

First: Green credit is granted for "green" production and business projects with low environmental risks. Generally, the credit granting process of a bank is based on three principles: (i) The borrower commits to complying with the terms of the credit agreement; (ii) The bank only provides credit for effective production and business projects; (iii) The bank grants credit based on collateral. Therefore, any legal entity or individual that meets all three of these principles will be considered by the bank for financing their business activities. However, when granting green credit, the bank is required to carefully evaluate the "green" factor of the projects. This requirement makes the process of granting green credit more complex than conventional credit granting. The repayment period for green projects is usually longer than for typical loans, thus increasing the risk level of these projects.

Second: The main source of funds for commercial banks to implement green credit activities is capital obtained through green funding sources, such as central bank trust contracts, government green credit support funds, or directly issuing green bonds on the market. In addition, commercial banks may arrange and allocate part of their raised funds for green credit implementation.

Third: The process of granting green credit by banks involves many relevant agencies. Green credit is granted for green projects, which often require large investment costs, high product prices, and long payback periods. Therefore, to encourage investors, the government supports these projects through tax policies and stable output price commitments for businesses investing in projects that prioritize environmental protection. Banks commit to providing long-term financing at preferential interest rates. Creating a competitive market for renewable energy supply in rural areas, through a combination of interest rate support, capital support, and other financial incentives, is crucial.

**2.3. The Role of Green Credit in Commercial Banks**

In practice, the trend of green credit growth has been developing globally for a long time, with projects focused on energy conservation, renewable energy, and clean technologies, aiming to achieve the dual goal of sustainable

economic growth and environmental protection.

Green credit is an important solution for individuals, organizations, and businesses, helping to reduce the negative impact of life and production on the environment and society, contributing to the sustainable development of the economy.

Commercial banks are increasingly aware of their role in minimizing environmental harm by financing green projects and restricting funding for projects with adverse effects. Green credit offers multiple benefits for the sustainable development of the banking system, including (1) Credit Risk Reduction: Green credit helps minimize bad debts and enhance financial stability; (2) Reputation Risk Mitigation: Supporting environmentally and socially beneficial initiatives helps protect a bank's reputation in the market; (3) Legal Risk Reduction: Avoids legal disputes related to environmentally harmful projects (Yu et al., 2018; Zhang et al., 2021).

Moreover, the implementation of green credit programs enhances financial stability and protects the bank's brand image in the market. Banks can leverage this opportunity to position themselves as environmentally friendly brands, attracting and building trust with customers and investors who prioritize sustainability. Additionally, restructuring and improving green credit systems at commercial banks while promoting efficient investments in energy and resource projects with high added value will lead to long-term profitability. Green projects also tend to have lower risks and higher profitability due to strong governmental support and the rising trend of green consumption among citizens (Aizawa & Yang, 2010). Banks can seize this opportunity to diversify their investment portfolios and expand market share.

## III. CURRENT STATUS OF GREEN CREDIT IN VIETNAM

### 3.1. Organization of Green Credit Implementation

The legal basis directly regulating green credit activities issued by the State Bank is Directive No. 03/CT-NHNN dated March 24, 2015, on promoting green credit growth and managing environmental and social risks in credit activities. The Directive specifies that the banking sector's credit activities should focus on environmental protection and human health, ensuring sustainable development. Additionally, the Governor of the State Bank also issued Decision No. 1552/QD-NHNN dated August 6, 2015, on the action plan of the banking sector to contribute to and support the implementation of the National Green Growth Strategy. On August 7, 2018, the Governor issued Decision No. 1640/QD-NHNN approving the Green Bank Development Plan in Vietnam. The State Bank has cooperated with the International Finance Corporation (IFC) to research and issue the Environmental and Social Risk Assessment Handbook for 10 economic sectors. This is an important document that helps credit institutions and businesses better understand the environmental and social risks when granting credit and take necessary measures to mitigate these risks in the mentioned sectors. Decision No. 34/QD-NHNN dated January 7, 2019, by the State Bank of Vietnam issued the action program of the banking sector to implement the Strategy for the Development of the Vietnamese Banking Sector by 2025, with a vision toward 2030, which focuses on "implementing green banking activities through increasing awareness and responsibility for the environment and society in banking business; enhancing the capacity of credit institutions to develop products for mobilizing and lending funds to renewable energy, clean energy, and low-carbon production and consumption sectors to contribute to environmental protection and improve resource and energy efficiency.

Thus, Vietnam is in the process of building and improving the policy system to regulate the green credit activities of credit institutions. The above legal framework shows that both providers and users of green credit services benefit from support and incentives from the government and foreign organizations. In addition, the legal framework stipulates the functions and tasks of the relevant parties, all aiming to promote socio-economic development in a green and sustainable direction.

### 3.2. Green Credit at Vietnamese Commercial Banks

#### 3.2.1. General Situation of Green Credit Loan Balance

The Vietnam Banking Sector Development Strategy to 2025, with a vision to 2030, emphasizes the role of green credit in promoting sustainable social development. As energy security and environmental issues become increasingly pressing, the role of financial institutions has grown in importance. In recent years, Vietnamese commercial banks have

actively implemented green credit packages to support businesses investing in renewable energy, clean energy, and sustainable, environmentally friendly projects.

In recent years, Vietnamese commercial banks have provided a wide variety of green credit products, focusing primarily on the following areas:

**Agriculture, Forestry, and Aquaculture:** This includes products such as:

– Loans for high-tech agricultural development programs, implemented by Agribank, Vietcombank, Vietinbank, BacABank, Sacombank, ACB, HDBank, etc.;

– Loans for sustainable agricultural transformation in Vietnam, implemented by BIDV;

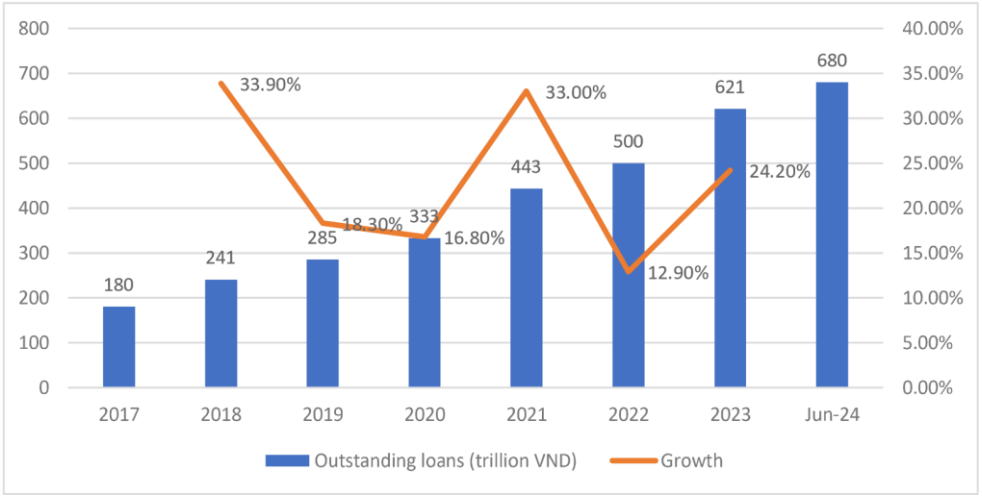
– Loans for sustainable forestry development under the Modernization of the Forestry Sector and Coastal Resilience Project (FMCR), implemented by Agribank.

**Clean Energy and Renewable Energy**: This includes products such as loans for solar energy production systems, wind power, projects to reduce CO2 emissions, energy-saving initiatives, etc., for both businesses and households. Notable banks providing these products include BIDV, Sacombank, TPBank, Vietinbank, HDBank, NamABank, MB, etc.

**Clean Water, Wastewater Treatment, and Waste Management**: Loans for clean water projects and rural environmental sanitation, with Agribank being the main bank participating in projects funded by the World Bank (WB).

In practice, the trend of green credit has been increasingly developed by many commercial banks in recent years. While lending, banks still need to select loans and clients to ensure compliance with general conditions and standards, green projects tend to carry less risk and bring significant sustainable development benefits. As a result, they are seen by banks as a promising niche market.

In recent years, the growth rate of green credit in Vietnam has shown positive signs. The green credit balance in Vietnam has increased from over 71 trillion VND at the end of 2015 to 620.984 trillion VND by the end of 2023, with 47 credit institutions reporting green credit balances, a 24% increase compared to the end of 2022. As a result, the green credit balance continues to grow. However, green credit from bank funding has not developed strongly in recent years. This is reflected in the low proportion of green credit in the banking sector's credit structure, which accounted for only 4.5% of the total credit balance in the economy in 2023.

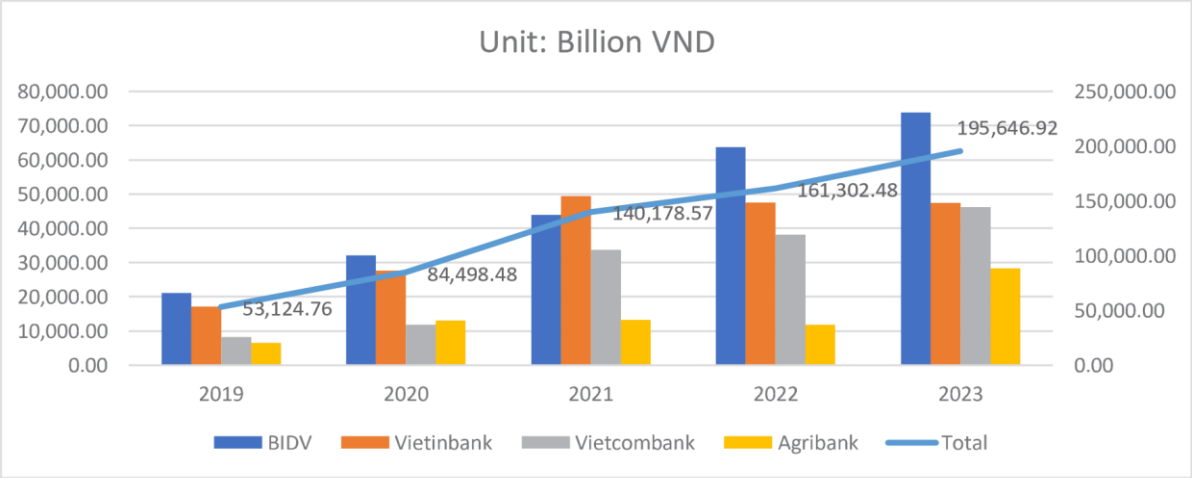



*Source: State Bank of Vietnam, BIDV Research and Training Institute synthesis*

**Figure 1: Green credit outstanding balance in Vietnam from 2017 – 2024**

As of December 31, 2023, there were 47 credit institutions in Vietnam participating in green credit activities. Among them, several banks actively provide green credit, such as Vietnam Joint Stock Commercial Bank for Industry and Trade (VietinBank), Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank), Bank for Investment and Development of Vietnam (BIDV), and Vietnam Bank for Agriculture and Rural Development (Agribank)...

Although the green credit balance in Vietnam has been increasing rapidly year by year, the scale of the balance is still relatively small compared to the total credit in the system. Specifically, the proportion of green credit balance in the total credit balance in Vietnam has increased from 1.5% in 2015 to 5.3% in 2022. The green credit activities of commercial banks still face difficulties because Vietnam currently lacks regulations on environmental criteria and the verification of projects receiving green credit, which would serve as a basis for credit institutions to prioritize capital allocation and loan approval for projects classified as "green."




*Source: State Bank of Vietnam*

**Figure 2: Green credit outstanding balance of selected commercial banks during 2019-2023**

During the period 2019 - 2023, BIDV's total green credit outstanding balance grew 3.48 times from VND 21,172 billion in 2019 to VND 73,777 billion in 2023, accounting for about 5% of BIDV's total outstanding loans. VietinBank's total green credit outstanding balance grew 2.76 times from VND 17,189.08 billion in 2019 to VND 47,464.54 billion in 2023. Vietcombank's total green credit outstanding balance increased 5.55 times, from approximately VND 8,303.98 billion in 2019 to over VND 46,100 billion in 2023, accounting for 3.6% of total outstanding loans. During 2019 - 2023, Agribank's total green credit outstanding balance continuously grew strongly, reaching nearly VND 28,277.2 billion by the end of 2023 (SBV, 2024).

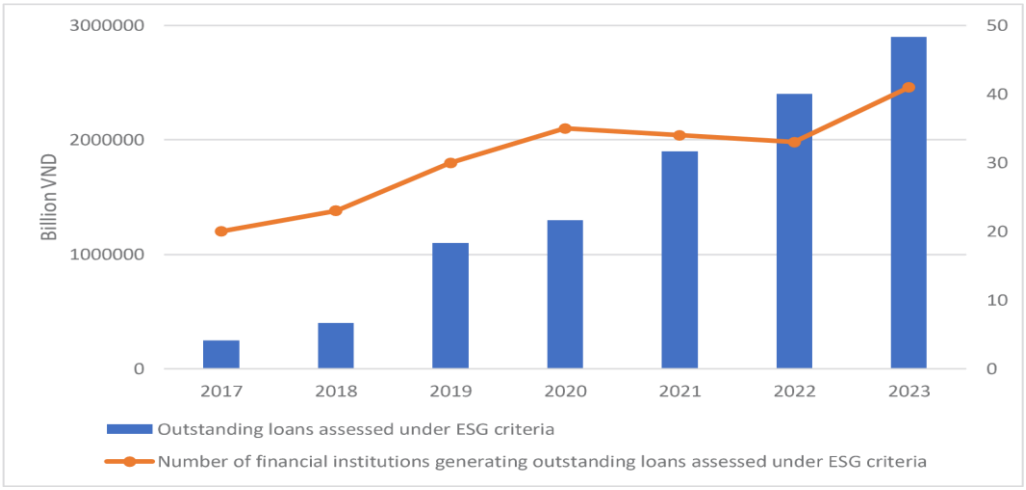



**Figure 3: Outstanding loans assessed under ESG criteria during 2018–2023**

Many commercial banks have developed green credit packages and green credit programs tailored to their business activities and green transition needs. These banks have strengthened their assessment of environmental, social, and governance risks (ESG) in credit operations, implementing ESG across its three pillars: Environmental, Social, and Governance.

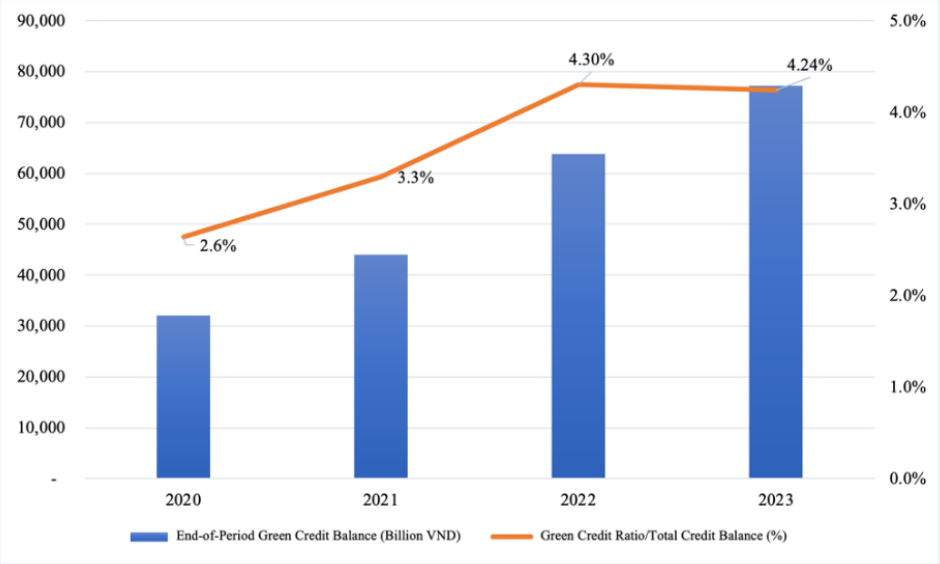
As of December 31, 2023, outstanding loans assessed for environmental and social risks reached VND 2.84 quadrillion, accounting for more than 20% of total loans in the economy, an increase of over 20% compared to the end of 2022 (Anh Minh, 2024). Specifically: 30.7% of commercial banks have established internal regulations on risk

management, 21.9% have established dedicated units or departments for ESG risk assessment, 30% conduct environmental risk assessments, only about 20% have separate, audited reports that systematically evaluate environmental-related risks.

### 3.2.2. Green Credit Balance at Some Vietnamese Commercial Banks

As of the end of 2023, the green credit balance of commercial banks reached nearly 528.3 trillion VND, accounting for approximately 4.2% of the total credit balance in the banking system for the entire economy. Among these, the Vietnam Bank for Agriculture and Rural Development (Agribank) holds the highest green credit balance in areas such as forestry, renewable energy, clean energy, and green agriculture. Additionally, the Joint Stock Commercial Bank for Investment and Development of Vietnam (BIDV) is also a pioneer in green economy lending. Other Vietnamese commercial banks, such as the Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank), the Joint Stock Commercial Bank for Industry and Trade of Vietnam (VietinBank), the Military Commercial Joint Stock Bank (MBBank), and the Asia Commercial Bank (ACB), have also achieved an average annual growth rate of over 45% in green credit balances. The projects that these banks focus on investing in include renewable energy, circular economy, and climate change mitigation.

BIDV, a leading commercial bank with a strategic orientation of being a "green bank," continued to lead the market in financing green projects in 2023. The bank provided green credit to 1,764 customers, with 2,132 projects/plans receiving green credit totaling 74.177 trillion VND, accounting for 4.24% of the total credit balance. Regarding the structure of green credit lending, 81% of the credit balance is allocated to renewable energy projects, including hydropower, wind power, solar power, and other clean and renewable energy sources.




*Source: BIDV Annual Report*

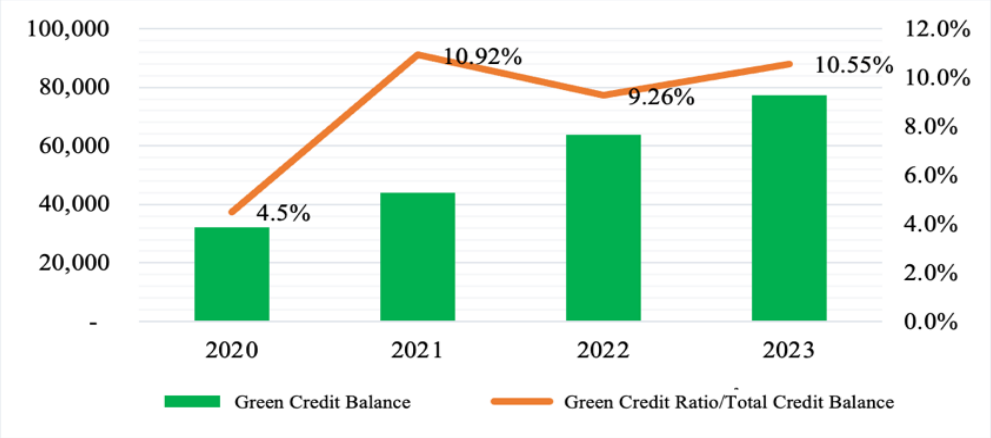
**Figure 4: Green Credit Balance and Green Credit Ratio at BIDV**

For individual customers: BIDV has launched a short-term credit package of 20,000 billion VND with preferential interest rates for individuals engaged in green sectors such as crop cultivation, livestock farming, aquaculture, food processing, and safe food supply. These customers must meet safety and environmental protection certifications such as VIETGAP, GLOBALGAP, BAP, ISO 22000, HACCP, GMP, SQF, etc. At the same time, BIDV continues to research new products and policies targeting green credit, such as electric vehicles and green buildings, to meet sustainable credit growth goals.

For evaluating projects using green capital: BIDV focuses on thorough evaluation and assessment of projects/organizations using green funds, specifically: Assessing the positive environmental impact of the project before, during, and after receiving funding; Ensuring that the project complies with legal regulations and international environmental protection standards and risk management before making a lending decision.

In particular, BIDV is the first domestic bank to issue an environmental and social risk management framework,

applicable to projects and clients receiving international capital.




*Source: MB Annual Report 2023*

**Figure 5: Green Credit Balance and Green Credit Ratio at MB Bank**

MB Bank: 2023 marks the second year of implementing the 2022–2026 Strategy. The senior leadership transition has opened a new chapter for MB on its strategic journey to "Become a Digital Enterprise - Leading Financial Group," maintaining a strong commitment to fulfilling assigned tasks and contributing positively to sustainable development goals. MB has been at the forefront of digital transformation, expanding green credit, with the green credit ratio accounting for 11% of total credit balance, growing year by year and 3.8 times higher than in 2020. In addition to continuously improving its organizational structure and enhancing ESG governance capacity, MB has actively developed a diverse range of green credit products, suitable and effective for its target customers. In 2023, the total green credit balance (including loans and bonds) reached 64,960 billion VND, serving 3,762 customers, reflecting a growth of 47% compared to 2022. MB has also developed data fields to identify green customers/products/programs within the system. In 2023, MB implemented environmental and social risk management regulations according to Circular 17/2022/NHNN, which helped strengthen the legal framework and policies related to credit linked with environmental and social management.

The green credit balance at commercial banks in Vietnam has grown significantly in recent years. Commercial banks like BIDV, MB, Agribank, and VCB have established green credit programs to provide financing for projects such as renewable energy (solar, wind), wastewater treatment, waste management, and sustainable agriculture. However, to optimize the effectiveness of this activity, close collaboration is needed between commercial banks, businesses, and the government in establishing clear standards and raising awareness about the benefits of green credit.

Currently, sustainable development is a global trend, and projects that are not environmentally friendly will face significant pressure, which could lead to boycotts or suspension of the projects, causing businesses to go bankrupt and default. These risks also mean that banks may face bad debts from the investors they have financed. Additionally, the reputation and credibility of banks could be affected if lawsuits arise related to environmentally harmful projects. However, many banks do not prioritize energy-saving or environmentally friendly projects because they require large investments and long payback periods. Some banks feel safer providing credit for projects that require less investment and have faster payback periods, rather than balancing economic benefits with the unclear advantages of becoming a "greener" bank.

### 3.3. Issues Regarding the Development of Green Credit

Despite the positive signals, green credit funding in Vietnam is considered underutilized, with several challenges and limitations:

Firstly, Incomplete legal framework: The legal foundation remains insufficient, lacking specific criteria for defining a green project portfolio. This results in difficulties for commercial banks in developing mechanisms for implementing green activities and providing green credit. Currently, regulations on green banking and green credit mainly serve as guidelines and incentives rather than mandatory requirements for credit institutions.

Secondly, limited policies to support green credit funding: Current policies have not resolved the issue of capital sources for commercial banks to implement green credit. Green projects require longterm, large-scale funding with extended payback periods, while commercial banks primarily rely on short-term mobilized funds. This makes it difficult for banks to balance their capital and comply with regulations on short-term capital for medium- and long-term lending.

Thirdly, uncompetitive interest rates: While green projects are prioritized for loans, the actual lending interest rates are not significantly different from other types of loans. Short-term loan interest rates range from 6.2% to 9.4% per year, while medium- and long-term loans range from 9.4% to 11.4% per year. This is due to unclear preferential mechanisms, high investment costs, extended payback periods, market risks, and additional potential expenses (The Anh, 2022).

Fourthly, challenges in environmental and social risk assessment: Banks face difficulties in appraising, evaluating, and managing environmental and social risks due to a lack of specialized personnel or experts in these areas. Commercial banks have extensive networks and large workforces; however, knowledge of environmental and social risk assessment requires specialized expertise. Developing processes, adjusting behaviors, and training staff in environmental protection, social safeguards, and sustainable finance knowledge require considerable time and effort to ensure systematic and effective implementation across the banking system.

Fifthly, lack of internal ESG frameworks: Some banks have not yet established internal regulations on ESG or dedicated departments for project appraisal, environmental and social risk assessment, and monitoring the effectiveness of green credit throughout a project's lifecycle. Additionally, businesses are only beginning to adopt ESG practices. As a result, it requires significant time and resources to train, persuade, and support enterprises—especially large, leading companies—in pursuing sustainable development goals.

Lastly, investor capacity limitations: The capabilities of project developers also create challenges for commercial banks when considering green credit approvals. Many new businesses undertaking projects are recently established, making it difficult for banks to assess their financial capacity and project implementation experience. Green projects often involve financial risks related to price fluctuations, technology costs, and regulatory requirements. Project implementation in Vietnam is frequently delayed due to prolonged licensing and land clearance phases. Therefore, commercial banks must thoroughly assess and manage risks when providing green credit.

## IV. SOME SOLUTIONS FOR THE DEVELOPMENT OF GREEN CREDIT

To promote the development of green credit in Vietnam, both the State Bank and commercial banks need to take a series of actions and solutions. For the State Bank, a comprehensive plan for the banking sector should be developed, including mechanisms, policies, and specific green credit programs. Relevant agencies also need to collaborate to increase capital and capacity, as well as create incentive mechanisms. Some specific solutions include:

### 4.1. For Commercial Banks

First, research and issue a Green Credit Framework (for banks that have not issued one) or continuously improve the content of the Green Credit Framework (for banks that have already issued one), ensuring that the process of using and managing green credit capital meets green criteria.

Second, develop an Environmental-Social Risk Management System according to the Operating Standards issued by the International Finance Corporation (IFC), which includes: internal guidelines on environmental and social risk management in credit activities; an organizational structure to manage and assess environmental and social risks; assignment of responsibilities, resource allocation, and implementation of the system; reporting systems for environmental and social risk management activities; and capacity-building programs for the bank's institutional ability to manage environmental and social risks. Consider establishing specialized departments (for banks that have not set up such departments) consisting of personnel with expertise in environmental and social fields to have the capacity to build internal regulations and evaluate loan conditions. Clearly define the responsibilities of each department and individual in the green credit process, ensuring that all credit proposals from customers are identified, classified by the level of environmental-social risks, and undergo thorough evaluation to determine compliance and appropriate risk management measures based on the identified risk level.

Third, strengthen activities to improve the quality of the bank's staff by conducting regular training and workshops on green projects and green credit. A deep understanding of environmental-social issues in green sectors is a prerequisite for staff to effectively implement green credit activities and assist customers.

Fourth, closely cooperate with the State Bank's functional units to assess needs, build training programs, and implement them within the bank and/or across the banking sector. Work closely with the State Bank's functional units and the environmental sector to develop a system of data on corporate compliance and violations of environmental requirements, creating a basis for commercial banks to assess the environmental risk level when evaluating borrowers. This will help limit or reduce loans for activities that harm the environment..

**4.2. Recommendations for the State Bank of Vietnam, Government, and Related Ministries**

– Developing National Green Criteria and Standards: First, expedite the establishment of a national framework of green criteria and standards aligned with international practices. This will provide legal foundations for selecting investment projects across ministries, sectors, and localities while enabling the quantification and assessment of progress in green growth. Second, strengthen the activities of green rating and evaluation organizations, ensuring transparency and disclosure of green rating indicators.

– Improving the Legal Framework for Green Credit: First, continue to refine the legal framework for green credit development, focusing on the creation and improvement of green credit standards. These standards will serve as a basis for commercial banks to assess, evaluate, and monitor green credit activities. Second, standardize the definition of green sectors and fields based on a list issued by regulatory authorities. Developing a green taxonomy based on international standards will clarify the criteria and key factors for evaluating the sustainability of projects.

– Enhancing Coordination Among Stakeholders: First, establish a coordination mechanism among ministries, sectors, and localities to identify and propose priority investment areas from the early stages of investment promotion. Second, the State Bank of Vietnam should work with relevant ministries to develop guidelines on green lists and criteria for identifying green projects aligned with Vietnam's economic sector classification. This will provide a foundation for commercial banks to assess, evaluate, and monitor green credit. Third, develop general ESG guidelines to support businesses in green transformation.

– Creating Incentives for Green Projects: First, formulate and improve policies to incentivize and support green projects, which often require long payback periods, large investments, and face high risks. Second, the State Bank of Vietnam should consider preferential policies, such as reducing reserve requirements and increasing access to concessional funding sources. Third, the government can explore establishing a Sustainable Development Support Fund for green projects by referencing international best practices. Fourth, reevaluate the existing policy framework to ensure focus and avoid resource fragmentation while researching mechanisms and policies to develop the green bond market.

– Raising Awareness on Green Growth: First, increase awareness of green growth among individuals, businesses, and organizations in society through practical, effective, and widespread initiatives. Second, promote energy conservation and environmental protection awareness, encouraging more customers to adopt green credit, thereby accelerating its development in Vietnam. Third, strengthen information dissemination and communication about environmental-social risk management and green credit policies.

**V. CONCLUSION**

The development of green credit services will be one of the key focuses of the sustainable development policies of banks and the Government in the future. The investments made by commercial banks in Vietnam, such as solar energy, waste treatment, and green agriculture, align with the global trend toward sustainability and environmental protection. To ensure that green credit becomes an effective tool in implementing the National Sustainable Development Strategy, the Government, regulatory agencies, commercial banks, and businesses must focus on implementing a coordinated series of appropriate solutions.

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# THE ROLE OF LIFESTYLE IN MEDIATING THE INFLUENCE OF FINANCIAL LITERACY AND FINANCIAL INCLUSION ON ONLINE LOAN DECISION MAKING FOR WOMEN IN INDONESIA

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**ABSTRACT**

This study aims to examine the role of lifestyle in mediating the influence of financial literacy and financial inclusion on the decision to take online loans. This research was conducted on women who use online loans in Indonesia. The sampling method used nonprobability sampling with the number of respondents 200 Indonesian women who used online loans. Data analysis uses Partial Least Square to test the direct and indirect effects of financial literacy and financial inclusion on online loan decision-making. The results show that financial literacy, financial inclusion and lifestyle have a significant positive effect on online loan decision-making. Financial literacy is not able to affect lifestyle, while financial inclusion has a significant positive effect on the lifestyle of women in Indonesia. Lifestyle is unable to mediate the influence of financial literacy and financial inclusion on women's online loan decision-making in Indonesia. The results of this study emphasize the importance of financial literacy and financial inclusion in shaping good financial behavior, especially in making decisions to apply for loans. Efforts to increase financial literacy and access to financial inclusion can be the main strategy to improve the financial behavior of women in Indonesia in online loan decision-making.

*Keywords*: “financial literacy”, “financial inclusion”, “lifestyle”, “decision-making”, “online loans”.

# THE MODERATING ROLE OF PROFITABILITY ON THE EFFECT OF GREEN ACCOUNTING, COMPANY SIZE, AND LEVERAGE ON FIRM VALUE

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**ABSTRACT**

This research addresses a significant research gap in green accounting, company size, leverage, and firm value. A factor which is thought to be considered influence the gap is because of differences in profitability. This study aims to determine the role of the profitability on the effect of green accounting, company size, and leverage on firm value. The research object is manufacturing companies in the energy sector and basic materials for 4 (four) years in 2018 – 2023 which were selected based on purposive sampling method. The testing and analysis method used was multiple linear regression analysis and moderated regression analysis. The results indicate that green accounting has a positive effect on firm value. Leverage has a negative effect on firm value. Meanwhile, company size has no effect on firm value. In addition, profitability is able to strengthen the positive effect of green accounting on firm value. Profitability is able to weaken the negative effect of leverage on firm value. Meanwhile, Profitability is not able to moderate the positive impact of company size on firm value.

*Key words:* “green accounting”, “company size”, “leverage”, “profitability”, “firm value”.

# DEEP LEARNING - BASED TIME SERIES ANALYSIS WITH REAL - WORLD APPLICATION

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**ABSTRACT**

Time series forecasting, particularly for volatile and noisy data such as stock prices, demands robust and flexible methods capable of uncovering hidden patterns within the fluctuations. The primary challenges arise from the nonlinear nature, instability of the data, and the presence of irregular patterns. Notably, the dataset employed in this study exhibits high irregularity as it includes the period during the COVID-19 pandemic, when financial markets experienced significant and unpredictable impacts. This research systematically evaluates the performance of five forecasting models—ARIMA, Holt-Winters, LSTM, BiLSTM, and GRU—on stock price datasets from three different sectors: banking (ACB), retail (MWG), and technology (CMC), each with unique structural characteristics, trends, and noise levels. To address the high irregularity of the data, advanced data-splitting techniques such as expanding window and sliding window (rolling window) were applied. These methods not only allowed the models to learn trends from the data but also ensured objective performance evaluation. Experimental results demonstrate that incorporating these techniques significantly enhanced the forecasting accuracy of deep learning models, particularly BiLSTM, across datasets with varying levels of noise and distinct characteristics. Our analysis reveals that deep learning models, especially BiLSTM, consistently outperformed traditional methods, achieving an impressive RMSE of 0.0224 on the MWG dataset or 0.0157 with GRU on the ACB dataset. These findings emphasize that advanced features such as bidirectional processing enable BiLSTM to effectively capture dynamic temporal dependencies while adapting to the specific characteristics of each dataset. By employing advanced data-splitting techniques and comparing model performance across datasets with varying complexities and irregularities, this study provides valuable insights into the strengths and limitations of each method. Furthermore, the research underscores the importance of tailoring model architectures to the unique challenges of specific datasets, particularly under high-irregularity scenarios such as those observed during the COVID-19 pandemic. This study contributes practical knowledge regarding the application of deep learning in time series forecasting, particularly for addressing complex and volatile real-world financial data.

*Keywords:* “Time Series Forecasting”, “Financial Data Analysis”, “Stock Price Prediction”, “Deep Learning”, “Bidirectional Processing”, “LSTM, BI-LSTM”, “GRU”, “Model Evaluation”, “Estimation”

## I. INTRODUCTION

Time series forecasting is a critical field in data science, particularly in its applications across finance, business, supply chain management, and production. A time series is a sequence of observations recorded over time. It includes patterns like trends or seasons that show how things change over time. These patterns can make analyzing the data more challenging because they need to be considered, but they also provide useful clues that can improve predictions. Due to their inherent complexity and variability, time series data pose significant challenges, particularly when dealing with rapidly fluctuating values, nonlinear relationships, and changing statistical properties over time.

Currently, time series forecasting models can be categorized into two main groups: traditional models and modern deep learning techniques. Traditional models such as ARIMA (Auto-Regressive Integrated Moving Average) and Holt-Winters are well-suited for time series that exhibit linearity, stationarity, or stable seasonal patterns. Their effectiveness stems from their simplicity, which allows for straightforward implementation, and their interpretability, which makes it easier to understand and explain the relationships within the data (Dariusz Kobiela, 2022). However, these models struggle when dealing with nonlinear or highly volatile time series. For instance, Holt-Winters, while effective for stable and seasonal data, fails to handle nonlinear or rapidly shifting trends (GAN Pongdatu, 2018). On the other hand, deep learning models like LSTM (Long Short-Term Memory), GRU (Gated Recurrent Unit), and Bi-LSTM

(Bidirectional LSTM) excel at capturing complex nonlinear relationships and long-term dependencies but require significant computational resources and longer training times (Peter T Yamak, 2020). Recent studies have demonstrated the superiority of deep learning methods in time series forecasting. LSTM has been shown to reduce forecasting errors by 84% to 87% compared to ARIMA for financial time series. Bi-LSTM, with its ability to learn from both directions of the time series, has outperformed LSTM and ARIMA in forecasting financial indicators (Shamsul Masum, 2018). GRU, a simpler variation of LSTM, has also shown strong performance on complex time series while significantly reducing training times (Sima Siami-Namini, 2018).

This study aims to identify the most suitable time series forecasting model for datasets with distinct structural characteristics. Five forecasting models—ARIMA, Holt-Winters, LSTM, Bi-LSTM and GRU are evaluated on three datasets representing different sectors: banking (ACB), retail (MWG), and technology (CMC). Each dataset exhibits unique patterns, trends, and noise levels, requiring tailored approaches to achieve optimal forecasting accuracy. To achieve this, the data is segmented using two advanced approaches: rolling window and expanding window. The rolling window method evaluates model performance by focusing on short-term patterns using fixed-sized sliding windows, making it effective for detecting localized trends and anomalies that could impact predictions. The expanding window progressively incorporates historical data to account for long-term dependencies while also highlighting any persistent irregularities, such as those arising during the COVID-19 period. The combination of these two segmentation methods ensures a comprehensive assessment of each model's ability to handle various time series dynamics, including the identification of anomalies and unusual patterns that may influence forecasting accuracy, particularly in datasets containing the volatile COVID-19 phase. The aims of this study are articulated through the following research questions:

(1) Which forecasting model among ARIMA, Holt-Winters, LSTM, Bi-LSTM and GRU is most suitable for each dataset, considering its unique structural characteristics?

(2) How do traditional models (ARIMA, Holt-Winters) compare to deep learning models (LSTM, Bi-LSTM, GRU) in handling volatile and nonlinear data?

(3) What are the strengths and limitations of each model when applied to datasets with varying complexities and segmentation methods?

By addressing these research questions, this study aims to provide substantive insights into identifying the most suitable forecasting model for datasets with varying structural characteristics. The findings are expected to advance the accuracy and efficiency of time series forecasting methodologies while offering a robust foundation for data-driven decision-making in business and technology domains.

## II. MATERIAL AND METHODOLOGY

### 2.1. Conceptual Foundation

#### 2.1.1 ARIMA Model

The ARIMA model is a foundational approach in time series analysis, combining two key processes: autoregressive (AR) and moving average (MA), which rely on weighted delayed random components. The “I” in ARIMA represents the integration level of the variable being analyzed, indicating the number of differences required to achieve stationarity. Stationarity refers to a condition where a time series has a constant mean and variance over time, and the covariance between two observations depends only on their lag, not their absolute position in time. ARIMA is particularly suitable for modeling stationary or non-stationary time series that can be transformed into a stationary series through differentiation. As a traditional forecasting model, ARIMA performs well with linear and stable datasets that exhibit clear trends but is less effective with nonlinear or highly volatile data, where it lacks the flexibility to capture complex relationships (Malska & Wachta, 2015).

The general ARIMA model is denoted as ARIMA(p, d, q), where p represents the order of autoregression, d indicates the degree of differencing, and q corresponds to the order of the moving average. Constructing an ARIMA model typically follows the Box-Jenkins methodology, which comprises three phases. The first phase, identification, involves analyzing the time series to determine whether transformations or differentiations are needed to stabilize its mean and variance. This step uses statistical tools such as the autocorrelation function (ACF), partial autocorrelation

function (PACF), and Dickey-Fuller or Augmented Dickey-Fuller tests (Eurostat, 2022). The second phase focuses on estimation and testing, where model parameters are estimated, and the final model selection is based on criteria such as the Akaike Information Criterion (AIC) or Bayesian Information Criterion (BIC). Residual diagnostics are then performed to ensure that errors follow a white noise process. If significant autocorrelation is detected in the residuals, the model must be refined or re-evaluated. The third phase involves forecasting, with the dataset split into in-sample and out-of-sample periods for parameter estimation and performance evaluation, respectively. Forecasting accuracy is generally deemed more reliable when assessed on out-of-sample data, as in-sample results can be overly influenced by outliers (Eurostat, 2022).

While ARIMA remains a popular choice for time series forecasting, especially with linear and trend-based datasets, its limitations in addressing nonlinear or volatile data underscore the need for more flexible models in complex scenarios. Nonetheless, its simplicity and reliability in stable conditions make it an enduring tool in time series analysis (Malska & Wachta, 2015).

### 2.1.2 Holt-Winters

The Holt-Winters model, also known as Triple Exponential Smoothing, is a statistical method specifically designed for forecasting time series data with inherent trends and seasonality. The model operates on three key components: the level, which represents the average value of the series at a specific time; the trend, which captures the direction and rate of change over time; and the seasonality, which models recurring patterns at regular intervals.

Holt-Winters supports two variations: the additive model, which is suitable for datasets with constant seasonal variations, and the multiplicative model, which is used when seasonal variations are proportional to the series level. By applying exponential weighting, the model smooths the data, making it ideal for short-term forecasts. This method is particularly effective for simple datasets with well-defined seasonal and trend patterns. Common applications of the Holt-Winters model include demand forecasting, predicting website traffic, and analyzing energy consumption trends, where accuracy in short-term predictions is crucial.

### 2.1.3 LSTM Model

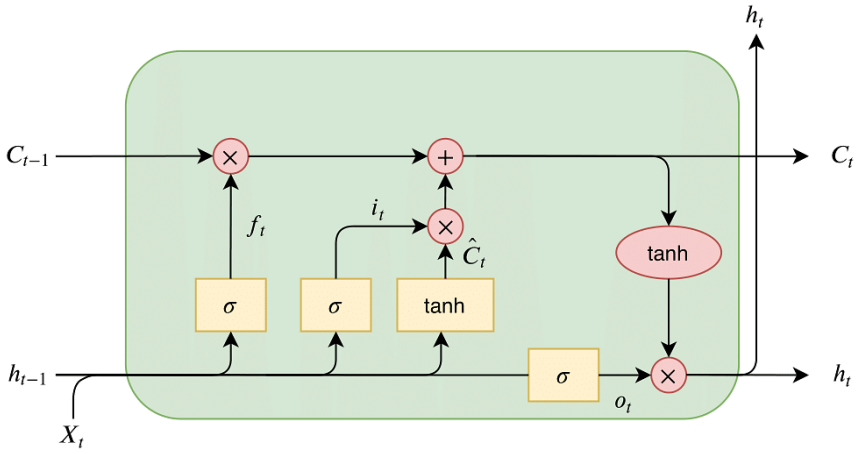



**Figure 1 – LSTM Model**

The concept of artificial neural networks (ANNs) was introduced in 1943 by McCulloch and Pitts, who described the foundational model of an artificial neuron, inspired by the biological structure of nerve cells. This breakthrough laid the groundwork for further exploration into neural network architectures (McCulloch & Pitts, 1943). Over the years, significant advancements were made, including Hebb's discovery in 1949, which proposed a theory on how learning processes modify the connection strengths between neurons (Hebb, 1949).

In 1958, Rosenblatt advanced the field by developing the “Perceptron”, a neural network capable of recognizing alphanumeric characters. This invention marked the transition from theoretical frameworks to functional neural network systems and spurred widespread interest in ANN research globally (Rosenblatt, 1958).

A major development in neural networks occurred with the introduction of Recurrent Neural Networks (RNNs). RNNs are a specialized class of models designed to process sequential data, making them particularly effective for tasks

such as natural language processing, time series forecasting, and classification. Unlike traditional feedforward networks, RNNs retain information from previous steps, enabling them to learn patterns and dependencies over time. However, RNNs face limitations, particularly the issue of vanishing gradients, which impairs their ability to model long-term dependencies.

To address these limitations, Hochreiter and Schmidhuber (1997) introduced the Long Short-Term Memory (LSTM) model, which enhances RNN capabilities by using gated mechanisms to selectively retain or discard information. This innovation allows LSTM networks to capture both short-term and long-term dependencies more effectively, making them highly suitable for complex time series forecasting (Hochreiter & Schmidhuber, 1997).

### 2.1.4 BI-LSTM

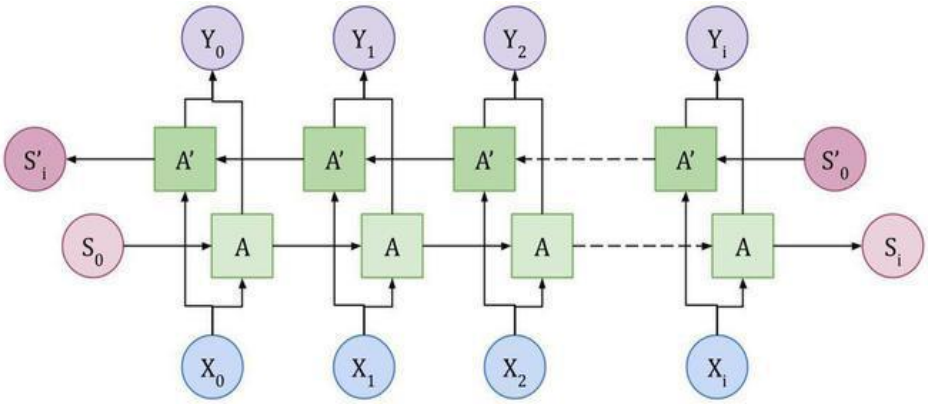



**Figure 2 – BI-LSTM Model**

Bidirectional Long Short-Term Memory (BiLSTM) networks extend traditional LSTM by processing data in both forward and backward directions. This bidirectional approach enables BiLSTM to capture contextual information from both past and future time steps, resulting in enhanced prediction accuracy. The architecture of BiLSTM consists of two LSTM layers: a forward layer that processes the sequence from the beginning to the end, and a backward layer that processes the sequence in reverse order. The outputs from these two layers are combined to form a comprehensive final output, encapsulating richer contextual insights. BiLSTM is particularly advantageous in applications where information from both past and future time steps is critical for accurate predictions. These applications include natural language processing, where understanding the full sentence context is crucial; sentiment analysis, where the tone may depend on preceding and succeeding phrases; and financial forecasting, where data trends often rely on historical patterns and anticipated future movements. Its ability to handle complex sequential data with strong dependencies makes BiLSTM a powerful tool for diverse predictive tasks.

### 2.1.5 GRU

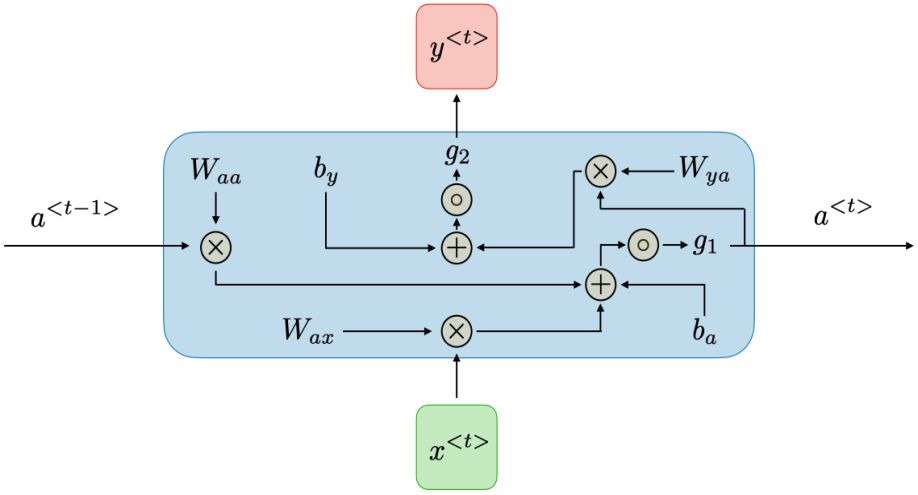



**Figure 3 – GRU Model**

The Gated Recurrent Unit (GRU) is a streamlined variant of the LSTM model, designed to address sequential data

challenges while minimizing computational demands. By simplifying the architecture, GRU replaces LSTM's three gates with two: the update gate, which determines how much of the information from the previous state is retained or updated, and the reset gate, which controls the influence of past information on the current state. This simplification allows GRU to maintain effectiveness while reducing the complexity and resources required for training and inference. GRU is particularly advantageous in scenarios where computational efficiency is critical, such as smaller datasets or applications requiring real-time predictions. Examples include Internet of Things (IoT) signal analysis, where devices generate continuous streams of data, and anomaly detection in systems where rapid identification of outliers is crucial. Despite its reduced complexity, GRU excels in capturing sequential relationships and long-term dependencies, making it a robust choice for tasks that demand a balance between speed and predictive accuracy.

**2.2 Experimental method**

This study adopts a multi-perspective approach to identify the most suitable forecasting models for time series data across three distinct stock sectors: banking (ACB), retail (MWG), and technology (CMC), each characterized by unique patterns, trends, and levels of variability. To achieve this, the performance of five forecasting models—ARIMA, Holt-Winters, LSTM, Bi-LSTM and GRU is analyzed using two segmentation methods: rolling window and expanding window. These techniques support the evaluation of model performance across datasets with varying structural characteristics, providing an approach for assessing their effectiveness in handling diverse data types.

Rather than segmenting the data into short-term, medium-term, and long-term phases as done by Dariusz Kobiela (Dariusz Kobiela, 2022), this study adopts a different approach. Dividing the data in such a way could unintentionally isolate anomalies, reducing their contextual significance for anomaly detection. Instead, the rolling window method focuses on short-term patterns by utilizing fixed-sized sliding windows, while the expanding window progressively incorporates historical data to account for long-term dependencies. This combined approach ensures a thorough evaluation of model performance across stable, volatile, and transitional market conditions while preserving the contextual relevance of anomalies within the datasets.

To evaluate the performance of the models, this study uses Root Mean Squared Error (RMSE) as the primary accuracy metric. RMSE quantifies the difference between actual values ($x_i$) and predicted values ($\hat{x}_i$), ensuring consistent and objective comparisons across models. The formula for RMSE is expressed as follows:

$$\text{RMSE} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \hat{x}_i)^2}$$

Where:

*N:* Total number of observations,

$x_i$*:* Actual values,

$\hat{x}_i$*:* Predicted values.

RMSE is particularly useful as it penalizes large errors, making it more sensitive to significant deviations. Additionally, RMSE normalizes the error to the same units as the forecasted values, ensuring interpretability within the study's context (e.g., monthly forecasts). By utilizing RMSE, this study provides a comprehensive evaluation of the effectiveness of models in handling diverse data conditions and segmentation methods (rolling window and expanding window). This assessment offers critical insights into the adaptability and accuracy of each model for datasets with unique structural characteristics.

**III. RESULT AND DISCUSSION**

The research results are analyzed based on the time series data structure of three datasets representing the retail (MWG), banking (ACB), and technology (CMC) sectors, alongside the performance of forecasting models. The evaluation focuses not only on model performance but also on the structural characteristics of the data to identify anomalies that may impact forecasting accuracy.

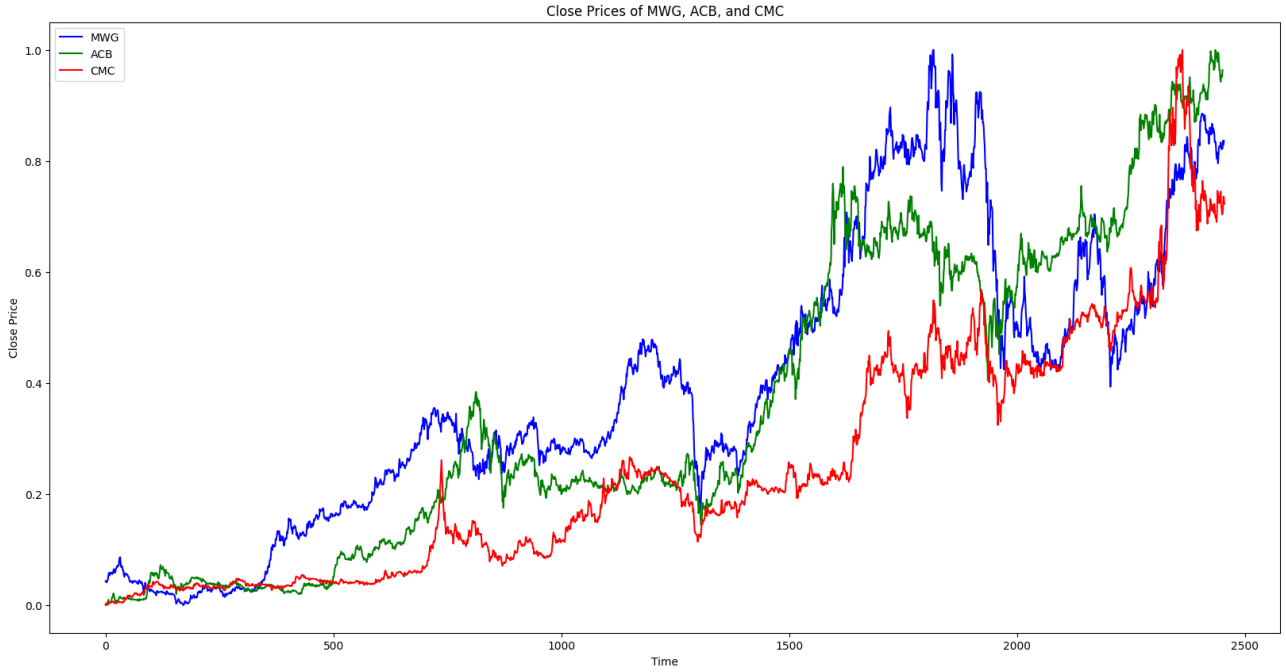



**Figure 4 - Close Price of MWG, ACB and CMC**

As depicted in Figure 4, the closing price charts of MWG, ACB, and CMC illustrate substantial variations in volatility across the respective sectors. The MWG dataset (retail) exhibits a steady upward trend but is accompanied by pronounced short-term fluctuations, reflecting the sensitivity of the retail market to supply and demand changes. The ACB dataset (banking) appears more stable, with a clear long-term upward trend and fewer short-term variations, characteristic of the financial sector's steadiness. In contrast, the CMC dataset (technology) shows high volatility, especially during periods of significant market changes, highlighting the instability and rapid evolution inherent to the technology sector. All three datasets are considered to be nonlinear and contain periods of substantial volatility, particularly around 2020 (approximately at point 1500 on the x-axis), likely linked to unusual impacts from the COVID-19 pandemic. These characteristics require forecasting models that not only capture long-term trends but also adapt well to short-term and unusual fluctuations.

**Table 1 - Best Results of Traditional Models**

| Model | Stock | RMSE |
|---|---|---|
| Arima | MWG | 6725.8229 |
| Holt-Winters | MWG | 6855.8016 |
| Arima | ACB | 2241.4632 |
| Holt-Winters | ACB | 2288.8692 |
| Arima | CMC | 7560.7487 |
| Holt-Winters | CMC | 8965.4100 |

The results from Table 1 reveal that both ARIMA and Holt-Winters exhibit relatively high RMSE values across all three datasets, particularly on MWG (RMSE = 6725.8229) and CMC (RMSE = 8965.4100). This poor performance indicates that traditional models are not suitable for handling the data used in this study. The primary reason lies in the fact that the time series data for MWG and CMC display highly irregular behavior, with significant short-term fluctuations and nonlinear characteristics. Traditional models like ARIMA and Holt-Winters are designed to perform well on linear, stable datasets with trends, as observed in the ACB dataset (which achieved a lower RMSE: 2241.4632 with ARIMA). However, even for ACB, the results are far from ideal. When tasked with processing complex, volatile, and nonlinear data, these models lack the flexibility to fully capture the hidden relationships in the time series. Therefore, transitioning to deep learning models such as LSTM, Bi-LSTM, and GRU is necessary. These models are capable of capturing both long-term trends and short-term fluctuations, enabling more accurate forecasting in cases of nonlinear and highly volatile data.

**Table 2 - Summary of Best RMSE Values for Forecasting Models**

| Model | Stock | Segmentation Method | RMSE |
|---|---|---|---|
| LSTM | MWG | Sliding window | 0.025 |
| BiLSTM | MWG | Sliding window | 0.021 |
| BiLSTM | CMC | Sliding window | 0.0431 |
| GRU | ACB | Expanding window | 0.0157 |
| GRU | CMC | Expanding window | 0.0226 |

The results from Table 2 indicate that the performance of forecasting models varies depending on the dataset and segmentation method applied. Bi-LSTM demonstrates superior performance when using the sliding window method, particularly on datasets with high volatility and clear short-term trends. On the MWG dataset, Bi-LSTM achieves an RMSE of 0.021, outperforming LSTM (RMSE = 0.025), highlighting its greater effectiveness in handling short-term fluctuations in retail data. Similarly, on the CMC dataset, Bi-LSTM achieves an RMSE of 0.0431, showcasing its adaptability to the significant volatility inherent in technology data.

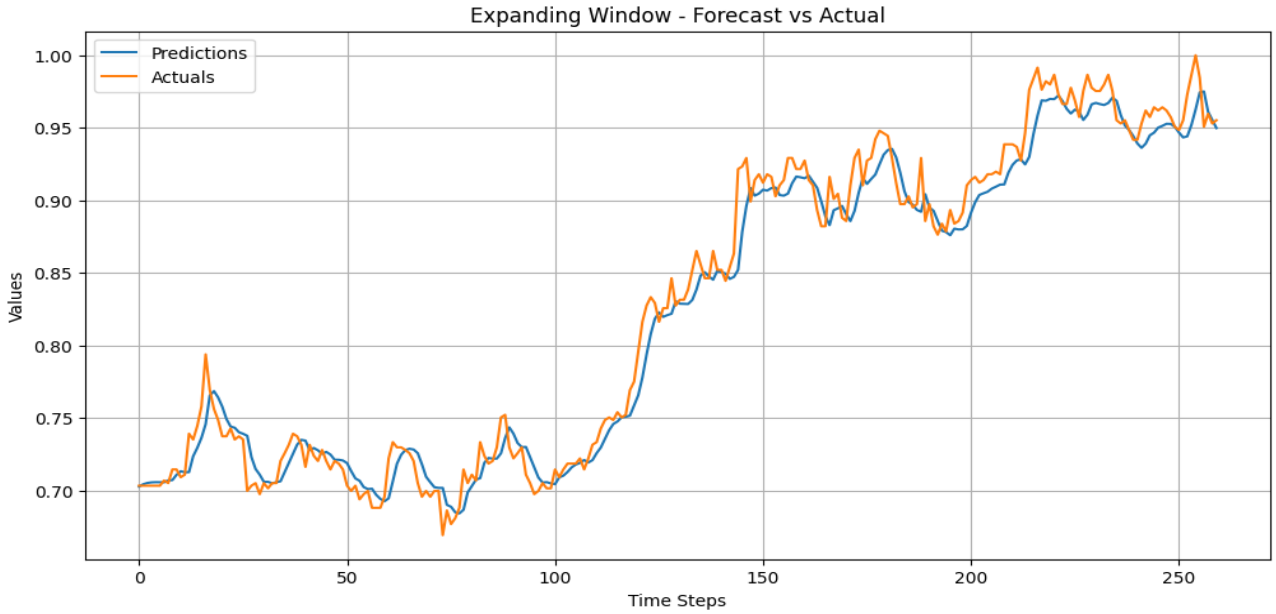



**Figure 5 - GRU Expanding Window - Best RMSE in ACB**

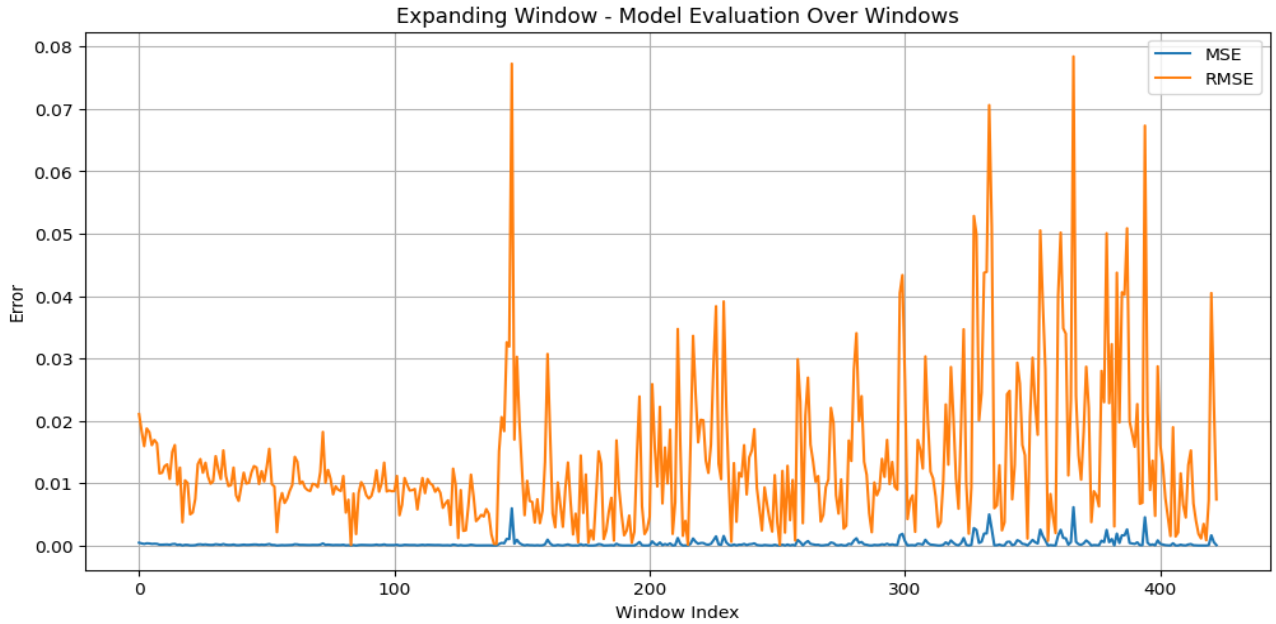



**Figure 6 - Performance of the GRU model over windows on CMC**

Using the expanding window method, GRU excels in capturing long-term dependencies in stable and moderately volatile data (see Figure 5). On the ACB dataset, GRU achieves an RMSE of 0.0157, demonstrating high efficiency in leveraging long-term trends within banking data. Additionally, on the CMC dataset, GRU achieves an RMSE of 0.0226, making it suitable for technology data that requires a balance between short-term volatility and long-term dependencies.

Although LSTM does not lead in performance, it delivers stable results on the MWG dataset with an RMSE of 0.025. This indicates that LSTM performs well under common data conditions but is not the optimal model for scenarios that demand a higher capacity to handle volatility or long-term dependencies.

As shown in Figure 6, the GRU model with the Expanding Window method exhibits a strong sensitivity to anomalies in the CMC dataset. In the initial phase, with smaller window sizes, the model achieves relatively low and stable RMSE values, indicating its ability to effectively capture early trends in stable data. However, as the window size increases, the RMSE begins to fluctuate significantly, particularly during periods corresponding to unusual events or high volatility, such as those associated with the COVID-19 pandemic. These sharp increases in RMSE highlight the challenges faced by the model in handling anomalous patterns and abrupt changes in the dataset.

The presence of pronounced RMSE peaks during these phases underscores the heightened sensitivity of the GRU model to the anomalous and nonlinear characteristics inherent in the CMC data. Despite these challenges, GRU demonstrates adaptability, as evidenced by the gradual reduction in RMSE following periods of high volatility. This indicates the model's ability to learn and adjust to the evolving characteristics of the data, although its overall performance remains influenced by the complexity and irregularity of the input.

These findings emphasize the model's capability to effectively manage the impact of anomalous patterns on forecasting accuracy. With the capabilities of models such as GRU, their performance can be further optimized to handle complex and volatile time series data.

Based on the research findings, the most effective forecasting models have been identified for each dataset, highlighting their distinct advantages. For the MWG dataset, characterized by a steady upward trend with pronounced short-term fluctuations, Bi-LSTM stands out as the most effective model, achieving an RMSE of 0.021 when using the sliding window method. Its ability to process information bidirectionally gives Bi-LSTM a clear advantage over LSTM and traditional models, particularly in capturing the retail market's sensitivity to supply and demand changes during Coivid19. For the ACB dataset, which exhibits greater stability and a clear long-term upward trend, GRU proves to be the most suitable model with the lowest RMSE of 0.0157 when applying the expanding window method. GRU's ability to capture long-term dependencies in the data makes it particularly well-suited to the characteristics of the financial sector, where stability and long-term trend analysis play a critical role. For the CMC dataset, characterized by high volatility and rapid changes, the results indicate that different methods are required for optimal performance. Using the sliding window method, LSTM achieves an RMSE of 0.0352, demonstrating strong adaptability to short-term fluctuations in technology data. Meanwhile, when using the expanding window method, GRU once again shows superior performance by effectively balancing short-term volatility and long-term trends, achieving an RMSE of 0.0226. These results suggest that selecting the appropriate model and segmentation method heavily depends on the characteristics of the time series data. Bi-LSTM demonstrates exceptional performance in handling short-term fluctuations and highly volatile data, while GRU proves highly effective for stable or moderately volatile data, particularly in long-term forecasting tasks. These findings provide practical guidance for selecting suitable forecasting models, effectively supporting strategic decision-making in various industries.

## IV. CONCLUSION

This study analyzed the performance of forecasting models, including ARIMA, Holt-Winters, LSTM, Bi-LSTM, and GRU, on three financial time series datasets representing the retail (MWG), banking (ACB), and technology (CMC) sectors. The results revealed that Bi-LSTM is the most effective model for datasets with high volatility, such as MWG and CMC, when using the sliding window method. This reflects Bi-LSTM's exceptional ability to capture both long-term trends and short-term fluctuations. For more stable datasets like ACB, GRU achieved the best performance when using the expanding window method, due to its ability to leverage long-term dependencies in the data.

Our experiments revealed limitations in traditional models like ARIMA and Holt-Winters when handling nonlinear, volatile data, particularly during events like the COVID-19 pandemic. Despite their stability with linear datasets, these models struggle to capture the complex hidden relationships within time series data. This highlights the critical role of deep learning models like Bi-LSTM and GRU in managing complex time series data.

This research contributes to the field of time series forecasting by providing deep insights into how to select forecasting models appropriate for specific data characteristics. Additionally, the research lays the groundwork for future studies focused on parameter optimization, developing hybrid models that combine traditional and deep learning methods, or expanding the scope to other domains such as energy, healthcare, or weather forecasting. These findings not only add academic value but also offer practical recommendations for applications in financial forecasting and related fields.

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# IMPACT OF TECHNOLOGICALLY VIGILANT LEADERSHIP ON SMART SUSTAINABLE CIRCULAR SUPPLY CHAIN MANAGEMENT IN THE CONTEXT OF INDUSTRY 6.0

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**ABSTRACT**

The main aim of this study was to explore how technologically vigilant leadership (TVL) impacts on smart sustainable circular supply chain management (SSCSCM) in context 6.0. This was accomplished by analyzing the mediating effects of the digital environment management accounting system (DEMA) on the link between TVL and SSCSCM. This research evaluated the proposed model using two distinct statistical methods within the framework of structural equation modeling, which facilitated the assessment of both linear and non-linear correlations among the constructs. Linear relationships were analyzed using AMOS, whereas non-linear relationships were examined with WarpPLS. The data was obtained from a sample of respondents employed in small and medium enterprises. In both instances, the influence of TVL on SSCSCM was significant and favorable, as demonstrated by CB-SEM and PLS-SEM techniques. Furthermore, DEMA partially mediated the relationship between TVL and SSCSCM. In addition to its theoretical contribution to the research trends associated with Industry 6.0, this study significantly enhanced the comprehension of SMEs as they endeavored to implement SSCSCM through TVL and DEMA. Notably, these profound insights would provide guidance for policymakers in developing improved TVL mechanisms to leverage the advantages of DEMA and thereby strengthen SSCSCM.

*Key words: "circular economy"; "environmental management accounting"; "Industry 6.0"; "smart supply chain"; "vigilant leadership".*

## I. INTRODUCTION

The supply chain is the lifeblood of the world economy and society (Ivanov, 2020). Sustainability imperatives and transformative technological advancements have necessitated responsible consumption and enhanced production from the industrial sector (Mathiyazhagan et al., 2022). The supply chain in a company is always an important step to assist all activities that take place sequentially and ensure efficiency. In fact, SMEs have certain limitations in terms of personnel, resources and people. However, an inevitable thing in the process of rapid and strong development of the current economy is the great impact of technology and the circular economy. This will make the management process of managers need to change and adjust. Disruptive technologies are improving the speed and resilience of supply chain operations while reducing carbon footprints (Karuppiah et al., 2024). According to Singh et al. (2024), researchers are beginning to consider Industry 6.0, a novel concept, as an advancement beyond Industry 5.0. As stated by Kumari et al., (2024), the emergence of Industry 6.0, defined by the incorporation of advanced technologies like artificial intelligence, blockchain, and the Internet of Things, has ushered in a novel epoch of connectivity and collaboration. A smart sustainable circular supply chain management (SSCSCM) amalgamates Industry 6.0 and circular economy principles inside the supply chain to fulfill sustainable objectives. As such, effective leadership will play an important role in enabling organizations to succeed in SSCSCM. Gao et al. (2024) assert that vigilant leaders, who prioritize predicting possible issues and obstacles, will significantly reduce followers' complacency and foster a sense of duty to implement constructive changes.

In line with the findings of Gao et al. (2024), technologically vigilant leadership (TVL) is characterized by leaders who raise awareness of recent technological advancements, assess which of these pose threats or opportunities, manage their effects on products, services, and the internal organization, and concurrently guide employees during periods of uncertainty while motivating them to adopt precautionary measures to alleviate those threats. Remarkably, top management should consider the implementation of EMA as a strategy to improve their environmental performance by

maintaining a comprehensive record of all materialistic inputs and outputs, such as garbage, emissions, water, and materials (Hasan et al., 2024). The deployment of EMA has a markedly favorable impact on corporate performance, and that EMA fosters innovation in processes, hence enhancing overall company performance. From the standpoint of managerial accounting, EMA is a synthesis of cost and financial accounting techniques aimed at reducing environmental impacts, managing risks, and lowering costs (Bresciani et al., 2023). The improvements of Industry 6.0 will undoubtedly influence accounting ecosystem (Deliu & Olariu, 2024). Digital EMA (DEMA) can be understood as the integration of digital technologies of Industry 6.0 into EMA system. The combined study of vigilant leadership, sustainable circular supply chain, Industry 6.0, and EMA in small and medium enterprises (SMEs) in the context of developing countries has been the subject of limited research until recently. This is primarily due to the emergence of these relationships in recent years. In light of this, it is imperative to establish more comprehensive management models and policies to optimize and enhance the efficiency of the SSCSCM of SMEs. The primary objective of this investigation is to investigate the potential role of TVL in improving SSCSCM and the role of DEMA in this relationship. The primary objective of this study is to analyze the stated reasons through the systematic development of research questions.

- RQ1. What is the effect that TVL induces on SSCSCM?
- RQ2. Does DEMA mediate the relationship between TVL and SSCSCM?

The present study addressed specific voids that were identified in the examination of the overall results and key observations, thereby making contributions to both the academic and practitioner communities. By addressing the voids in the literature on SSCSCM in developing countries, the current research's findings broaden the existing boundaries of knowledge. In developed countries, sustainable supply chain management (SCM) techniques are becoming prevalent, whereas developing countries exhibit a deficiency in sustainable practices due to many constraints, including knowledge, resources, support, and guidance (Syuaib, 2016). The current research is a pioneering study that examines the interconnection between TVL and SSCSCM in SMEs in developing countries. The perceptions of top management on environmental challenges affect the opportunities for and implementation of voluntary environmental strategies (Li et al., 2023). TVL allows executives to view the overarching context from a temporal standpoint and discern fundamental issues that could result in future failures in the management of smart sustainable circular supply chains. As such, the TVL is crucial for the expansion and reinforcement of SSCSCM. It also addressed a research gap in previous studies by providing empirical evidence on the mediating role of DEMA in the relationship between TVL and SSCSCM. With the increasing frequency and speed of information transmission across the supply chain network, supply chain managers can share enduring behavioral data regarding products and provide virtually instantaneous answers through innovative processing methods. The exchange of information among supply chain partners (Grimm et al., 2014) and forecasting methods that yield reliable outcomes while minimizing waste production are recognized as essential elements for effective circular SCM (Mena et al., 2014). The use of EMA provides enhanced visibility of environmental information to numerous stakeholders (van Der Poll, 2022), and this visibility significantly positively influences environmental practices (Aluchna et al., 2022). It enables practitioners and policymakers to establish strategies and policies that assist enterprises in implementing the incentives of Industry 6.0, resulting in significant enhancements in their processes and the industry.

The present investigation is organized as follows. Section 2 provides a concise overview of conceptual elements and their theoretical foundations. Section 3 of the study delineates the formulation of research hypotheses and the construction of a research model. Additionally, Section 4 provides a detailed overview of the research methodology, while Section 5 presents the outcomes derived from the study. The sixth section of the manuscript delineates theoretical and practical implications, as well as noteworthy insights for future research.

## II. LITERATURE REVIEW

### 2.1. Stakeholder theory

Stakeholder theory offers a conceptual structure for comprehending the wider social, environmental, and economic impacts of operational activities in organization (Dmytriyev et al., 2021). With the advent of digital technology, key stakeholders have gained more authority to exert influence on organizations, either directly or indirectly, to advocate for

digitalization (Jin et al., 2024). Stakeholder pressure has intensified for firms to engage in sustainable development (Waheed et al., 2024). Sustainability pressures and radical technological development have mandated responsible consumption and value-added production from the industrial community (Mathiyazhagan et al., 2022). Thus, this theory is able to elucidate the reasons behind how TVL and DEMA will improve and enhance SSCSCM.

### 2.2. Smart sustainable circular supply chain management

Industry 6.0 anticipates intelligent, fully integrated systems that reduce human intervention by amalgamating artificial intelligence, human-robot collaboration, cloud computing, big data analytics, and quantum computing (Deliu & Olariu, 2024). Sustainable SCM refers to the collaboration of organizations to deliver environmental and social advantages either inside an individual organization or across the entire supply chain (Taylor & Vachon, 2018). Geissdoerfer et al. (2018) assert that managing a circular supply chain aims to shut material and energy loops, minimize resource inputs and waste, thus improving operational efficiency and securing a competitive advantage. The incorporation of I6.0 technologies into the circular SCM has represented a substantial advancement in sustainable operations in recent years. A SSCSCM amalgamates Industry 6.0 and circular economy principles inside the supply chain to fulfill sustainable objectives. By promoting the use of circular economy ideas, Industry 6.0 enhances environmental sustainability while providing businesses with avenues for innovation, competitive edge, and enduring viability.

### 2.3. Digital environmental management accounting

Managerial accounting is one of the important fields in providing financial, accounting, and strategic budget information, helping leaders of units to plan and establish policies, tasks and plans in the medium- and long-term periods. Building on the viewpoint of Amoako et al. (2021), EMA was developed to assist companies in identifying, measuring, and managing the costs related to natural resource utilization, waste production, and pollutant emissions, thereby enhancing organizational transparency regarding environmental expenses, improving resource efficiency, minimizing waste, and reducing operational costs. In this research, DEMA can be understood as the integration of digital technologies of industry 6.0 into EMA system.

### 2.4. Technologically vigilant leadership

Leadership is not only defined by those working in positioning orientation, but it exists at all levels in every entity and society. In business, it is a set of behaviors used to unify direction and strategy for each level of employees, implementing plans and continuously innovate, bringing value to the organization. Effective leadership is when the leader can lead the group and organization to achieve goals effectively and sustainably. To become an effective leader, it is necessary to have a combination of skills and leadership styles suitable for specific circumstances and environments. In line with the findings of Gao et al. (2024), TVL is characterized by leaders who raise awareness of recent technological advancements, assess which of these pose threats or opportunities, manage their effects on products, services, and the internal organization, and concurrently guide employees during periods of uncertainty while motivating them to adopt precautionary measures to alleviate those threats.

## III. HYPOTHESIS DEVELOPMENT

Supply chains must be more intelligent to address the previously mentioned challenges (Wu et al., 2016), deliver sustainable outcomes (Zouari et al., 2021), and minimize human-machine interaction to promote the adoption of sustainability practices that support circular economy principles (Yadav et al., 2020). A smart supply chain enables stakeholders to optimize and streamline processes, aiming to reduce production costs and company expenses. Gao et al. (2024) assert that vigilant leaders, who prioritize predicting possible issues and obstacles, will significantly reduce followers' complacency and foster a sense of duty to implement constructive changes. TVL allows SMEs to evaluate the prospective future results of their current activities and is affected by those potential outcomes. TVL allows executives to view the overarching context from a temporal standpoint and discern fundamental issues that could result in future failures in the management of smart sustainable circular supply chains.These arguments aid in the development and formulation of the following hypothesis.

**Hypothesis 1 (H1).** TVL is likely to significantly and positively influence SSCSCM.

The vigilant leaders prioritize the long-term sustainability of their teams and motivate their staff to gather

peripheral information and anticipate potential issues prior to their emergence (Gao et al., 2024). The EM pertains to environmental information that has ecological implications and enhances the sustainability performance of an organization (Deb et al., 2023). Executives with an optimistic perspective on the implementation of environmental practices are more inclined to enhance their companies' engagement in environmental management (Park & Kim, 2014). Digitalization has substantial prospects for process enhancement by enabling a corporation to reduce resource consumption through the implementation of information and communication technology tools (Agrawal et al., 2022). When companies implement innovative systems, they enhance their ability to improve their EMA systems; hence, they can make more effective decisions, ultimately resulting in improved financial performance (Abdelhalim et al., 2023). These arguments aid in the development and formulation of the following hypothesis.

**Hypothesis 2 (H2).** *TVL is likely to significantly and positively influence DEMA.*

The effectiveness of sustainable supply chains is contingent upon the circular economy proficiency of organizations, as evidenced by pollution levels and resource utilization efficiency within supply chain operations (Zeng et al., 2017). The deployment of EMA has a markedly favorable impact on corporate performance, and that EMA fosters innovation in processes, hence enhancing overall company performance. From the standpoint of managerial accounting, EMA is a synthesis of cost and financial accounting techniques aimed at reducing environmental impacts, managing risks, and lowering costs (Bresciani et al., 2023). These arguments aid in the development and formulation of the following hypothesis.

**Hypothesis 3 (H3).** DEMA is likely to significantly and positively influence SSCSCM.

Digitalization is as essential as circular development for firms' enduring advantages in attaining sustainability. The shift to Industry 6.0 has catalyzed the redefinition of SCM towards smarter, more sustainable, and circular approaches. TVL refers to leader behaviors aimed at encouraging people to concentrate on prospective issues related to digital technologies and to prepare for unforeseen setbacks in the future. Leaders who are technologically vigilant and prioritize the anticipation of potential issues in SSCSCM will significantly reduce followers' complacency and foster a sense of duty to implement constructive changes for success in this domain. Executives with an optimistic perspective on the implementation of environmental practices are more inclined to enhance their companies' engagement in environmental management (Park & Kim, 2014). The use of EMA provides enhanced visibility of environmental information to numerous stakeholders (van Der Poll, 2022), and this visibility significantly positively influences environmental practices (Aluchna et al., 2022). These arguments aid in the development and formulation of the following hypothesis.

**Hypothesis 4 (H4).** DEMA is likely to mediate the relationship between TVL and SSCSCM.

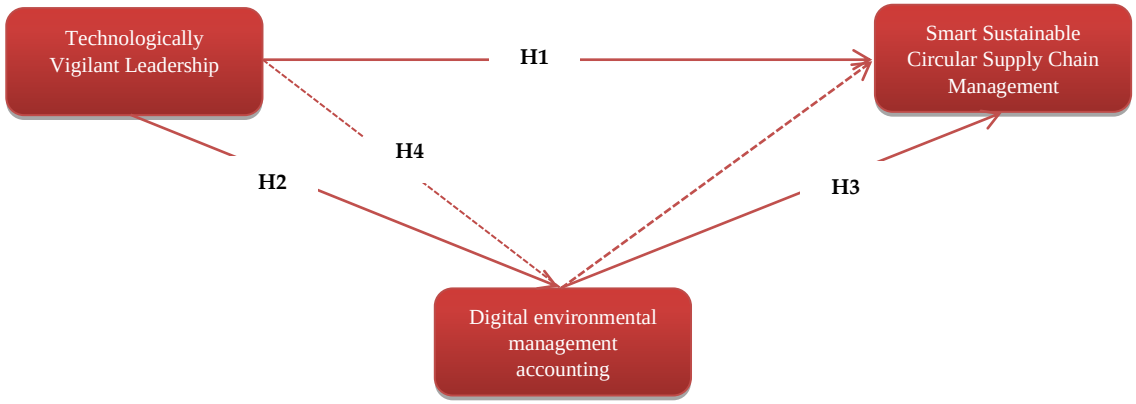



**Fig. 3.1 Conceptual model and hypotheses**

## IV. RESEARCH METHODOLOGY

### 4.1 Measurement scale

This work collected data via questionnaires. English questionnaires were translated to Vietnamese by bilingual experts and back-translated by additional bilingual experts for dataset establishment and data analysis. Then, the two English questionnaires were cross-checked for item consistency. After setting up the questionnaire, a pilot test verified

the concept interconnections and ensured participant clarity. A 35-person pilot test was conducted. Hair et al. (2011) used Cronbach's α value to assess questionnaire construct internal consistency, requiring 0.7 or above for acceptable reliability. Internal consistency reliability studies found that the questionnaire's Cronbach's alpha value exceeded 0.7, confirming its reliability and consistency (Hair et al., 2011). The current research used the seven-point Likert scale from 1 = "strongly disagree" to 7 = "strongly agree" for all measurement scales.

*Technologically vigilant leadership.* The TVL construct in the current investigation was determined as a higher-level combination of three core constructs – Task-oriented behavior; Relational-oriented behavior; Change-oriented behavior which were modified from the findings of DeRue et al. (2011); Gerpott et al. (2019); Gao et al. (2024); Abbu et al. (2023).

*Smart sustainable circular supply chain management.* The SSCSCM construct in the current investigation was determined as a higher-level combination of three core constructs - Circular economy SCM design; Circular economy supply chain relationship management; Circular economy human resource management which were modified from the findings of Kim et al. (2019); Zeng et al. (2017); Kayikci et al. (2022).

*Digital environmental management accounting.* The DEMA construct in the current investigation was determined as a higher-level combination of five core constructs – Environmental cost, Environmental regulation, Environmental safety, Management commitment, Customer and stakeholder focus which were modified from the findings of Abdelhalim et al. (2023), Fuzi et al. (2020).

### 4.2 Sampling and data collection

The principal data in this study were obtained through two sample units. The primary sample unit consisted of organizations, while organizational accountants served as the secondary sampling unit. The present study focuses on SMEs situated in Vietnam. The accountants were responsible for executing the control mechanisms and strategizing the organization. Gupta (2021) proposed that the ideal sample size should range from 5:1 to 20:1, with 5 and 20 being the sample size for each individual item, respectively. Data was gathered from May 2024 to October 2024. Following the evaluation of the questionnaires, the final sample comprised 356 valid replies, resulting in a data loss rate of 28.80 percent. The examination of the sample's socio-demographic profile indicated that males constituted 57.58 percent of participants, whereas females represented 42.42 percent. The study indicated that people aged "41-50" comprised 54.21 percent of the overall sample. The age group "31-40" constituted around 37.36 percent. In contrast, the groups classified as "below 30" and "above 51" represented a minimum of 4.78 and 3.65 percent, securing the lowest ranks among the previously described categories. The majority of participants possessed at least a graduate degree in academic qualifications. The respondents have almost eight years of collective expertise in accounting.

### 4.3. Data analysis technique

We employed two statistical software tools, WarpPLS 7.0 and SmartPLS 4.1.0.9, for data analysis. Linear relationships were analyzed using CB-SEM in SmartPLS 4.1.0.9, whereas non-linear relationships were examined with WarpPLS 7.0. The recent emergence of software tools for non-linear route studies, such as WarpPLS, enabled researchers to account for non-linearity in determining coefficients of association among interconnected variables (Kock, 2019).

## V. RESULT ANALYSIS

### 5.1 Common method bias

In order to ascertain the potential presence of common method variance in the study results, this study implemented Harman's single-factor test. The results indicated that the common method variance was 16.377%, which was less than the widely accepted threshold of 50%. Consequently, this indicated that it was not a significant concern.

### 5.2 Model fit indices

Model fitness evaluations were performed utilizing standard assessments with the support of Smartpls 4.1.0.9, including Chi-square/df; p-value; Root Mean Square Error of Approximation (RMSEA); Goodness of Fit Index (GFI); Adjusted Goodness-of-Fit Index (AGFI); Comparative Fit Index (CFI); Parsimonious Goodness of Fit Index (PGFI); Standardized Root mean square residual (SRMR); Normed Fit Index (NFI). Accordingly, a significant value higher than

0.05 (p-value >0.050) emphasized that there was no difference between the sample covariance and the covariance of the prediction model. The statistical outcomes of model fit were illustrated in **Table 5.1**.

**Table 5. 1 – Results of Model fit**

| Criteria | Acceptable fit | Value |
|---|---|---|
| Chi-square/df | ≤ 3 | 1.085 |
| P-value | >0.050 | 0.106 |
| Root Mean Square Error of Approximation (RMSEA) | ≤ 0.08 | 0.015 |
| Goodness of Fit Index (GFI) | ≥ 0.90 | 0.925 |
| Adjusted Goodness-of-Fit Index (AGFI) | ≥ 0.90 | 0.905 |
| Comparative Fit Index (CFI) | ≥ 0.90 | 0.992 |
| Parsimonious Goodness of Fit Index (PGFI) | ≤ 1.00 | 0.726 |
| Standardized Root mean square residual (SRMR) | ≤ 0.08 | 0.033 |
| Normed Fit Index (NFI) | ≥ 0.90 | 0.907 |

**5.3 Measurement model assessment**

In the context of establishing convergent validity, it was generally accepted that items possessed standardized factor loadings exceeding 0.6 (Hair et al., 2019). The average variance extracted (AVE) for the constructs exceeded 0.5, thus providing further support for convergent validity (Hair et al., 2019). The value of composite reliability and Cronbach's alpha were higher than the cutoff value of 0.7 (Hair et al., 2019). Consequently, the statistical outcomes in **Table 5.2** proved reliability and convergent validity for further investigation.

**Table 5. 2 - Results summary of reliability and convergent validity**

| Constructs and operationalization | | Convergent validity | | Construct reliability | | Result |
|---|---|---|---|---|---|---|
| | | Factor Loadings | AVE | Cronbach's Alpha | Composite Reliability | |
| **Technologically vigilant leadership** | **TVL** | | | | | |
| Task-oriented behavior | TO | 0.711 - 0.779 | 0.548 | 0.785 | 0.786 | Retained |
| Relational-oriented behavior | RO | 0.786 - 0.834 | 0.644 | 0.844 | 0.844 | Retained |
| Change-oriented behavior | COH | 0.736 - 0.870 | 0.620 | 0.826 | 0.828 | Retained |
| Digital environmental management accounting | **DEMA** | | | | | |
| Environmental cost | EC | 0.763 - 0.817 | 0.626 | 0.834 | 0.835 | Retained |
| Environmental regulation | ER | 0.753 - 0.854 | 0.638 | 0.839 | 0.841 | Retained |
| Environmental safety | ES | 0.752 - 0.831 | 0.613 | 0.826 | 0.828 | Retained |
| Management commitment | MC | 0.705 - 0.790 | 0.551 | 0.784 | 0.786 | Retained |
| Customer and stakeholder focus | CSF | 0.709 - 0.783 | 0.576 | 0.801 | 0.802 | Retained |
| **Smart sustainable circular supply chain management** | **SSCSCM** | | | | | |
| Circular economy supply chain management design | CESCD | 0.710 - 0.807 | 0.582 | 0.806 | 0.803 | Retained |
| Circular economy supply chain relationship management | CESCRM | 0.726 - 0.812 | 0.614 | 0.825 | 0.827 | Retained |
| Circular economy human resource management | CEHRM | 0.740 - 0.843 | 0.634 | 0.837 | 0.839 | Retained |

The heterotrait-monotrait ratio (HTMT) was a statistical measure used to evaluate discriminant validity in the context of SEM. The HTMT ratio contrasts the average correlation among items that evaluate multiple constructs (heterotrait) to the average correlation among items that evaluate a single construct (monotrait). The statistical outcomes of the HTMT which were notably lower than 0.85 (Henseler et al., 2015) were presented in Table 5.3.

**Table 5. 3 – Results summary for discriminant validity on Heterotrait–Monotrait ratio**

| | CEHRM | CESCD | CESCRM | COH | CSF | EC | ER | ES | MC | RO | TO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CEHRM** | | | | | | | | | | | |
| **CESCD** | 0.390 | | | | | | | | | | |
| **CESCRM** | 0.253 | 0.307 | | | | | | | | | |
| **COH** | 0.171 | 0.230 | 0.029 | | | | | | | | |
| **CSF** | 0.173 | 0.239 | 0.179 | 0.136 | | | | | | | |
| **EC** | 0.169 | 0.352 | 0.189 | 0.234 | 0.361 | | | | | | |
| **ER** | 0.194 | 0.133 | 0.196 | 0.066 | 0.285 | 0.292 | | | | | |
| **ES** | 0.120 | 0.147 | 0.148 | 0.131 | 0.176 | 0.301 | 0.188 | | | | |
| **MC** | 0.212 | 0.373 | 0.186 | 0.171 | 0.384 | 0.231 | 0.167 | 0.196 | | | |
| **RO** | 0.113 | 0.181 | 0.173 | 0.069 | 0.095 | 0.140 | 0.089 | 0.098 | 0.185 | | |
| **TO** | 0.337 | 0.399 | 0.334 | 0.371 | 0.223 | 0.334 | 0.260 | 0.174 | 0.295 | 0.345 | |

**5.4 Structural model assessment**

*Direct effect*. To evaluate the hypotheses, we established a structural model using CB-SEM in SmartPLS and PLS-SEM in Warp PLS (Refer to **Table 5.4**, **Fig 5.1** and **Fig 5.2**). Based on the outputs of CB-SEM carried out in SmartPLS 4.1.0.9, TVL had a beneficial and statistically significant effect on SSCSCM ($\beta = 0.415$; p-value < 0.001). In the same vein, the output of PLS-SEM carried out in WarpPLS 7, TVL had a beneficial and statistically significant effect on SSCSCM ($\beta = 0.283$; p-value < 0.001). Thus, H1 was empirically supported. The outputs of CB-SEM carried out in SmartPLS 4.1.0.9 corroborated the positive and significant relationship between TVL and DEMA ($\beta = 0.557$; p-value < 0.001). Likewise, the outputs of PLS-SEM carried out in WarpPLS 7, TVL was verified significantly and positively impact DEMA ($\beta = 0.351$; p-value < 0.001). Thus, H2 was empirically supported. The outputs of CB-SEM carried out in SmartPLS 4.1.0.9 also revealed the significant and positive impact of DEMA on SSCSCM ($\beta = 0.465$; p-value < 0.001). Similarly, the output of PLS-SEM carried out in WarpPLS 7 substantiated that DEMA affected SSCSCM in a significant and positive manner ($\beta = 0.285$; p-value < 0.001). Thus, H3 was empirically supported. The values of $R^2$ for DEMA and SSCSCM were reported to be 0.310 and 0604, respectively, based on the outputs of CB-SEM carried out in SmartPLS 4.1.0.9. However, the outputs of PLS-SEM carried out in WarpPLS 7 highlighted that the values of $R^2$ for DEMA and SSCSCM were 0.120 and 0.220, respectively.

*Indirect effect*. Based on the outputs of CB-SEM carried out in SmartPLS 4.1.0.9, given that the direct effect of TVL on SSCSCM were also supported and that the indirect effect was insignificant ($\beta = 0.259$; p-value < 0.001). Similarly, the outputs of PLS-SEM carried out in WarpPLS 7, the direct effect of TVL on SSCSCM were also supported and the indirect effect was insignificant ($\beta = 0.100$; p-value < 0.001). In the nutshell, it confirmed that DEMA partially mediated the relationship between TVL and SSCSCM. Thus, H4 was empirically supported.

**Table 5. 4 – Hypotheses, and path coefficient for SmartPLS and Warp PLS, and the shape of relationships**

| Relevant path | SmartPLS | | WarpPLS | | |
|---|---|---|---|---|---|
| | Path coefficient | p-value | Path coefficient | p-value | Shape of relationship in Warp PLS |
| Direct effect | | | | | |
| **TVL ➔ SSCSCM** | 0.415 | < 0.001 | 0.283 | < 0.001 | Non-linear S-shaped |
| **TVL ➔ DEMA** | 0.557 | < 0.001 | 0.351 | < 0.001 | Non-linear S-shaped |
| **DEMA ➔ SSCSCM** | 0.465 | < 0.001 | 0.285 | < 0.001 | Non-linear S-shaped |
| Indirect effect | | | | | |
| **TVL ➔ DEMA ➔ SSCSCM** | 0.259 | < 0.001 | 0.100 | < 0.001 | |
| **$R^2$** | $R^2_{DEMA} = 0.310$; $R^2_{SSCSCM} = 0.604$ | | $R^2_{DEMA} = 0.120$; $R^2_{SSCSCM} = 0.220$ | | |

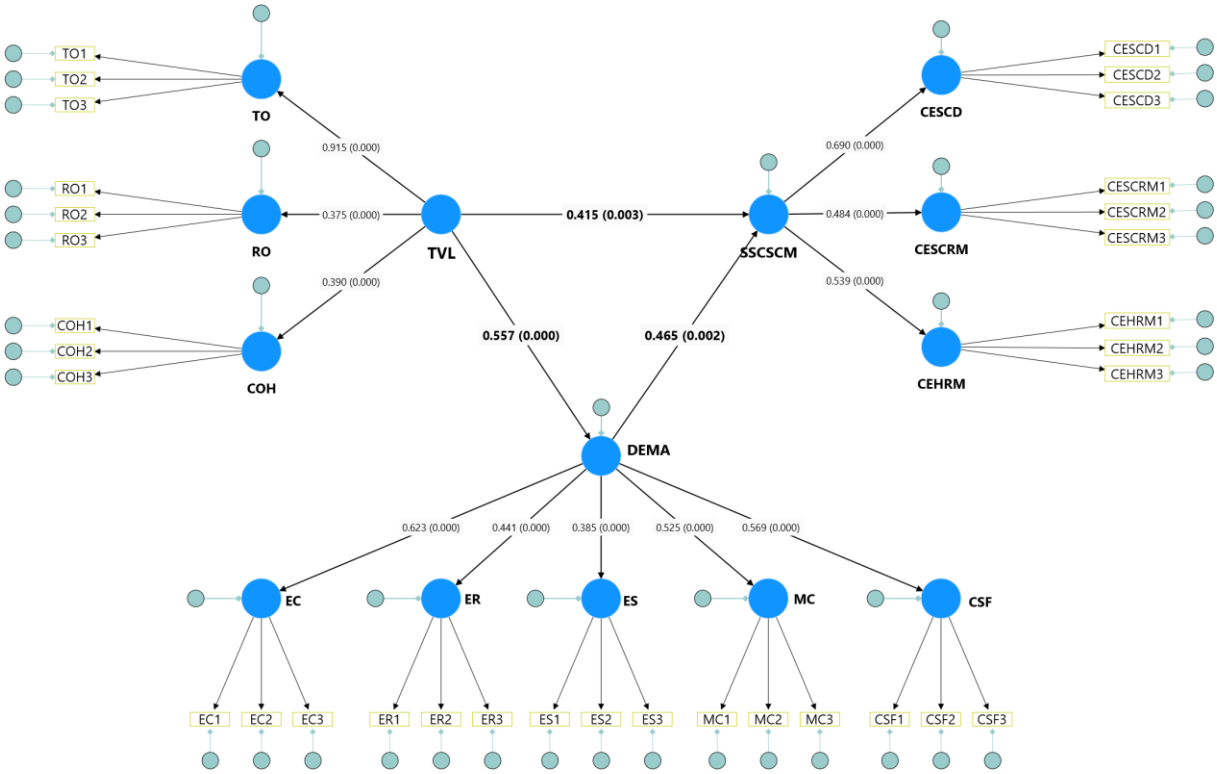



**Fig 5.1 – Structural model**

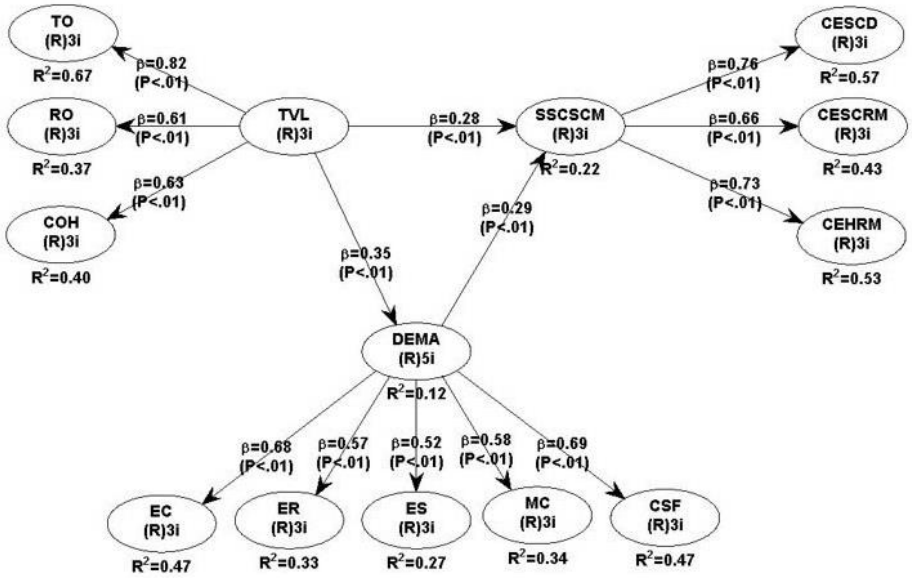



**Fig 5.2 – Structural model**

## VI. CONCLUSION

### 6.1. Theoretical implication

To the best of our knowledge, this could be among the first study focus on the impact of TVL on SSCSCM in SME in one developing country. The shift to Industry 6.0 has catalyzed the redefinition of supply chain management towards smarter, more sustainable, and circular approaches. TVL refers to leader behaviors aimed at encouraging people to concentrate on prospective issues related to digital technologies and to prepare for unforeseen setbacks in the future. Leaders who are technologically vigilant and prioritize the anticipation of potential issues in SSCSCM will significantly reduce followers' complacency and foster a sense of duty to implement constructive changes for success in this domain. A statistically significant non-linear (S-shaped) association existed between TVL and DEMA. This suggested that there existed an optimal level of TVL that enhanced the performance of DEMA, with the effect reducing thereafter. It could be among the first study focused on the impact of TVL on DEMA in SME in a developing country. EMA has become essential in directing sustainable company activities (Zeng et al., 2024). Among the numerous environmental

management systems available, the EMA system can be particularly advantageous for the organization in identifying, gathering, employing, and analyzing diverse forms of accounting information pertinent to its environmental management.

Empirical findings provided by Schaltegger et al. (2015) indicated that numerous managers value and analyze diverse types of environmental data. The correlation between DEMA and SSCSCM was statistically significant and exhibited a non-linear S-shaped pattern. As the efficacy of DEMA escalated, its impact on SSCSCM likewise intensified, although there existed a threshold beyond which the effect stabilized. It could be among the first study focus on the impact of DEMA on SSCSCM in SME in a developing country. The supply chain is becoming expensive, complex, uncertain, and susceptible, but managers persist in their pursuit of more economical, expedited, and superior supply networks (Wu et al., 2016). To address these difficulties, supply chains must become more intelligent (Wu et al., 2016) and adopt circular practices. I6.0 technologies can serve as essential facilitators of a circular economy by aiding in the management of goods flow, enabling automatic position tracking and analysis of natural resources, and optimizing waste-to-resource alignment in industrial symbiosis networks through real-time data collection for improved resource management. Nonetheless, despite the inherent flexibility and versatility of a smart sustainable circular supply chain, SMEs must be adequately prepared to address supply chain difficulties and disruptions. In this context, DEMA might serve as helpful tools for addressing these concerns. DEMA can be pondered as the internal management instrument to enable enterprises to recognize potential ecological impacts by serving as a mechanism for implementing financial controls and strategies for environmental management.

**6.2 Practical implications**

The significance of SSCSCM as a strategic environmental initiative that enhances sustainable development can be recognized by managers in Vietnamese SMEs and similar environments. The research results have confirmed the relationship between circular management accounting and technology, so the leaders of an organization can be interested in improving their management accounting system, aiming to integrate information technology into the daily work process. To address the distinctive challenges and opportunities that SMEs and locally held enterprises face, managers should contemplate the development of adaptable and targeted strategies. This entails the adoption of new technologies, the promotion of innovation, and the willingness to take calculated risks in order to enhance the enterprise. Consequently, strategic decisions that are consistent with long-term objectives are made, including the investment in infrastructure that facilitates business growth. The results also corroborate that TVL can provide substantial advantages to SSCSCM. Consequently, managers should concentrate on the strategic advantages of this leadership style. As a result, the development of TVL is a critical factor in guaranteeing the long-term success and sustainability of the circular supply chain of SMEs. Lastly, the results of this study suggest that the SME can effectively acquire useful information to develop SSCSCM, which can contribute to better sustainable performance, through using effective DEMA. Consequently, SME managers should prioritize the establishment, development, and enhancement of the organization's learning capability by investing in resources and assets, as well as increasing their awareness of the importance of DEMA. To facilitate the efficient and systematic learning of employees, managers should integrate, collaborate, and coordinate the knowledge and experiences acquired through the implementation of DEMA within the organization. They should also organize training sessions and apprenticeship programs that prioritize the acquisition of in-depth knowledge in the fields of EMA and digital technology.

**6.2. Limitation and orientation for upcoming studies**

This study encountered numerous limitations that may directly or indirectly affect the outcomes. This study was undertaken in Vietnam, a developing country and emerging economy, to facilitate the generalization of its conclusions to other comparable nations. Consequently, the researchers recommend undertaking future investigations to analyze the study model and its implementation by gathering original data from various countries. Secondly, this study employed a cross-sectional approach for the collection of primary data. It is advisable for researchers to collect primary data longitudinally (i.e., at several phases over time) in future studies to enhance the reliability of the findings. Third, a single respondent from each organization was directed, hence augmenting the likelihood of common bias method manifesting. We utilized statistical methods to reduce common bias methods. Nevertheless, this study cannot entirely rule out the potential for common bias method. To mitigate the incidence of this damage, it is essential to engage many

respondents from each industrial organization to complete the study questionnaire. This study employed stakeholder theory, and future research may incorporate more theories to bolster the model and its findings.

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# THE RELATIONSHIP BETWEEN THE LEVEL OF CIRCULAR ECONOMY DISCLOSURE AND FINANCIAL PERFORMANCE OF LISTED ENTERPRISES IN VIETNAM

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**ABSTRACT**

This study examines the relationship between the level of circular economy disclosure (CED) and the financial performance of listed enterprises in Vietnam. The paper was conducted on a sample of 337 annual reports of listed companies in HOSE and HNX from 2021 to 2023. The study has used a quantitative method with the regression analysis model to test the hypotheses and CE disclosure index with 14 sections of disclosure compiled from Circulation **No.** 96/2020/TT-BTC, Circular No.200/BTC, and Vietnamese Accounting Standards (VAS). The results show that (1) the circular economy disclosure reaches a low level (46.03%), and (2) there is a positive relationship between circular economy disclosure and financial performance of corporations, measured by ROA and ROE.

*Keywords: "Circular economy", "Financial performance", "Information Disclosure", "Corporate sustainability"*

## I. INTRODUCTION

The circular economy (CE) has become a significant global focus, gaining substantial momentum in recent years (Kaipainen, 2022). According to the United Nations Environment Programme (UNEP), the world is facing pressing environmental issues, including intense pollution, resource depletion, and an increasing demand for natural resources that exceeds the Earth's capacity to regenerate (Blomsma, 2017). Without prompt and effective measures, waste production may overwhelm the environment's carrying capacity. Implementing circular economy initiatives provides a viable and impactful strategy to curtail resource usage and waste generation, thereby conserving resources and reducing environmental damage (Bertassini, 2021), (Arranz, 2023).

The circular economy (CE) emphasizes the efficient use of resources by minimizing consumption, waste, and emissions while enhancing the value and lifespan of products and materials. This approach is supported by methods such as innovative product design, routine maintenance, recycling, reuse, repair, remanufacturing, and refurbishing (Geissdoerfer, 2017). Nevertheless, despite significant progress, challenges such as regulatory complexities, financial constraints, cultural barriers, and technological limitations can elevate costs and discourage organizations from adopting circular economy practices (Aarikka-Stenroos, 2022); (de Mattos Nascimento, 2024).

In Vietnam, the intersection of rapid economic growth and escalating environmental issues has created significant pressure on listed enterprises to adopt and disclose circular economy practices. While existing research has emphasized the benefits of circular economy disclosure (CED) in improving corporate reputation and regulatory compliance (Korsunova, 2022), its influence on financial performance remains inadequately explored. This paper aims to address this gap by analyzing the relationship between the level of circular economy disclosure and the financial performance of listed enterprises in Vietnam. Specifically, the study seeks to: (1) Assess the extent to which listed companies' circular economy disclosures comply with Circulation **No.** 96/2020/TT-BTC, Circular No.200/BTC, and Vietnamese Accounting Standards (VAS); (2) Examine the relationship between the level of circular economy disclosure and the financial performance of listed enterprises in Vietnam.

## II. THEORETICAL FRAMEWORK

Circular economy practices, which focus on reducing, reusing, and recycling resources, can profoundly influence the financial performance of businesses and organizations (Neligan, 2023). By promoting efficient resource utilization, these practices can lower material costs and expenses associated with waste disposal (Kwarteng, Simpson, & Agyenim-Boateng, 2022). Reuse and recycling of materials reduce dependence on new raw materials, thereby generating

significant cost savings. Energy efficiency initiatives aligned with circular economy principles can decrease energy expenditures, as highlighted by (MacArthur, 2013). Additionally, recycling or refurbishing products opens up new revenue opportunities, while product-service systems, such as leasing or renting, foster steady income streams and encourage lasting customer relationships. Innovating business models based on circular principles can enhance competitiveness and appeal to environmentally conscious consumers. Streamlined processes that reduce waste and maximize resource use lead to higher operational efficiency and productivity (Yu, 2022). Shifting away from reliance on finite resources and adopting sustainable approaches helps mitigate risks tied to resource scarcity and price volatility. Proactively implementing these practices ensures compliance with environmental regulations, reducing the likelihood of fines or penalties (Uhrenholt, 2022). Furthermore, embracing sustainability can enhance a company's reputation, making it more attractive to customers who prioritize environmental responsibility (Kuo, 2021).

Numerous studies have explored the impact of circular economy (CE) on corporate financial performance and sustainability. (Obeidat, 2023) examined the role of green human resource management and CE in driving sustainable corporate performance, confirming their positive influence on long-term business viability. Similarly, (Kwarteng, 2022) analyzed the moderating role of organizational culture in the relationship between CE initiatives and business performance, demonstrating that a strong organizational culture reinforces the effectiveness of CE strategies. Furthermore, (Dey, 2022) and (Chowdhury, 2022) assessed how organizational factors influence CE adoption and its impact on the financial sustainability of small and medium-sized enterprises (SMEs). Their research confirms that the implementation of CE strategies positively correlates with improved financial resilience and long-term performance. Employing a mixed-methods approach, (Yaoteng, 2022) investigated the effect of sustainable development strategies, including CE, on financial performance using big data analytics. Their findings indicate that sustainability-oriented business practices significantly enhance green finance and financial stability.

Besides, the stakeholder theory provides a robust theoretical foundation for understanding the potential relationship between circular economy (CE) disclosure and financial performance. (Gelb, 2001) highlighted that enterprises are likely to enhance their level of disclosure due to their accountability to stakeholders, framing such disclosure as a form of socially responsible behavior. From this perspective, CE disclosure serves as a critical mechanism for enterprises to manage their relationships with various stakeholder groups. By addressing stakeholders' expectations and concerns, enterprises can secure their approval and support or mitigate opposition and disapproval (Deegan, 2002). Empirical evidence supports the view that CE practices enhance financial performance. However, the financial benefits of circular economy practices may differ depending on factors such as industry type, operational scale, and the nature of implemented initiatives (Rehman Khan, 2022). Transitioning to a circular economy framework often requires upfront investments in infrastructure, technology, and workforce training. While these initial costs may impact short-term profitability, they pave the way for sustainable long-term gains (Mazzucchelli, 2022). Thus, considering the information presented above, we propose the following research hypothesis.

*H: Circular Economy disclosure has a significant positive influence on the financial performance of listed enterprises in Vietnam.*

## III. METHODOLOGY

### 3.1. Sample and data collection

This paper examines the relationship between the level of circular economy disclosure and the financial performance of listed enterprises in Vietnam. We obtain panel data for a set of Vietnam firms listed in HOSE and HNX indexes from 2021 to 2023 to verify from annual reports, and sustainability reports (if any). In addition, the companies listed in the sample do not belong to the financial sector because enterprises in the financial sector are different from typical manufacturing and trading enterprises. Besides, the listing time of the enterprises in the sample is before January 1 2023; as the study uses non-financial information in 2023, enterprises must be listed before January 1, 2023, to ensure data sufficiency and must have an annual accounting period from January 1 to December 31 according to calendar year.

**Table 1. Statistics of research sample**

| | | |
|---|---|---|
| Listed companies as of December 31, 2023 on HOSE and HNX | | 493 |
| Exclude: | Banks, and companies in the financial sector | (43) |

| | | |
|---|---|---|
| | Listed companies after January 1, 2023 | (31) |
| | Companies lacking data at the time of collection | (34) |
| | Outliers | (48) |
| Total number of companies in the sample | | **337** |

*Source: The authors compiled*

As of December 31, 2023, the total number of listed companies in HOSE and HNX indexes was 493 companies. The authors excluded businesses in the field of banking and finance, businesses listed after January 1 2023, businesses of which the authors found it difficult to obtain annual reports, as well as eliminated outliers by 3-sigma method. Finally, the research sample consists of 337 listed companies.

**3.2. Method to score the disclosure index**

The study employs an unweighted method to score a publication to evaluate the disclosure of circular economy information. Under this method, disclosed information within annual reports or other relevant publications is assigned a score of 1, while non-disclosure is scored as 0. The scoring is calculated using the following formula:

$$\text{CED}_{ij} = \frac{\sum_{i=1}^{n} x_{ij}}{n_j}$$

Of which:

– CEDij: Circular economy disclosure index of company j, and $0 \leq \text{CED} \leq 14$

– $x_{ij}$= 1 if the section of circular economy is disclosed, $x_{ij}$ = 0 if the section of circular economy is not disclosed

– $n_j$: The number of circular economy sections that might be disclosed

The authors employed Stata and Excel software to assist in data analysis, utilizing descriptive statistics to calculate the mean, disclosure rate, frequency of disclosure, and standard deviation. This approach enabled the authors to assess the extent of circular economy disclosure among listed enterprises. Through these analyses, they were able to draw conclusions regarding the prevalence and transparency of such disclosures within the companies, helping to identify factors influencing disclosure levels and recognizing trends within the circular economy domain.

**3.3. Regression model**

Based on the assumptions, the regression model on the level of circular economy disclosure and the financial performance of listed enterprises in Vietnam used in the study to test the hypothesis has the following form:

$$\mathbf{Y_t = \beta_0 + \beta_1 CED + \varepsilon}$$

of which:

– Y: Financial performance, measured by ROA and ROE

– β: Partial regression coefficients

– Ɛ: Errors in the model

**Table 2. Measurement of independent variable in the model and its expected sign**

| Variable | Type of variable | Measurement | Expected sign | Sources |
|---|---|---|---|---|
| Return on assets (ROA) | Quantitative | NPAT/Total Asset | +/- | (Clemens, 2006); (Galbreath, 2006) |
| Return on equity (ROE) | Quantitative | NPAT/Total Equity | +/- | (Clemens, 2006); (Galbreath, 2006) |

Circular economy disclosures in Vietnam are governed by a framework of regulations applicable to listed companies. Key regulatory instruments include Circular No. 96/2020/TT-BTC, the Vietnamese Accounting Standards (VAS), and Circular No. 200/2014/TT-BTC, which outlines guidelines for corporate accounting practices. Drawing from these regulations, a group of researchers has meticulously identified and categorized 14 core sections of sustainability accounting information for systematic evaluation and analysis.

**Table 3. Statistics of Circular economy disclosure**

| Information section | Quantity |
|---|---|
| Environmental information | 9 |
| Social information | 3 |
| Corporate governance information | 2 |
| **Total** | **14** |

*Source: Compiled from Circular No. 96/2020/TT-BTC, Circular No. 200/BTC and VAS*

## IV. RESULT AND DISCUSSION

The findings indicate that the level of circular economy disclosure (CED) among Vietnamese listed enterprises remains relatively low, with an average disclosure rate of 46.03% (Table 4)

**Table 4. Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **CED** | 337 | 2 | 27 | 15.45 | 6.31 |
| **CED (%)** | 337 | 5.58% | 86.62% | 46.03% | 25.02% |
| **CED_Env** | 337 | 0 | 9 | 4.21 | 2.24 |
| **CED_Env(%)** | 337 | .00% | 98.11% | 49.55% | 31.75% |
| **CED_Soc** | 337 | 0 | 6 | 3.16 | 1.52 |
| **CED_Soc(%)** | 337 | .00% | 87.71% | 32.78% | 21.25% |
| **ROA** | 337 | .22 | .85 | .051 | .088 |
| **ROE** | 337 | .15 | .65 | .081 | .162 |
| **Valid N (listwise)** | 337 | | | | |

*Source: Results compiled from Stata*

Table 4 shows that the highest score within the sample is 27 out of 29, accounting for 86.62%, whereas the lowest score is 2 out of 29, representing 5.58%. Specifically, the maximum environmental disclosure score reaches 9 out of 9 (98.11%), while the minimum is 0 out of 9 (0%). Similarly, the highest social disclosure score is 6 out of 7 (87.71%), and the lowest is 0 out of 7 (0%).

Table 4 also summarizes the performance of the listed companies in the sample, evaluated using two key metrics: ROA and ROE. The highest ROA is 0.85, while the lowest is 0.22. For ROE, the maximum level reaches 0.65, and the minimum is 0.15. These results highlight significant disparities in both disclosure levels and financial performance across the companies analyzed.

**Table 5. ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 0.765 | 3 | 0.140 | 7.029 | .000[a] |
| | Residual | 3.017 | 334 | 0.502 | | |
| | Total | 3.782 | 337 | | | |

a. Predictors: (Constant), ROA, ROE

b. Dependent Variable: CED

The ANOVA analysis results in Table 5 reveal that the significance value (Sig) of the F-test is very small (Sig = 0.000 < 0.05), confirming a statistically significant linear relationship between circular economy disclosure (CED) and firm performance. This suggests that variations in CED can meaningfully influence financial performance indicators, such as return on assets (ROA) and return on equity (ROE).

Moreover, the findings validate the robustness and explanatory power of the regression model in assessing the relationship between CED and financial performance. The model's statistical significance reinforces the argument that

enhanced environmental disclosure contributes to corporate transparency, strengthens investor confidence, and supports sustainable financial growth. These results are consistent with existing literature, which highlights the role of environmental reporting in mitigating corporate risk, improving regulatory compliance, and enhancing firm valuation.

**Table 6. Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 13.220 | .451 | | 30.129 | .000 |
| | ROA | 1.686 | 5.306 | .012 | .218 | .022 |
| | ROE | 7.205 | 1.413 | .159 | 2.105 | .031 |

a. Dependent Variable: CED

The company's performance is assessed using two key metrics: ROA and ROE. The regression results in Table 6 indicate that the relationship between circular economy (CE) disclosure and financial performance, as measured by ROA (Sig = 0.022, $p < 0.05$) and ROE (Sig = 0.031, $p < 0.05$), is statistically significant. Furthermore, the findings demonstrate that CE disclosure has a positive impact on the financial performance of listed enterprises in Vietnam. This underscores the importance of enhancing CE disclosure, not only to meet stakeholder demands but also to improve financial performance and foster a sustainable competitive advantage for businesses.

## V. CONCLUSION

An empirical analysis of 337 listed firms assessing the extent of circular economy (CE) disclosure revealed that the actual disclosure level was relatively low, reaching only 46.03% (below the 50% benchmark). This raises significant concerns, particularly given that the industries examined in the sample have direct environmental, social, and corporate governance (ESG) implications. The study further confirms a positive correlation between CE disclosure and corporate financial performance, measured by return on assets (ROA) and return on equity (ROE). This research contributes to the evolving discourse on CE by highlighting emerging trends in CE impact studies. It provides empirical evidence that CE adoption can serve as a strategic mechanism for achieving sustainable competitive advantage through enhanced corporate transparency, operational efficiency, and long-term financial resilience. This shift is particularly critical as businesses align their operations with global sustainability frameworks, including the United Nations Sustainable Development Goals (SDGs). For firms listed on the Vietnamese stock exchange, these findings underscore the necessity of improving CE disclosure practices. Enhancing transparency in CE reporting will not only address the increasing demands of stakeholders but also contribute to strengthening corporate value, market credibility, and long-term financial sustainability.

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# FACTORS AFFECTING THE APPLICATION OF SDGS SOLUTIONS IN SMES' DONG NAI

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**ABSTRACT**

This study examines the factors influencing the adoption of Sustainable Development Goal (SDG) solutions by small and medium-sized enterprises (SMEs) in Dong Nai province, Vietnam. SMEs play a crucial role in economic growth and sustainability but face challenges in integrating SDG principles. The research identifies key enablers, including government support policies, increasing consumer demand for sustainable products, and technological advancements. However, major barriers such as limited financial resources, insufficient technical knowledge, and low awareness of SDGs hinder adoption. A quantitative research approach was employed, with data collected from 250 SMEs through structured surveys in 2024. A total of 212 valid responses were analyzed using SPSS, including reliability tests, exploratory factor analysis (EFA), and multiple regression analysis. The findings indicate that stakeholder pressure is the most significant factor driving SDG adoption, followed by leadership awareness, government policies, perceived benefits, and enterprise resources. The study highlights the need for supportive policy frameworks, financial incentives, stakeholder engagement, and leadership training to enhance SDG implementation. These insights provide valuable guidance for policymakers, financial institutions, and SMEs in fostering sustainable development in the region.

*Keywords: "Dong Nai", "Sustainable Development Goals (SDGs)", "Small and Medium-Sized Enterprises (SMEs)"*

## I. INTRODUCTION

Small and medium-sized enterprises (SMEs) play a critical role in global economic development and sustainability, contributing significantly to employment, innovation, and GDP growth (United Nations Development Programme [UNDP], 2024). However, as sustainability becomes a central concern, SMEs are increasingly expected to align their operations with the United Nations' Sustainable Development Goals (SDGs). The SDGs, established in 2015, serve as a comprehensive framework to address global challenges such as poverty, inequality, climate change, and environmental degradation (United Nations, 2020). While large corporations have the resources to implement sustainability initiatives, SMEs often face substantial challenges in adopting SDG-oriented solutions due to financial constraints, limited expertise, and regulatory barriers (Dalampira & Nastis, 2020). In developing economies, including Vietnam, SMEs encounter unique challenges in integrating SDG principles into their business strategies. Unlike multinational corporations, SMEs typically operate with restricted access to financial capital, limited technological capabilities, and a lack of strategic awareness regarding sustainability (Wang, Guo, & Lu, 2021). Government policies play a crucial role in facilitating SDG adoption by providing financial incentives, regulatory guidance, and technical support (Köhler et al., 2022). However, the effectiveness of these policies often varies, depending on their accessibility and alignment with SME needs. Without clear and practical policy frameworks, SMEs may struggle to implement sustainable practices, leading to slow progress in achieving SDG-related objectives (Smith & Torres, 2024).

Stakeholder pressure is another significant factor driving SDG adoption among SMEs. Consumers, business partners, and regulatory agencies increasingly demand corporate transparency, environmental responsibility, and ethical business practices (Freeman, 1984; ElAlfy, Palaschuk, & Weber, 2020). Studies have shown that businesses that align with SDGs can enhance their reputation, improve operational efficiency, and gain competitive advantages in

sustainability-conscious markets (Löwstedt, Sandberg, & Josefsson, 2021). However, many SMEs perceive sustainability initiatives as costly and complex, leading to hesitation in implementation. Addressing these concerns requires a strategic approach, including leadership training, financial incentives, and stakeholder collaboration to make SDG adoption more accessible and beneficial (Green & Parker, 2024).

This study aims to analyze the key factors affecting the adoption of SDG solutions among SMEs in Dong Nai province, Vietnam. Specifically, it examines the influence of five determinants: leadership awareness, enterprise resources, stakeholder pressure, policies and regulations, and perceived benefits. Leadership awareness plays a crucial role in shaping SME engagement with SDGs, as decision-makers with a strong understanding of sustainability are more likely to incorporate SDG principles into their operations (Johnson & Li, 2024). Enterprise resources, including financial capital, skilled employees, and technological infrastructure, determine an SME's ability to adopt sustainability initiatives (Barney, 1991). Stakeholder theory suggests that external pressures from consumers, investors, and regulatory bodies encourage SMEs to implement sustainable practices (Freeman, 1984). Additionally, government policies and financial incentives create an enabling environment for SMEs to transition towards sustainability (Smith & Torres, 2024). Finally, perceived benefits, such as cost savings, improved brand reputation, and expanded market access, influence SME motivation to adopt SDGs (Rogers, 2003).

To examine these factors, this study employs a quantitative research methodology. A structured survey was distributed to 250 SMEs in Dong Nai, resulting in 212 valid responses. Data were analyzed using SPSS, including reliability testing, exploratory factor analysis (EFA), and multiple regression analysis. The findings indicate that stakeholder pressure is the most influential factor, followed by leadership awareness, government policies, perceived benefits, and enterprise resources. These results underscore the importance of strengthening policy frameworks, increasing financial support, and enhancing leadership capacity to promote sustainability among SMEs. By identifying both the enablers and barriers to SDG adoption, this research provides valuable insights for policymakers, business leaders, and financial institutions. The study highlights the need for collaborative efforts to foster a sustainable business ecosystem in Dong Nai, ensuring that SMEs contribute effectively to the global SDG agenda while achieving long-term growth and competitiveness.

## II. RESEARCH OVERVIEW

### 2.1. Overview of related research

The adoption of Sustainable Development Goals (SDGs) by small and medium-sized enterprises (SMEs) has become a growing focus in sustainability research, reflecting their critical role in achieving global sustainability objectives. SMEs, which constitute a significant portion of global enterprises, are uniquely positioned to contribute to the SDGs but face substantial challenges in doing so. These include limited resources, low technical capacity, and a lack of strategic awareness about the benefits of sustainability (Dalampira & Nastis, 2020; Green & Parker, 2024). Research highlights the importance of leadership awareness as a key driver of SDG adoption. Leaders who understand the strategic importance of SDGs are more likely to integrate sustainability into their operations and decision-making processes (Rogers, 2003; Johnson & Li, 2024). Furthermore, external pressures from stakeholders, including consumers, governments, and business partners, serve as significant motivators for SMEs to adopt sustainable practices (Freeman, 1984; ElAlfy, Palaschuk, & Weber, 2020). Adequate resources, such as financial capital, technical expertise, and access to advanced technology, also play a pivotal role in overcoming adoption barriers (Wang, Guo, & Lu, 2021; Löwstedt et al., 2021).

However, research gaps persist in understanding how SMEs in developing regions, particularly under unique local conditions, navigate these challenges. Most studies focus on developed economies or specific industries, leaving the dynamics in resource-constrained contexts underexplored (Köhler et al., 2022; Smith & Torres, 2024). Additionally, while government policies are widely acknowledged as enablers, there is limited empirical analysis on how policy frameworks influence SDG adoption at the SME level in emerging markets.

Addressing these gaps, this study investigates SMEs in Dong Nai province, Vietnam, to provide insights into how local economic, social, and cultural factors influence SDG adoption. The findings aim to bridge the gap between theoretical frameworks and practical solutions, contributing to the broader literature on SME sustainability and SDG

implementation.

### 2.2. Theoretical basis

This study leverages multiple theoretical frameworks to analyze the factors influencing the adoption of Sustainable Development Goals (SDGs) by small and medium-sized enterprises (SMEs). Stakeholder theory highlights the growing pressure from external stakeholders, such as customers, employees, and governments, which compels SMEs to adopt sustainable practices and align their operations with SDG objectives (Freeman, 1984; Smith & Torres, 2024). The resource-based view (RBV) emphasizes the critical role of internal resources—financial capital, human expertise, and technology—in enabling SMEs to implement sustainable practices. Resource constraints often hinder SDG adoption, making access to financial support and technological solutions essential for overcoming these barriers (Barney, 1991; Green & Parker, 2024).

The Theory of Planned Behavior (TPB) further underscores the importance of leadership awareness in shaping organizational attitudes and behaviors. Leaders who understand the benefits of SDG adoption are more likely to integrate sustainability into their strategies (Ajzen, 1991; Johnson & Li, 2024). Additionally, Rogers' Diffusion of Innovations Theory highlights the role of perceived benefits, such as cost savings and enhanced reputation, in encouraging the adoption of new practices. External factors, including government policies and financial incentives, reduce risks and accelerate SDG implementation (Rogers, 2003; UNDP, 2024). Together, these frameworks provide a comprehensive basis for understanding how internal and external factors influence SDG adoption in SMEs, particularly in resource-constrained contexts.

## III. RESEARCH METHODS

### 3.1. Research model

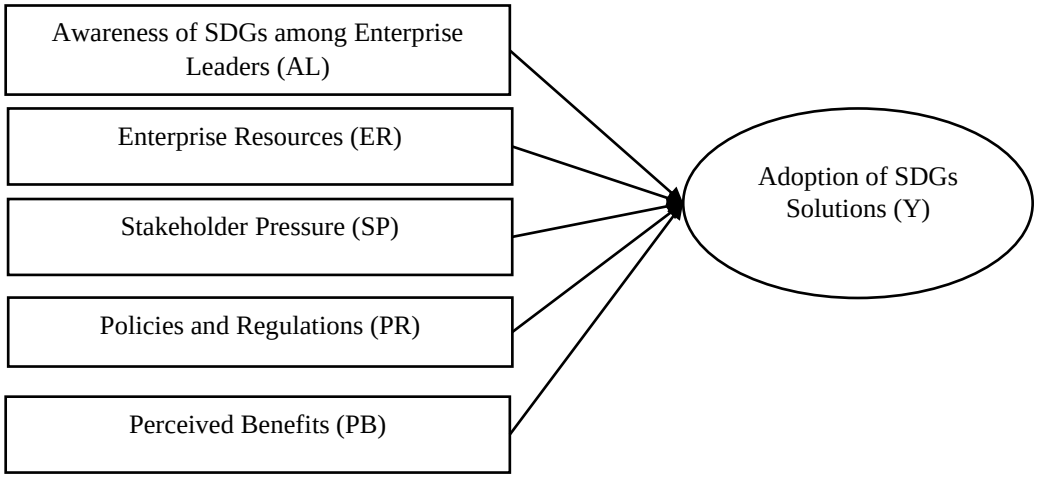



**Figure 1. Research Model**

*Source: Recommended author*

### 3.2. Developing research hypothesis

This study formulates hypotheses based on theoretical frameworks and prior research, examining how key factors—leadership awareness, enterprise resources, stakeholder pressure, policies and regulations, and perceived benefits—affect the adoption of Sustainable Development Goal (SDG) solutions by small and medium-sized enterprises (SMEs)**.**

Leadership awareness is crucial for SDG adoption. Leaders who understand the importance of SDGs are more likely to perceive their strategic value and align organizational goals with sustainability. Research emphasizes that leaders who prioritize SDGs as a strategic objective often recognize their long-term economic and social benefits (Dalampira & Nastis, 2020; Johnson & Li, 2024). For instance, leaders who acknowledge the strategic value of SDGs foster a proactive approach to implementation.

*H1: Leadership awareness of SDGs positively influences the adoption of SDG solutions by SMEs.*

Resources such as financial capital, employee training, and technological access are critical for implementing SDG solutions. Studies show that SMEs with robust resources, including trained employees and suitable technology, are

better positioned to overcome sustainability barriers (Wang, Guo, & Lu, 2021; Green & Parker, 2024). For example, enterprises that invest in employee training for sustainable practices significantly enhance their implementation capacity.

*H2: Enterprise resources positively influence the adoption of SDG solutions by SMEs.*

Stakeholder pressure from customers, business partners, and local governments is a significant driver of SDG adoption. Customers demanding eco-friendly products and business partners advocating for sustainability create a strong impetus for SMEs to implement SDGs (ElAlfy, Palaschuk, & Weber, 2020; White & Ahmed, 2024). For instance, local government policies emphasizing sustainability often shape SME strategies.

*H3: Stakeholder pressure positively affects the adoption of SDG solutions by SMEs.*

Supportive government policies, financial incentives, and clear regulatory frameworks significantly influence SDG adoption. Research highlights that financial incentives, such as subsidies or tax benefits, lower barriers for SMEs in adopting sustainable practices (Köhler et al., 2022; Smith & Torres, 2024). Well-structured policies provide the enabling environment needed for SMEs to integrate sustainability.

*H4: Policies and regulations positively influence the adoption of SDG solutions by SMEs.*

Perceived benefits, including cost savings, enhanced brand reputation, and market access, strongly motivate SMEs to adopt sustainable practices. Studies show that businesses adopting SDGs experience operational efficiencies and improved customer loyalty (Löwstedt et al., 2021; Green & Parker, 2024). For example, SMEs implementing SDGs often report increased access to environmentally conscious markets.

H5: Perceived benefits positively influence the adoption of SDG solutions by SMEs.

### 3.3. Scales

**Table 1: Factors of the scale**

| Number | | Observation variables | Citation |
|---|---|---|---|
| 1 | | Scale of Awareness of SDGs among Enterprise Leaders (AL) | |
| 1.1 | AL1 | Leaders have a clear understanding of the Sustainable Development Goals (SDGs). | Dalampira & Nastis, **(**2020**)**; Johnson & Li, **(**2024**)** |
| 1.2 | AL2 | The enterprise considers SDGs a strategic priority | |
| 1.3 | AL3 | Leaders recognize the economic and social benefits of adopting SDGs | |
| 2 | | Scale of Enterprise Resources (ER) | |
| 2.1 | ER1 | The enterprise has sufficient financial resources to implement SDGs | Wang, Guo, & Lu, **(**2021**)**; Green & Parker, **(**2024**)** |
| 2.2 | ER2 | Employees are trained in sustainable development practices | |
| 2.3 | ER3 | The enterprise has access to technology suitable for SDG solutions | |
| 3 | | Scale of Stakeholder Pressure (SP) | |
| 3.1 | SP1 | Customers demand the adoption of SDG-related solutions | ElAlfy, Palaschuk, & Weber, (2020); White & Ahmed, (2024) |
| 3.2 | SP2 | Business partners encourage sustainable development practices | |
| 3.3 | SP3 | Local government policies emphasize the importance of adopting SDGs | |
| 4 | | Scale of Policies and Regulations (PR) | |
| 4.1 | PR1 | Government policies support enterprises in implementing SDGs | Köhler et al., **(**2022**)**; Smith & Torres, **(**2024**)** |
| 4.2 | PR2 | Legal regulations encourage sustainable practices | |
| 4.3 | PR3 | Financial incentives are available for enterprises adopting SDGs | |
| 5 | | Scale of Perceived Benefits (PB) | |
| 5.1 | PB1 | Adopting SDGs enhances the enterprise’s brand image and reputation | Löwstedt et al., **(**2021**)**; Green & Parker, **(**2024**)** |
| 5.2 | PB2 | SDG implementation reduces operational costs and increases efficiency | |
| 5.3 | PB3 | Sustainable practices expand market access and attract new customers | |

*Source: Self-synthesized author*

### 3.4. Research methods

This study employs a quantitative research approach to analyze factors influencing the adoption of Sustainable Development Goal (SDG) solutions by small and medium-sized enterprises (SMEs). Data were collected through a structured survey administered to 250 SMEs in Dong Nai province, Vietnam. The questionnaire included variables related to leadership awareness, enterprise resources, stakeholder pressure, policies and regulations, and perceived benefits. The data included 212 valid samples and were analyzed using SPSS software to conduct reliability tests, exploratory factor analysis (EFA), and multiple regression analysis. These methods were selected to ensure the robustness of the findings and to identify significant predictors of SDG adoption in SMEs.

## IV. RESULTS AND DISCUSSION

### 4.1. Statistical Description

**Table 2. Data Statistics**

| Variables Mouth | Classify | Suitable research sample | | Sum |
|---|---|---|---|---|
| | | Number of Survey Samples | Proportion % | |
| Years in operation | Less than 5 years | 78 | 36.79% | 212/100% |
| | 5–10 years | 85 | 40.09% | |
| | More than 10 years | 49 | 23.11% | |
| Size of the enterprise | Fewer than 10 employees | 83 | 39.15% | 212/100% |
| | 10–50 employees | 77 | 36.32% | |
| | 50–200 employees | 52 | 24.53% | |
| Sector of operation | Manufacturing | 45 | 21.23% | 212/100% |
| | Services | 54 | 25.47% | |
| | Trade | 89 | 41.98% | |
| | Other | 24 | 11.32% | |

*Source: Extracted from SmartPLS*

Table 2 presents demographic characteristics of the surveyed small and medium-sized enterprises (SMEs), highlighting their years of operation, size, and sectors of activity. The majority of SMEs have been operating for 5–10 years (40.09%), followed by those with less than 5 years (36.79%), and more than 10 years (23.11%). Regarding size, micro-enterprises with fewer than 10 employees constitute the largest group (39.15%), while small (10–50 employees) and medium-sized enterprises (50–200 employees) account for 36.32% and 24.53%, respectively. Sectoral distribution reveals that trade is the most represented sector (41.98%), followed by services (25.47%), manufacturing (21.23%), and others (11.32%). These findings reflect the diversity of SMEs in Dong Nai, aligning with the resource-based view (RBV), which emphasizes the importance of resources in shaping enterprise behavior (Barney, 1991). The prominence of smaller and newer enterprises suggests resource constraints may significantly impact SDG adoption, requiring targeted support mechanisms (Wang, Guo, & Lu, 2021).

### 4.2. Reliability Analysis of the Scale

**Table 3: Results of the Reliability Testing of the Scales**

| Item-Total Statistics | | | | |
|---|---|---|---|---|
| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
| Scale of Awareness of SDGs among Enterprise Leaders (AL): Cronbach's Alpha = 0.883 | | | | |
| AL1 | 7.37 | 4.101 | 0.798 | 0.810 |
| AL2 | 7.34 | 4.274 | 0.778 | 0.829 |
| AL3 | 7.26 | 4.383 | 0.741 | 0.861 |
| Scale of Enterprise Resources (ER): Cronbach's Alpha = 0.849 | | | | |
| ER1 | 6.19 | 2.552 | 0.773 | 0.746 |

| | | | | |
|---|---|---|---|---|
| ER2 | 6.17 | 2.338 | 0.722 | 0.787 |
| ER3 | 6.09 | 2.480 | 0.669 | 0.838 |
| Scale of Stakeholder Pressure (SP): Cronbach's Alpha = 0.826 | | | | |
| SP1 | 7.04 | 4.719 | 0.744 | 0.696 |
| SP2 | 7.02 | 5.336 | 0.719 | 0.734 |
| SP3 | 7.46 | 4.856 | 0.604 | 0.850 |
| Scale of Policies and Regulations (PR): Cronbach's Alpha = 0.804 | | | | |
| PR1 | 7.22 | 2.458 | 0.645 | 0.740 |
| PR2 | 7.15 | 2.220 | 0.662 | 0.721 |
| PR3 | 7.18 | 2.309 | 0.648 | 0.736 |
| Scale of Perceived Benefits (PB): Cronbach's Alpha = 0.784 | | | | |
| A1 | 5.19 | 3.891 | 0.579 | 0.763 |
| A2 | 5.16 | 2.533 | 0.660 | 0.694 |
| A3 | 5.15 | 3.291 | 0.678 | 0.653 |

*Source: Extracted from SPSS*

Table 3 outlines the reliability analysis of scales used to measure key constructs influencing the adoption of Sustainable Development Goal (SDG) solutions among SMEs. The scales for Awareness of SDGs among Enterprise Leaders (AL), Enterprise Resources (ER), Stakeholder Pressure (SP), Policies and Regulations (PR), and Perceived Benefits (PB) all exhibit acceptable reliability, with Cronbach's Alpha scores ranging from 0.784 to 0.883. According to Nunnally and Bernstein (1994), a Cronbach's Alpha above 0.7 indicates high internal consistency, suggesting that the scales reliably measure their intended constructs. Corrected item-total correlations for all items exceed 0.6, demonstrating strong alignment between individual items and their respective scales. Furthermore, no significant improvement in Cronbach's Alpha is observed if any item is removed, confirming the robustness of the scales. These findings validate the reliability of the constructs, enabling their use in exploratory factor analysis and regression testing to identify determinants of SDG adoption in SMEs.

**Table 4: KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.746 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1490.083 |
| | df | 105 |
| | Sig. | <0.01 |

*Source: Extracted from SPSS*

Table 4 presents the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity, both critical for assessing the suitability of data for exploratory factor analysis (EFA). The KMO value is 0.746, which exceeds the recommended threshold of 0.6, indicating that the dataset has adequate common variance to support factor extraction (Kaiser, 1974). Bartlett's test of sphericity produces a significant Chi-Square value of 1490.083 ($p < 0.01$), confirming that correlations among variables are statistically significant and non-random (Bartlett, 1954). Together, these results demonstrate the dataset's appropriateness for factor analysis, ensuring reliable identification of underlying constructs. The high KMO value and significance of Bartlett's test validate the robustness of the dataset and its suitability for subsequent analyses. These findings provide a solid foundation for uncovering the latent factors influencing the adoption of Sustainable Development Goal (SDG) solutions among SMEs.

**Table 5: Rotated Matrix of Independent Factors**

| Number | Observed Variables | Independent Factor Loading | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | AL1 | 0.893 | | | | |
| | AL2 | 0.875 | | | | |
| | AL3 | 0.833 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | ER1 | 0.878 | | | | |
| | ER2 | 0.861 | | | | |
| | ER3 | 0.819 | | | | |
| 3 | SP1 | | 0.882 | | | |
| | SP2 | | 0.831 | | | |
| | SP3 | | 0.799 | | | |
| 4 | PR1 | | | 0.864 | | |
| | PR2 | | | 0.837 | | |
| | PR3 | | | 0.814 | | |
| 5 | PB1 | | | | 0.839 | |
| | PB2 | | | | 0.827 | |
| | PB3 | | | | 0.811 | |

*Source: Extracted from SPSS*

Table 5 provides the rotated factor matrix for independent variables, confirming the presence of five distinct factors: Awareness of SDGs among Enterprise Leaders (AL), Enterprise Resources (ER), Stakeholder Pressure (SP), Policies and Regulations (PR), and Perceived Benefits (PB). Each observed variable demonstrates strong factor loadings exceeding 0.7, a commonly accepted threshold for reliable correlations with underlying constructs (Hair et al., 2010). For instance, variables under AL (AL1 = 0.893, AL2 = 0.875, AL3 = 0.833) and SP (SP1 = 0.882, SP2 = 0.831, SP3 = 0.799) exhibit high loadings, underscoring their alignment with their respective constructs. These results validate the scale's structure, ensuring robust convergent and discriminant validity, meaning that the factors are both internally consistent and distinct from one another. The findings strengthen the reliability of the research model, laying a strong foundation for subsequent regression analysis to assess how these factors influence the adoption of SDG solutions by SMEs.

**Table 6: EFA Results for Dependent Variables**

| Observed Variables | Dependent Factor Loading |
|---|---|
| | 1 |
| Y1 | 0.882 |
| Y2 | 0.854 |
| Y3 | 0.827 |
| KMO and Bartlett's Test | 0.705 |

*Source: Extracted from SPSS*

Table 6 presents the exploratory factor analysis (EFA) results for the dependent variables measuring the adoption of Sustainable Development Goal (SDG) solutions. The analysis reveals high factor loadings for all observed variables: Y1 (0.882), Y2 (0.854), and Y3 (0.827). These values exceed the acceptable threshold of 0.5, indicating strong correlations between the variables and the underlying construct (Hair et al., 2010). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.705, suggesting that the data is suitable for factor analysis (Kaiser, 1974). Bartlett's test of sphericity is significant ($p < 0.01$), confirming the presence of meaningful correlations among variables (Bartlett, 1954). The results also indicate unidimensionality, as all items load onto a single factor, validating the scale's structure. These findings confirm the robustness of the dependent variable scale, supporting its use in regression analysis to evaluate the impact of independent factors on SDG adoption among SMEs.

### 4.3. Correlation Testing

**Table 7: Correlation Matrix**

| Correlations | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | AL | ER | SP | PR | PB | Y |
| AL | Pearson Correlation | 1 | 0.313** | 0.318** | 0.300** | 0.301** | 0.563** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sig. (2-tailed) | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| | N | 212 | 212 | 212 | 212 | 212 | 212 |
| ER | Pearson Correlation | 0.313** | 1 | 0.419* | 0.190** | 0.322** | 0.532** |
| | Sig. (2-tailed) | <0.01 | | <0.01 | <0.01 | <0.01 | <0.01 |
| | N | 212 | 212 | 212 | 212 | 212 | 212 |
| SP | Pearson Correlation | 0.318** | 0.419** | 1 | 0.366** | 0.355** | 0.720** |
| | Sig. (2-tailed) | <0.01 | <0.01 | | <0.01 | <0.01 | <0.01 |
| | N | 212 | 212 | 212 | 212 | 212 | 212 |
| PR | Pearson Correlation | 0.300** | 0.190** | 0.366** | 1 | 0.137* | 0.484** |
| | Sig. (2-tailed) | <0.01 | <0.01 | <0.01 | | <0.01 | <0.01 |
| | N | 212 | 212 | 212 | 212 | 212 | 212 |
| PB | Pearson Correlation | 0.301** | 0.322** | 0.355** | 0.137* | 1 | 0.497** |
| | Sig. (2-tailed) | <0.01 | <0.01 | <0.01 | <0.01 | | <0.01 |
| | N | 212 | 212 | 212 | 212 | 212 | 212 |
| Y | Pearson Correlation | 0.563** | 0.532** | 0.720** | 0.484** | 0.497** | 1 |
| | Sig. (2-tailed) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| | N | 212 | 212 | 212 | 212 | 212 | 212 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Source: Extracted from SPSS*

Table 7 presents the Pearson correlation matrix, examining the relationships between independent variables (AL, ER, SP, PR, PB) and the dependent variable (Y), which measures the adoption of Sustainable Development Goal (SDG) solutions. All independent variables show positive and statistically significant correlations with Y at the 0.01 level. The strongest correlation is observed between Stakeholder Pressure (SP) and Y (0.720), highlighting SP as the most influential factor in driving SDG adoption. Leadership Awareness (AL), Enterprise Resources (ER), Perceived Benefits (PB), and Policies and Regulations (PR) also demonstrate moderate to strong positive correlations with Y (ranging from 0.484 to 0.563). Intercorrelations among independent variables, such as SP-ER (0.419) and PB-PR (0.137), are moderate and do not indicate multicollinearity concerns (Hair et al., 2010). These results validate the theoretical framework, showing that each variable significantly contributes to SDG adoption and supporting the use of these factors in regression analysis.

### 4.4. Regression Testing

**Table 8: Regression Analysis Results**

| Modle | | Unstandardized Regression Coefficients | | Standardized Regression Coefficients | t | Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Standard Error | Beta | | | Tolerance | VIF |
| 1 | Conts | -0.209 | 0.173 | | -1.206 | 0.229 | | |
| | AL | 0.288 | 0.045 | 0.260 | 6.423 | <0,001 | 0.797 | 1.254 |
| | ER | 0.136 | 0.032 | 0.175 | 4.249 | <0,001 | 0.766 | 1.305 |
| | SP | 0.332 | 0.034 | 0.428 | 9.845 | <0,001 | 0.688 | 1.453 |
| | PR | 0.198 | 0.041 | 0.190 | 4.792 | <0,001 | 0.827 | 1.209 |
| | PB | 0.202 | 0.044 | 0.184 | 4.587 | <0,001 | 0.810 | 1.234 |

*Adjusted $R^2$ : 0.725*

*Durbin-Watson: 1.907*

*F(ANOVA): 112.150*

*Sig.(ANOVA): <0.01*

*Source: Extracted from SPSS*

**Regression Equation:**

$$Y = - 0.209 + 0.428*SP + 0.260*AL + 0.190*PR +0.184*PB + 0.175*ER$$

Table 8 presents the regression analysis results, evaluating the influence of independent variables (AL, ER, SP, PR, PB) on the adoption of Sustainable Development Goal (SDG) solutions (Y). The model demonstrates strong explanatory power with an $R^2$ of 0.725, indicating that 72.5% of the variance in Y is explained by the predictors. Stakeholder Pressure (SP) emerges as the most influential factor, with a standardized coefficient (β=0.428), followed by Leadership Awareness (AL) (β=0.260), Policies and Regulations (PR) (β=0.190), Perceived Benefits (PB) (β=0.184), and Enterprise Resources (ER) (β=0.175). All variables are significant at $p < 0.01$, underscoring their critical roles in driving SDG adoption. Collinearity statistics, with variance inflation factors (VIF) below 2, confirm no multicollinearity concerns (Hair et al., 2010). The model's statistical significance ($F = 112.150$, $p < 0.01$) and Durbin-Watson statistic (1.907) validate its robustness.

**Table 9: Total Results**

| Hypothesis | Independent Variable | Standardized β | t-value | Sig. (p-value) | Result |
|---|---|---|---|---|---|
| H1 | Leadership Awareness (AL) | 0.260 | 6.423 | < 0.001 | Supported |
| H2 | Enterprise Resources (ER) | 0.175 | 4.249 | < 0.001 | Supported |
| H3 | Stakeholder Pressure (SP) | 0.428 | 9.845 | < 0.001 | Supported |
| H4 | Policies & Regulations (PR) | 0.190 | 4.792 | < 0.001 | Supported |
| H5 | Perceived Benefits (PB) | 0.184 | 4.587 | < 0.001 | Supported |

*Source: Self-synthesized author*

The regression analysis validates all five research hypotheses, confirming that key factors significantly influence the adoption of Sustainable Development Goal (SDG) solutions by SMEs in Dong Nai. Stakeholder pressure (SP) ($\beta = 0.428$, $p < 0.001$) is the most influential factor, supporting H3, which posits that external forces from customers, business partners, and regulatory bodies drive SDG adoption. This aligns with stakeholder theory (Freeman, 1984), emphasizing the role of external expectations in shaping business practices. Leadership awareness (AL) ($\beta = 0.260$, $p < 0.001$) is the second strongest predictor, confirming H1, which suggests that SME leaders who recognize the strategic value of SDGs are more likely to integrate sustainability into their operations. This finding is consistent with the Theory of Planned Behavior (Ajzen, 1991), which states that awareness and attitudes influence decision-making. The results also support H4, as policies and regulations (PR) ($\beta = 0.190$, $p < 0.001$) significantly impact SDG adoption, highlighting the importance of government incentives and regulatory frameworks in facilitating sustainability. Similarly, H5 is confirmed, with perceived benefits (PB) ($\beta = 0.184$, $p < 0.001$) playing a crucial role in motivating SMEs to adopt SDG solutions by demonstrating tangible advantages such as cost savings, improved brand reputation, and market expansion, aligning with Rogers' Diffusion of Innovations Theory (Rogers, 2003). Finally, enterprise resources (ER) ($\beta = 0.175$, $p < 0.001$), while significant, have the weakest impact, supporting H2 and suggesting that financial and technological constraints, though relevant, are not as decisive as external pressures and leadership commitment. These findings reinforce the need for a comprehensive approach, combining government policies, leadership development, and stakeholder engagement to accelerate SDG adoption among SMEs.

## V. CONCLUSIONS AND RECOMMENDATIONS

This study validated all proposed hypotheses, demonstrating the significant impact of leadership awareness (H1), enterprise resources (H2), stakeholder pressure (H3), policies and regulations (H4), and perceived benefits (H5) on the adoption of Sustainable Development Goal (SDG) solutions by small and medium-sized enterprises (SMEs). Grounded in established theoretical frameworks, these findings highlight the multifaceted nature of SDG adoption and offer practical insights for policymakers and practitioners.

Leadership Awareness (H1)**: "**Leadership awareness emerged as a significant determinant of SDG adoption ($\beta=0.260, p<0.01$). Leaders who recognize the strategic importance of SDGs are more likely to integrate sustainability into their business operations. This aligns with the Theory of Planned Behavior, which underscores the role of attitudes and awareness in shaping organizational decisions (Ajzen, 1991). Training programs, workshops, and case studies that emphasize the economic, social, and environmental benefits of SDGs can further strengthen leadership commitment

(Dalampira & Nastis, 2020; Johnson & Li, 2024)**".**

Enterprise Resources (H2)**: "**Enterprise resources also significantly influence SDG adoption ($\beta$=0.175,$p$<0.01). The resource-based view highlights the importance of financial, human, and technological resources for implementing sustainable practices (Barney, 1991). Many SMEs in developing regions face resource constraints that limit their ability to adopt SDGs. Providing financial aid, improving access to advanced technology, and implementing employee skill development programs can help address these challenges (Wang, Guo, & Lu, 2021; Green & Parker, 2024)**"**.

Stakeholder Pressure (H3)**: "**Stakeholder pressure was identified as the most influential factor ($\beta$=0.428,$p$<0.01), reflecting the critical role of external influences. Customers, business partners, and governments create substantial pressure for SMEs to adopt sustainable practices. Stakeholder theory emphasizes the need to meet these expectations to maintain legitimacy and competitiveness (Freeman, 1984). Collaborative partnerships, public-private initiatives, and sustainability awareness campaigns can enhance stakeholder engagement (ElAlfy, Palaschuk, & Weber, 2020; White & Ahmed, 2024)**"**.

Policies and Regulations (H4)**: "**Supportive policies and regulations significantly impact SDG adoption ($\beta$=0.190,$p$<0.01). Financial incentives, such as subsidies and tax breaks, along with clear regulatory frameworks, reduce barriers to sustainability (Köhler et al., 2022; Smith & Torres, 2024). Policymakers should focus on implementing tailored policies that address the unique needs of SMEs, particularly in resource-constrained regions**"**.

Perceived Benefits (H5)**: "**Perceived benefits, including cost savings, enhanced reputation, and market access, positively influence SDG adoption ($\beta$=0.184,$p$<0.01). SMEs motivated by these tangible advantages are more likely to invest in sustainability initiatives. This finding aligns with Rogers' Diffusion of Innovations Theory, which emphasizes the importance of perceived benefits in promoting the adoption of new practices (Rogers, 2003; Löwstedt et al., 2021)**"**.

To foster the adoption of Sustainable Development Goals (SDGs) among small and medium-sized enterprises (SMEs), this study proposes a comprehensive set of strategies addressing key barriers and leveraging enablers identified in the findings**:**

First, Enhance Leadership Awareness: "Leadership plays a critical role in SDG adoption. SME leaders need targeted education and training programs to understand the strategic importance of SDGs. Workshops, seminars, and online courses should focus on the economic, social, and environmental benefits of sustainability, demonstrating how aligning business operations with SDGs can enhance competitive advantage. Sharing success stories and case studies from other SMEs successfully implementing SDGs can inspire leaders to take actionable steps. Additionally, partnerships with academic institutions and industry experts can provide practical tools and frameworks for integrating sustainability into business strategies".

Second, Strengthen Resource Support: "Limited resources are a significant barrier to SDG adoption. Governments, financial institutions, and industry stakeholders should collaborate to provide financial aid, including low-interest loans, grants, and subsidies for sustainability initiatives. Enhancing access to advanced technologies, such as renewable energy systems and efficient manufacturing tools, can help SMEs implement sustainable practices more effectively. Moreover, employee training programs should be developed to build internal capacity, focusing on sustainability practices, innovation, and efficient resource management".

Third, Engage Stakeholders: "Building strong partnerships with customers, business partners, and governments is vital for fostering SDG adoption. Public-private collaborations can create platforms for knowledge exchange and resource sharing. Encouraging customer participation through green marketing campaigns can generate demand for sustainable products and services. Similarly, engaging local communities and civil society organizations can amplify the social impact of SMEs' sustainability efforts, fostering mutual trust and support".

Fourth, Optimize Policy Frameworks: "Policymakers play a pivotal role in reducing barriers to SDG adoption. Developing targeted incentives, such as tax benefits, financial subsidies, and simplified compliance processes, can encourage SMEs to adopt sustainability practices. Policies should address sector-specific challenges, providing tailored support to industries with higher sustainability potential. Regular stakeholder consultations can help ensure that policy measures are practical and accessible for SMEs".

Fifth, Communicate Benefits Effectively: "Awareness campaigns highlighting the tangible benefits of SDG

adoption—such as cost savings, enhanced brand reputation, and access to environmentally conscious markets—can motivate SMEs to embrace sustainability. Sharing real-world examples and testimonials from SMEs successfully implementing SDGs can further reinforce the value of sustainability. Industry associations and chambers of commerce can collaborate to create guides, toolkits, and outreach programs aimed at demonstrating the advantages of SDG integration**"**.

By implementing these strategies, SMEs can overcome existing barriers, capitalize on sustainability opportunities, and actively contribute to global SDG objectives, enhancing their competitiveness while fostering long-term sustainable development. This study has limitations that must be addressed in future research. First, its geographic focus on Dong Nai province limits the generalizability of findings to other regions. Second, its cross-sectional design prevents analysis of long-term impacts of SDG initiatives. Third, reliance on self-reported data may introduce biases. Additionally, factors such as organizational culture, innovation capacity, and global market dynamics were not explored. Expanding the geographic scope, adopting longitudinal studies, and integrating qualitative methods can further validate findings and enrich understanding of SDG adoption processes (UNDP, 2024).

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# PREDICTING TRENDS IN THE USE OF NEW TECHNOLOGIES OF USERS THROUGH TECHNOLOGY READINESS INDEX

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**ABSTRACT**

This article introduced and conducted an illustrative experiment in the context of Viet Nam to demonstrate the effectiveness of the Technology Readiness Index (TRI) in predicting technology usage trends. Accordingly, the TRI 2.0 measurement study was based on a survey sample of 117 users in Ho Chi Minh City in August 2024. The results showed that with a high average level of technology readiness (TRI = 3.1777 points), users in Ho Chi Minh City belonged to the Pioneer Group. From there, the study showed the feasibility of referring to TRI when deploying new technologies suitable for the masses in Viet Nam through user grouping according to TRI 2.0 and considering the differences in TRI between user groups based on different demographic characteristics.

*Keywords: "TRI 2.0"," Technology Readiness Index", "trends in the use of new technologies"*

## I. INTRODUCTION

In recent years, with the strong digital transformation and the continuous development of advanced technologies, it has become more important than ever to measure the adoption and use of new technologies by users. An individual's technological readiness will reflect their tendency to accept technology in their daily activities (Parasuraman, 2000). To accurately assess this trend, the Technology Readiness Index (TRI) has become a useful tool, helping to measure user psychology, attitudes and behaviors towards technology applications. From there, businesses and researchers can better understand the technology readiness of the target audience, as well as forecast the development trend of the market.

TRI has attracted significant interest from the academic and business communities across the globe, particularly in researching user behavior and the ability to adopt new technologies. Since being developed by Parasuraman in 2000, TRI has become one of the most popular models for assessing the readiness of users for the adoption of technological advancements. Many international studies have applied the TRI to study a variety of fields, including online services, e-commerce, distance education, digital health, and financial technology (Lin & Hsieh, 2007; Liljander & ctg., 2006) as well as examining differences in TRI between groups of users with different demographic characteristics (Rojas-Mendez & ctg., 2015 and Blut & Wang, 2020).

Viet Nam is also in the general trend of strong digital transformation, especially in the banking and finance industry. Therefore, the application of TRI is extremely necessary to better understand the trend of consumer technology use. This supports organizations in building effective customer outreach strategies, differentiating themselves in a competitive market, and promoting the sustainable development of the industry. Yet, research and empirical application of technology readiness of users in Vietnam is still lacking, as evidenced by the limited focus on specific sectors or demographic groups in existing studies. For example, prior research has explored technology readiness among college students (Phung & ctg., 2024), the accounting and auditing industry (Anh & ctg., 2023), and luxury hotels (Huy & ctg., 2019). However, comprehensive studies assessing the broader population's technology readiness remain scarce, highlighting the need for more extensive research to address these gaps.

Therefore, this study examines relevant literature and conducts illustrative experiments in the context of Viet Nam to introduce TRI 2.0 as a strong predictor of technology-related behavioral intentions as well as actual user behaviors. especially for new technology. At the same time, research contributes to helping organizations and businesses in Viet Nam design, manufacture and release new technology products suitable for the masses. The composition of the article has 5 main parts, including (1) Introduction, (2) Literature reviews, (3) Research methodology, (4) Research findings and (5) Conclusions.

## II. LITERATURE REVIEWS

### 2.1. Technology Readiness Index (TRI)

Parasuraman & Colby (2014) argue that technological readiness is a personal trait that is stable, does not change rapidly in a short period of time or is suddenly affected by external stimuli. Accordingly, individuals with higher levels of technology readiness tend to have higher rates of acceptance of advanced technologies, stronger use of technology, and a higher sense of ease of use of these technologies. These people tend to be more confident in approaching and applying technological solutions, leading to higher efficiency in daily activities and professional work (Kuo, 2011; Lin & Chang, 2011).

TRI was built with the aim of better understanding people's tendency to embrace and use advanced technologies. Accordingly, the initial TRI 1.0 structure considers four main aspects, including innovativeness, optimism, insecurity, and discomfort of users in the face of new technology (Parasuraman, 2000).

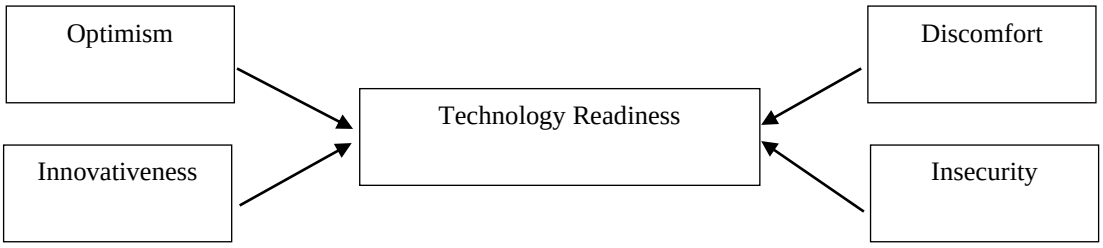



**Figure 1. TRI Model**

*Source: Parasuraman (2000)*

– Innovativeness: This is understood as the trend to be a pioneer in technology and a thought leader. Pioneers tend to easily adopt and use new technology, and they often adapt quickly to constantly updating technology (Parasuraman & Colby, 2014).

– Optimism: A person's belief that technology can provide greater control, increased flexibility, and efficiency in their daily lives or at work (Rinjany, 2020).

– Discomfort: This characteristic is labeled as a person who lacks control over technology. In other words, this aspect represents a lack of technological proficiency, leading to a feeling of inferiority when using technology. This low self-esteem will eventually create an uncomfortable feeling when using technology, causing them to continue to use traditional methods in their daily activities (Parasuraman & Colby, 2014).

– Insecurity: This characteristic is labeled for a lack of trust in technology-based transactions and pessimism about the technology's performance. In other words, a feeling of distrust or doubt that technology can accomplish a task properly. This discomfort is a barrier to technology adoption, such as a lack of confidence in using technology, perceptions of risks and costs, or concerns about security and privacy-related issues (Parasuraman & Colby, 2014).

In order to improve the TRI 1.0 model in the context of drastic and continuous changes in new technologies, researchers have proposed and implemented new development steps. In an effort to update the model, the authors conducted research through two phases, qualitative and quantitative, leading to the birth of TRI 2.0 (Parasuraman & Colby, 2014). The TRI 2.0 model implements significant streamlining when the number of questions is shortened from 36 questions to 16 questions and evenly distributed to the four core elements that remain the same from TRI 1.0.

**Table 1. TRI 2.0 Questionnaire**

| Variables | Code | Descriptions of scale items |
|---|---|---|
| Optimism | OPT1 | New technologies contribute to a better quality of life |
| | OPT2 | Technology gives me more freedom of mobility |
| | OPT3 | Technology gives people more control over their daily lives |
| | OPT4 | Technology makes me more productive in my personal life |
| Innovativeness | INN1 | Other people come to me for advice on new technologies |
| | INN2 | Ingeneral, I am among the first in my circle of friends to acquire new technology when |

| | | |
|---|---|---|
| | | it appears |
| | INN3 | I can usually figure out new high-tech products and services without help from others. |
| | INN4 | I keep up with the latest technological developments in my areas of interest |
| Discomfort | DIS1 | When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do |
| | DIS2 | Technical support lines are not helpful because they don't explain things in terms I understand |
| | DIS3 | Sometimes, I think that technology systems are not designed for use by ordinary people |
| | DIS4 | There is no such thing as a manual for a high-tech product or service that's written in plain language |
| Insecurity | INS1 | People are too dependent on technology to do things for them |
| | INS2 | Too much technology distracts people to apoint that is harmful |
| | INS3 | Technology lowers the quality of relationships by reducing personal interaction |
| | INS4 | I do not feel confident doing business with a place that can only be reached online |

*Source: Parasuraman & Colby (2014)*

The overall TRI score is calculated based on the average score of the four dimensions listed in Table 1 after backcoding the scores for discomfort and insecurity (Parasuraman & Colby, 2014). From there, the five segments are labeled to users according to the TRI score as follows:

– Pioneers tend to hold both strong positive and negative views on technology or are people who want the benefits of new technology but are also more realistic about the difficulties and dangers;

– Hesitators are people with low levels of innovativeness;

– Explorers tend to have a high level of motivation and a low level of resistance;

– Avoiders tend to have high levels of resistance and low levels of motivation;

While TRI 2.0 is easy to use, it also has certain limitations. TRI 2.0 was developed in the context of the United States with outstanding advanced technology while the culture and technology in each different country can create different behavior patterns when researching and applying innovativeness. In other words, not every country can only rely on TRI scores to classify into four fixed groups of people according to the original TRI 2.0 model. Therefore, even if the value of TRI is affirmed and applied in analyzing the trend of using new technology, researchers continue to explore and adjust the TRI model. This is to adapt to developing market conditions and limited technological infrastructure compared to geographical environments that are focusing on TRI to assess the trend of using more advanced technologies such as artificial intelligence.

**2.1. Significance of the application of TRI in the context of Viet Nam**

In the current context of Viet Nam, TRI can become a useful tool in predicting the trend of users to use new technologies for a number of reasons, specifically as follows:

*Competition and innovativeness in the banking and finance sector are taking place strongly and fiercely in Viet Nam*

The banking and finance sector in Viet Nam is a pioneer in actively transforming the model to digital banking in order to effectively apply and exploit the achievements of the 4.0 Industrial Revolution. In order to implement this trend effectively, financial institutions are required to grasp technology consumption trends quickly and accurately. TRI allows to assess consumer readiness for new services, thereby helping financial institutions find opportunities to innovate and develop products in line with market needs (Parasuraman, 2000).

*Financial Technology (FinTech) is growing rapidly in Viet Nam*

Along with the development of the Industrial Revolution 4.0, Viet Nam is witnessing an explosion of products and services from FinTech such as e-wallets, mobile payments, digital banking, and blockchain. However, along with

development opportunities, FinTech in Viet Nam still faces many challenges. For FinTech to be successful, one of the important things is to understand the readiness of users to adopt these technologies (Rogers, 1983). TRI helps measure factors such as user optimism and innovativeness, helping organizations have appropriate strategies for deploying financial products and services.

*Users in Viet Nam still have a risk-averse mentality and lack of trust in new technologies*

In Viet Nam, there are still many consumers who are hesitant to access new technologies in the financial sector, due to security and safety concerns. In 2023, Viet Nam has about 13,900 cyberattacks and more than 83,000 computers and servers have fallen victim to ransomware-related attacks with the aim of extortion (KPMG, 2024). TRI helps assess these concerns through factors such as insecurity and discomfort with technology, helping financial institutions adjust their approach to building trust with customers.

*Over time, users change consumer behavior and preferences in the digital age, especially after COVID-19*

The industrial revolution 4.0 and the digital economy are increasingly popular and are becoming an objective reality trend for many countries and many sectors of the economy. Under the impact of the digital economy, consumers have had a marked change in shopping behavior (Xiong, 2022). TRI not only helps measure the technological readiness of users, but also provides insight into the change in consumer behavior as they transition from traditional services to digital banking services (Naidu & Sainy, 2018). This is especially important in the context that new technology has been pushing Viet Nam closer to a cashless society when smart payments are popular with consumers.

In conclusion, applying TRI to the Vietnamese context in the banking and finance sector not only helps organizations grasp the technological readiness of consumers but also supports in building effective customer access strategies, differentiating themselves in a competitive market and promoting the sustainable development of the industry.

**2.3. Some related studies**

Blut & Wang (2020) conducted a meta-analysis aimed at improving the understanding of TRI by re-examining its aspects as well as investigating the mediating mechanism and regulatory influence in the relationship between TRI and users' use of new technologies. Through 193 independent samples extracted from 163 papers reported by 69,263 individuals, Blut & Wang (2020) found that TRI is best conceptualized as a two-dimensional structure that distinguishes between motivational aspects (innovativeness, optimism) and inhibitors (insecurity, discomfort). The authors also show the indirect impact of these aspects on the use of technology through the intermediaries proposed by the quality-value-satisfaction chain and the Technology Acceptance Model. Moreover, the strength of the relationships between TRI and the use of new technologies depends on the type of technology (for pleasure or pragmatism), the characteristics of the company being evaluated (voluntary or compulsory use; support from the company), and the firm context (gross domestic product; human development index). Finally, the client's age, education, and experience are determined to be relevant to the TRI. These findings enhance regulators' understanding of how TRI affects users' use of technology.

Lin & Hsieh (2007) applied TRI to learn about the technological readiness of 413 consumers in Taiwan for online self-service services, especially in the banking and telecommunications industries. The results show that user optimism and innovativeness have a positive impact on the acceptance of online services.

Liljander & ctg. (2006) explored how 1258 customers of a European airline's loyalty program responded to online customer care services and digital self-service tools using TRI. Data analysis shows that only optimism and creativity form unique personal aspects. Optimism best explains consumer behavior towards self-service technology, while innovativeness has only a small impact on attitudes towards registration via the Internet or mobile phones.

Rinjany (2020) based on the TRI model to simultaneously study the technology readiness and technology acceptance of 225 people in Jakarta, Indonesia with new technology on citizen management in the smart city program. The results showed that the level of technology readiness of Jakarta residents was identified as low (TRI = 2.7 points) and was considered into the Explorers Group. This is because the contribution value of optimism and innovativeness is high in the total TRI value. At the same time, those who are classified into the Discovery Group are individuals who are very open to progress and the adoption of new modern technology in their daily lives.

Rojas-Mendez & ctg. (2015) surveyed the differences in demographics and attitudes about the technology readiness index in the developed country – the United States and the developing country – Chile. The study used TRI to study simultaneously in two countries, with 499 samples in the US and 501 in Chile. The results indicate that there are differences in gender, age, and education across all four aspects of TRI and that there is no significant difference between the indicators in the two countries. Thereby, the authors say that TRI can be used for comparison in different regions and propose to expand research on TRI to other clusters of countries such as Asia and Africa.

In summary, these studies have shown that TRI can be widely applied to analyze the level of technology adoption and use in various sectors and geographical locations, including banking and finance, helping researchers and businesses better understand consumer behavior.

## III. METHODOLOGY

The authors conducted a quantitative study based on the TRI 2.0 framework (Parasuraman & Colby, 2014) through a survey of users in Ho Chi Minh City, employing convenience sampling for data collection. The 5-point Likert scale was used for the variables in the study, which included 5 choices: (1) Completely disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Completely agree. The authors also collected demographic information of survey participants (gender, age, education level, monthly income, experience using electronic networks, experience in online payments, level of self-assessment of financial literacy, occupation) to look for differences in TRI between groups of users based on other demographic characteristics part with.

According to Hair & ctg. (2006), the minimum sample size is calculated using the formula $n \geq m \times 5$ (n is the sample size, m is the number of observed variables) for exploratory factor analysis (EFA). For 16 observed variables in 4 factors of the TRI 2.0 scale, the minimum sample size must be 80 (guaranteed according to the formula $16 \times 5 = 80$). During the implementation of the survey in August 2024, the number of valid votes collected was 117, meeting this condition. The data is processed via SPSS 20.0 software, with the main steps being (1) Determining the reliability of the scale according to Cronbach's Alpha; (2) Exploratory factor analysis (EFA); (3) Pearson correlation analysis; (4) Statistics describing the TRI score and component variables; (6) Object clustering; (7) Chi-square analysis at a significance level of 10%.

For the classification of the cluster, the authors used a two-stage clustering process, including (1) the Ward Method and the Euclidean distance and (2) the K-means cluster analysis (Yim & Ramdeen, 2015) to divide the individuals in the survey sample into different groups based on TRI scores and 4 aspects of the scale to allow for a deeper understanding of the characteristics and the attitude of each group towards technology.

## IV. FINDINGS

**Table 2. Demographic Profile**

| Demographic variable | Categories | Number of Respondents | Percentage |
|---|---|---|---|
| **Age** | 18-30 | 106 | 90,6 |
| | 31-45 | 0 | 0 |
| | 46-60 | 6 | 5,1 |
| | Above 60 | 5 | 4,3 |
| **Gender** | Male | 41 | 35 |
| | Female | 76 | 65 |
| **Education** | Higher secondary or below | 13 | 11,1 |
| | College | 2 | 1,7 |
| | Bachelor | 100 | 85,5 |
| | Master or higher | 2 | 1,7 |

| | | | |
|---|---|---|---|
| **Monthly income** (in million VND) | Below 10 | 97 | 82,9 |
| | 10–20 | 10 | 8,5 |
| | Over 20–30 | 1 | 0,9 |
| | Over 30–40 | 4 | 3,4 |
| | Above 40 | 5 | 4,3 |
| **Self-assessed financial literacy** | No knowledge or skills | 2 | 1,7 |
| | Limited knowledge and skills | 57 | 48,7 |
| | Sufficient knowledge and skills. | 4 | 37,6 |
| | Good knowledge and skills. | 10 | 8,5 |
| | Excellent knowledge and skills. | 4 | 3,4 |
| **Internet Experience** | No Experience | 1 | 0,9 |
| | 0-2 years | 4 | 3,4 |
| | Over 2-5 years | 25 | 21,4 |
| | Over 5-10 years | 42 | 35,9 |
| | Above 10 years | 45 | 38,5 |
| **Online Payment Experience** | No Experience | 1 | 0,9 |
| | 0-2 years | 27 | 23,1 |
| | Over 2-5 years | 71 | 60,7 |
| | Over 5-10 years | 13 | 11,1 |
| | Above 10 years | 5 | 4,3 |
| **Occupation** | Private employee | 25 | 21,4 |
| | Public employee | 0 | 0 |
| | Self-employed | 0 | 0 |
| | Retired | 0 | 0 |
| | Other | 92 | 78,6 |

*Source: Extracted from analysis results.*

Statistics describing the characteristics of respondents showed that the majority of respondents participating in the survey were young people from 18 to 30 (90.6%), with most respondents not belonging to specific occupational groups listed (78.6%), of which women dominated (65%), had a university degree (85.5%), and earned less than 10 million VND/month (82.9%). have 5 years or more of experience in using the Internet (74.4%), have 2 years or more of experience in using online payments (76.1%). However, nearly half of the respondents (48.7%) self-identified their financial knowledge and skills as limited.

**Table 2. Cronbach's Alpha Coefficient Analysis Results**

| Observed variables | Corrected Item – Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|
| **OPT (Cronbach's Alpha = 0,864)** | | |
| **OPT1** | 0.701 | 0.832 |

| | | |
|---|---|---|
| **OPT2** | 0.726 | 0.823 |
| **OPT3** | 0.718 | 0.831 |
| **OPT4** | 0.729 | 0.819 |
| **INN (Cronbach's Alpha = 0,826)** | | |
| **INN1** | 0.627 | 0.794 |
| **INN2** | 0.737 | 0.739 |
| **INN3** | 0.686 | 0.765 |
| **INN4** | 0.571 | 0.816 |
| **DIS (Cronbach's Alpha = 0,840)** | | |
| **DIS1** | 0.592 | 0.838 |
| **DIS2** | 0.718 | 0.779 |
| **DIS3** | 0.744 | 0.771 |
| **DIS4** | 0.659 | 0.804 |
| **INS (Cronbach's Alpha = 0,810)** | | |
| **INS1** | 0.622 | 0.756 |
| **INS2** | 0.701 | 0.728 |
| **INS3** | 0.689 | 0.732 |
| **INS4** | 0.518 | 0.820 |

*Source: Extracted from analysis results*

Table 2 shows that the observed variables all have a total variable correlation coefficient greater than 0.3, so the observed variables are accepted and satisfactory. In addition, Cronbach's Alpha reliability coefficient is greater than 0.8, proving a suitable scale. Therefore, the 16 observation variables of 4 independent variables all showed a suitable scale and proceeded to proceed to the next step, Exploratory Factor Analysis (EFA).

**Table 3. The Kaiser-Meyer-Olkin Test and Ballet's Test**

| | | |
|---|---|---|
| **Number of KMO sampling appropriateness** | | 0.816 |
| **The Barlett's Test** | **Approximate Chi-Square** | 989.159 |
| | **Degree of freedom** | 120 |
| | **Significance** | 0.000 |

*Source: Extracted from analysis results*

Table 3 presents the results of the Bartlett's test and KMO test, indicating that the observed variables are correlated across the entire dataset. This satisfies the requirement of $0.6 \leq KMO \leq 1$ and a p-value significance level of less than 0.05, confirming the suitability of the data for conducting exploratory factor analysis (EFA) (Hair & ctg., 2006).

**Table 4. EFA Results**

| **Observed varibales** | **Component** | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **OPT** | | | | |
| **OPT1** | 0.857 | | | |
| **OPT2** | 0.826 | | | |
| **OPT3** | 0.823 | | | |
| **OPT4** | 0.816 | | | |
| **DIS** | | | | |
| **DIS3** | | 0.841 | | |
| **DIS2** | | 0.839 | | |
| **DIS4** | | 0.681 | | |
| **DIS1** | | 0.622 | | |
| **INS** | | | | |

| | |
|---|---|
| **INS3** | 0.851 |
| **INS2** | 0.791 |
| **INS1** | 0.684 |
| **INS4** | 0.687 |
| **INN** | |
| **INN2** | 0.899 |
| **INN3** | 0.795 |
| **INN1** | 0.758 |
| **Extraction Sums of Squared Loadings** | 70.531 |
| **Eigen value** | 1.008 |

*Source: Extracted from analysis results*

Table 4 presents the EFA results with 15 observed variables after INN4 removal due to the high load factor on the two factors with the difference between the load factors less than 0.2. Accordingly, these 15 observed variables all had a factor load coefficient greater than 0.55, meeting the criterion of statistical significance with a sample number of 117 (Hair & ctg., 2006). The total variance is 70.531% (> 50%).

**Table 5. Pearson correlation coefficient (N = 117)**

| | | **OPT** | **INN** | **DIS** | **INS** |
|---|---|---|---|---|---|
| **OPT** | Rho | 1 | 0.271 | 0.232 | 0.227 |
| | Sig. (2-tailed) | | 0.003 | 0.012 | 0.014 |
| **INN** | Rho | 0.271 | 1 | 0.395 | 0.152 |
| | Sig. (2-tailed) | 0.003 | | 0.000 | 0.101 |
| **DIS** | Rho | 0.232 | 0.295 | 1 | 0.612 |
| | Sig. (2-tailed) | 0.012 | 0.000 | | 0.000 |
| **INS** | Rho | 0.227 | 0.152 | 0.612 | 1 |
| | Sig. (2-tailed) | 0.014 | 0.101 | 0.000 | |

*Source: Extracted from analysis results*

Table 5 shows that the pairs of variables are weakly correlated with each other because the correlation coefficients range from 0.152 to 0.395.

**Table 6. Descriptive statistics of TRI scores and component variables**

| | **Min** | **Max** | **Mean** | **SD** | **Skewness** | **Kurtosis** |
|---|---|---|---|---|---|---|
| **OPT** | 1.00 | 5.00 | 4.3376 | 0.74374 | -2.126 | 6.864 |
| **INN** | 1.00 | 5.00 | 3.2963 | 1.01311 | -0.136 | -0.469 |
| **DIS** | 1.00 | 5.00 | 3.2543 | 0.91620 | -0.213 | -0.393 |
| **INS** | 1.00 | 5.00 | 3.6688 | 0.83229 | -0.510 | 0.705 |
| **Total TRI score** | 2.00 | 4.44 | 3.1777 | 0.42321 | 0.412 | 0.485 |

*Source: Extracted from analysis results*

Table 6 shows that the technology readiness level of respondents in Ho Chi Minh City is at a high average level (TRI = 3.1777), with a high level of optimism (OPT = 4.3376) and a high average level of innovativeness (INN = 3.2963). However, they also felt quite uncomfortable (DIS = 3.2543) and quite insecure (INS = 3.6688). The INN had the largest standard deviation (1.01311), indicating the existence of large differences in the responses, while the remaining variables had a standard deviation lower than 1, indicating a high concentration around the mean. The above results are relatively consistent with the reality of the trend of using new technologies and the effectiveness in converting input resources into innovativeness outputs in Vietnam in general and Ho Chi Minh City in particular.

The World Intellectual Property Organization (WIPO) has published the Global Innovation Index (GII) Report 2024, according to which, Vietnam ranks 44 out of 133 countries and economies and has always had higher innovativeness results than the continuous development level over the past 14 years. Although users are still afraid of

technological risks in the face of great risks of errors, malware and phishing attacks, it can be seen that Vietnam is pursuing a risk-taking policy to encourage technological development and innovativeness (KPMG, 2024). Based on the TRI score, the respondents can be placed in the Pioneer Group.

After conducting a hierarchical cluster analysis with the Ward method and Euclidean squared distance, the authors conducted a K-means cluster with the number of clusters K = 2. Table 7 shows that the data are divided into two separate clusters with a relatively balanced number of observations: Cluster 1 (n = 60) and Cluster 2 (n = 57). Cluster 2 had a higher mean score of each aspect when comparing correlations and the differences were of high statistical significance (Sig. < 0.05) (Table 7).

**Table 7. K-Means Cluster**

| | Cluster 1 | Cluster 2 | F value | Sig. |
|---|---|---|---|---|
| **OPT** | 4.19 | 4.50 | 5.198 | 0.024 |
| **INN** | 2.81 | 3.81 | 37.017 | 0.000 |
| **DIS** | 2.55 | 4.00 | 193.579 | 0.000 |
| **INS** | 3.23 | 4.13 | 48.408 | 0.000 |
| **Total TRI score** | 3.31 | 3.1 | | |
| **N of Valid Cases** | 60 | 57 | | |

*Source: Extracted from analysis results.*

The study found differences in TRI between groups of respondents based on gender. Table 8 shows the gender distribution between the two clusters and the results of the independent examination of gender and clustering. The p-value of the Pearson Chi-Square inspection is 0.051 (< 0.1). Therefore, at a significance level of 10%, it can be concluded that there is a statistically significant association between sex and the two clusters. At the same time, the analysis results show that the Phi value is -0.180 at a significant level of 10%. This suggests that there is an inverse relationship between gender and clustering. Specifically, the results indicate that female respondents are more likely to belong to Cluster 1 – Pioneer Group (with 73.3% female), while male respondents are more likely to belong to Cluster 2 – Pioneer Group with a stronger level of technology readiness (with 43.9% male and a more balanced gender distribution). The results of the analysis also showed that there were significant differences based on gender between the two clusters.

**Table 8. Chi-square Test on gender**

| **Frequencies** | | | |
|---|---|---|---|
| **Gender** | **Cluster 1** | **Cluster 2** | **Total** |
| **Male** | 16 (26.7%) | 25 (43.9%) | 41 (35%) |
| **Female** | 44 (73.3%) | 32 (56.1%) | 76 (65%) |
| **N of Valid Cases** | 60 | 57 | 117 |
| **Chi-square Tests** | | | |
| | **Value** | **df** | **Asymptotic Sig.** |
| **Pearson Chi-Square** | 3.796 | 1 | 0.051 |
| **Likelihood Ratio** | 3.818 | 1 | 0.079 |
| **Linear-by-Linear Association** | 3.763 | 1 | 0.052 |
| **Symmetric Measures** | | | |
| | **Value** | **Approx. Sig.** | |
| **Phi** | -0.180 | 0.051 | |
| **Cramer's V** | 0.180 | 0.051 | |

*Source: Extracted from analysis results.*

Figure 2 shows the final classification results based on the differences in TRI between gender-based respondent groups. Accordingly, the study identified two user clusters with separate levels of new technology readiness, including Cluster 1 as the Pioneer Group and Cluster 2 as the Pioneer Group with a stronger level of technology readiness.

Accordingly, respondents have an average high level of technology readiness, they are optimistic but also have concerns about potential risks in new technologies.

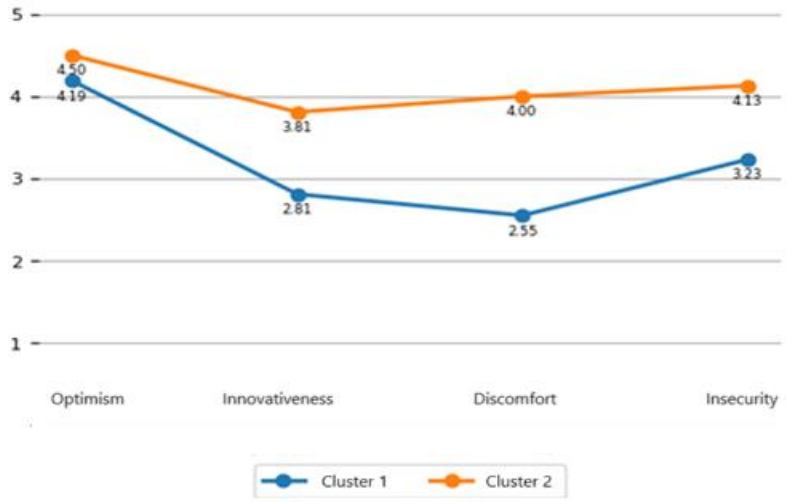



**Figure 2. Technology User Classification (N=117)**

*Source: Extracted from analysis results.*

## V. CONCLUSIONS

Viet Nam has made great strides in promoting digital transformation in the 4.0 revolution, but the reality is that there are still many challenges that need to be solved. With the results of the above study, the authors recognized two interesting information, namely (1) the classification of users based on TRI and (2) the differences in TRI between groups of users based on different demographic characteristics. They can play a useful role in helping organizations in Viet Nam assess users' technology usage trends to deploy new technology products that are suitable for the masses as well as contribute to improving users' awareness of the benefits and risks of using technology. Thus, TRI can be used as a practical way to survey the market, reach target customers, and apply it within the organization; thereby offering a reasonable approach to develop the organization in the digital age. Thereby, strengthening communication activities, promoting, raising awareness, and encouraging the participation of people, authorities and businesses in digital transformation will contribute to accelerating the digital transformation process.

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# THE IMPACT OF INFORMATION TECHNOLOGY ON THE IMPLEMENTATION OF MANAGEMENT ACCOUNTING IN THE CIRCULAR ECONOMY: PROPOSED RESEARCH MODEL AND SCALE

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**ABSTRACT**

Many enterprises are transitioning from a linear economy model to a circular economy, during which management accounting practices also undergo changes to align with the new paradigm, supported by information technology systems. Using a literature review and expert interviews, this study proposes a research model and a scale to measure the impact of information technology on the implementation of management accounting and the level of participation in the circular economy of enterprises. The theoretical model includes three factors, with a proposed scale comprising 39 indicators. A survey of 228 enterprises in Son La province, a region known for its strong performance in agriculture and potential for circular economy development, was conducted. The scale was validated using Cronbach's Alpha coefficient and exploratory factor analysis. The results indicate three factors: The level of participation in the circular economy with four indicators; Information technology with six indicators; The implementation of management accounting with five indicators. These factors meet the conditions for validation and lay the foundation for future research.

*Keywords*: Circular economy, information technology, management accounting, small and medium-sized enterprises

## I. INTRODUCTION

Many enterprises are currently transitioning from the linear economy model to the circular economy (CE). The typical activities associated with CE include waste recovery, substitution of raw materials and components, investments aimed at reducing the environmental impact of products, ecological design for CE, resource efficiency, waste evaluation, and other related factors. Overall, CE is related to changes in businesses, industries, and economies through shifts in values, norms, behaviors, and societal attitudes (Chizaryfard et al., 2021). Therefore, regardless of the level of involvement in CE, businesses must adapt their production processes, information systems, and management practices. Management accounting practices (MAP) are among the aspects that must change to meet the requirements of CE, such as assessing the financial impact of sustainable practices, ecological design, resource recovery strategies, measuring performance from non-financial perspectives, and providing information to encourage sustainable resource exchange. Consequently, traditional MAP reporting systems will become outdated and must evolve continuously to align with management needs.

With the explosion of science and technology, the application of IT in accounting practices in general, and MAP in particular, is inevitable, bringing significant changes to accounting practices. Even small and micro-enterprises can easily invest in accounting software. However, many software companies today primarily focus on developing products for financial accounting needs, often overlooking the development of features that meet the requirements of management accounting techniques, or at most, only supporting basic techniques. In the context of CE, how should the impacts of IT on MAP in enterprises be measured? This study aims to build a research model, identify measurement scales, and initially test the scale based on a survey of 228 enterprises in Son La province – a region with notable achievements in agriculture and strong potential for CE development. The research results serve as a foundation for future studies.

## II. MATERIAL AND METHOD

The study was conducted through the following steps:

Step 1: The author synthesized relevant studies, then compiled factors and proposed a theoretical research model

and a draft measurement scale.

Step 2: Through in-depth interviews with experts such as chief accountants, directors, and accountants, the measurement scale was further refined to ensure its suitability for the characteristics of enterprises in Son La.

Step 3: A survey was conducted, and data were collected.

Step 4: The reliability of the measurement scale was tested using Cronbach's Alpha and exploratory factor analysis (EFA).

- Testing the reliability of the measurement scale using Cronbach's Alpha: Variables were excluded if their item-total correlation coefficient was less than 0.3. The scale was accepted if Cronbach's Alpha ≥ 0.6 (Nunnally & Bernstein, 1994).
- EFA: Principal Axis Factoring (PAF) and Promax rotation were used. The EFA results must meet the following conditions:

KMO coefficient ≥ 0.5 and Bartlett's test of sphericity significance ≤ 0.05; (2) Factor loadings ≥ 0.5 to ensure convergent validity (Hair et al., 2017); (3) Cumulative variance explained ≥ 0.5; (4) Eigenvalue > 1 (Hair et al., 2017), with the number of factors determined based on the proportion of variance explained by each factor; (5) The difference in factor loadings for an observed variable between factors must be ≥ 0.3 to ensure discriminant validity (Jabnoun & Al-Tamimi, 2003).

The sample size for EFA analysis ensures that the ratio of observations to measurement variables (N/p) is 5:1 (Hair et al., 2017). With a total of 39 observed variables, the minimum sample size is 39x5=195. The study used a non-probability convenience sampling method. The survey participants included directors, chief accountants, and accountants. Each enterprise provided one respondent to complete the survey. The questionnaire distribution and collection process took place in June and July 2024. A total of 243 questionnaires were collected, and 228 valid responses were used after excluding 15 incomplete responses, which exceeds the minimum sample size.

## III. RESULT AND DISCUSSION

### 3.1. Theoretical Basis

Since the mid-1970s, Information Processing Theory has been developed by Galbraith (Randolph & Richard, 2005). This theory revolves around three key concepts: information processing capacity, information processing requirements, and the alignment between these two factors to optimize organizational performance. Organizations must regulate information to mitigate environmental uncertainty and enhance decision-making processes.

According to Information Processing Theory, the suitability of an organization's information processing capability has a significant impact on its operational effectiveness (Galbraith, 1973). Businesses can adopt two strategic approaches to cope with environmental uncertainty and increasing information demands. The first strategy involves developing factors that minimize the impact of uncertainty, while the second focuses on enhancing information processing capacity to acquire more effective information, thereby reducing uncertainty (Premkumar et al., 2005).

To successfully implement these strategies, organizations need to establish a connection between information requirements and processing capabilities. In the context of rapid technological advancements and deeper integration into CE, businesses should adopt these strategies by either leveraging IT applications or modifying MAP to enhance information efficiency. This, in turn, enables MA to better serve corporate information needs within the CE framework. Based on this rationale, this study adopts Information Processing Theory as the foundation for designing MAP content. Only when MA is effectively conducted—ensuring quality, alignment with objectives, and adherence to CE principles—can it provide relevant and high-quality MA information.

### 2. Research Model and Measurement Scales

### 2.1. Research Model

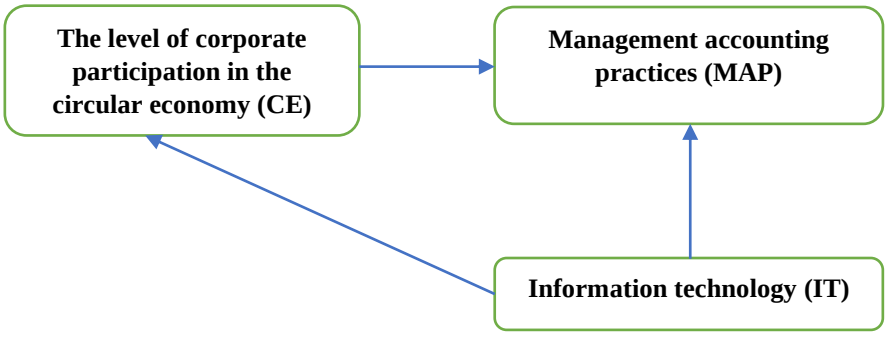
The extent of participation in CE significantly influences MAP, as confirmed by various studies. Integrating CE principles requires changes in the MA framework to support sustainable decision-making and resource efficiency. For instance, regenerative MA provides tools for cost control and value maximization while emphasizing sustainability from the early stages of production. Additionally, CE participation often leads decision-makers to bypass formal

accounting systems in favor of informal methods and life cycle analyses, fostering multi-stakeholder dialogue and new organizational configurations (Aureli et al., 2023). This transition enhances accountability and transparency in waste management and recycling (Luminita et al., 2024). Furthermore, sustainable accounting and integrated reporting are essential for measuring impacts and risks related to waste management, thereby improving competitiveness and innovation in CE (Ionescu & Andronie, 2024). Innovations in MAP due to CE participation include activity-based costing and environmental MA, which facilitate sustainable cost management by improving cost allocation and environmental cost tracking (Hossain & Hasan, 2024). Additionally, CE challenges businesses with supply chain restructuring, indirectly affecting MAP (Shiva, 2024). Overall, research agrees that CE participation impacts MAP either directly or indirectly.

The impact of Information Technology IT on MAP is profound, reshaping processes, enhancing decision-making, and improving efficiency. Integrating advanced IT tools such as Enterprise Resource Planning (ERP) systems and cloud computing has become essential, especially for small and medium enterprises (SMEs). IT's influence on MAP has been a critical topic in accounting research. Shields (1998) provided deep insights into MAP, while Granlund et al. (2002) examined ERP's impact on MAP, questioning whether the effects are immediate or long-term. By 2011, Granlund expanded this research to encompass accounting information systems and MAP control (Granlund, 2011). Alves (2010) contributed to understanding how IT affects accounting task execution, highlighting its significant implications for research and MAP.

IT adoption has evolved beyond simple financial management systems to enterprise resource planning (ERP) and large-scale accounting information processing systems (Zheng et al., 2011). This shift has streamlined accounting functions and enhanced managerial decision-making quality through real-time data access and improved accuracy (Putro, 2023; Omar, 2023). These changes impact various business aspects, including performance and operational efficiency. However, IT adoption also poses challenges. Continuous IT advancements bring numerous benefits but also raise integration issues and ongoing training demands, particularly for SMEs (Omar, 2023; Zafar et al., 2024). Businesses must adapt their regulations and organizational structures to successfully implement IT in accounting (Putro, 2023) to maintain competitive advantage.

Numerous studies confirm that digitalization drives sustainable activities and CE (Antikainen et al., 2018). Specific IT contributions include product-sharing models in Scandinavia (He et al., 2021) and blockchain technology's impact on CE, emphasizing IT's role in sustainability and corporate social responsibility (Kumar et al., 2022). Optimized information flows and actor integration are critical for CE participation (Berglund-Brown et al., 2022), particularly in promoting circular consumption behavior (Gomes et al., 2023). These factors provide significant development opportunities for businesses engaged in sustainable and innovative activities.




*Source: Proposed by the author*

**Figure 1 - Research model**

Research Hypotheses:

H1: The level of corporate participation in CE influences management accounting practices.

H2: Information technology affects the level of corporate participation in the circular economy.

H3: Information technology influences management accounting practices.

**2.2. Measurement Scale**

### 2.2.1. Level of Corporate Participation in the Circular Economy

The level of corporate participation in CE is typically assessed based on various aspects, including waste recovery, substitution of raw materials and components, investments aimed at reducing the environmental impact of products, eco-design for CE, resource efficiency, and waste assessment, along with other related variables. Based on expert opinions, six indicators have been slightly adjusted in wording to align with the language and context of Sơn La.

**Table 1 - Summary of Measurement Scale for the Factor Level of Corporate Participation in the Circular Economy**

| Code | Indicator | Source |
|---|---|---|
| **CE1** | The company has consulted stakeholders on environmental management issues | Alhamdi Mohammed, Suzana Sulaiman, Norlaila Md Zin (2022) |
| **CE2** | The company has implemented waste recovery/recycling | |
| **CE3** | The company has sold recycled products | |
| **CE4** | The company has reused waste materials | |
| **CE5** | The company has focused on energy efficiency | Smol, M., Kulczycka, J., & Avdiushchenko (2017) |
| **CE6** | The company has used renewable energy | |

*Source: Compiled by the author*

The level of corporate participation in CE is measured using a 5-point Likert scale with the following conventions: 1.Never; 2. Rarely; 3. Occasionally; 4. Frequently; 5. Very frequently.

### 2.2.2. Management Accounting Practices

MAP aims to assess the extent to which profit expectations are met in business activities and, more importantly, to explore ways to improve future profitability (Waymire, 2009). The core tasks of MA include planning, cash flow forecasting, and performance goal setting. Building upon the research of Shields and Shelleman (2016) and in accordance with Section 1, Part I, Circular 53/2006/TT-BTC, which provides guidelines on MA in enterprises, MAP involves collecting, processing, analyzing, and providing economic and financial information as required for management and economic decision-making within an accounting entity.

MAP provides information on internal business activities to support management, control, and economic decision-making, including: cost allocation for individual departments, tasks, and products; analysis and evaluation of actual performance against planned revenue, costs, and profits; selection of relevant information for short- and long-term investment decisions; and the preparation of production and business budgets. Accordingly, MAP consists of four key activities: Planning, Execution and Control, Evaluation, and Decision-Making.

CE revolves around five main components: waste recovery, recycling, energy consumption reduction, renewable energy use, and eco-conscious activities. When a company engages in CE, MAP must integrate environmental and social factors, helping businesses adjust their operations to minimize environmental impact and sustain resources, thereby enabling a more comprehensive value assessment system.

Based on MAP's primary functions in implementing CE-related activities, the author has developed 20 indicators, categorized as follows: Planning (07 indicators), Execution and Control (06 indicators), Evaluation (03 indicators), Decision-Making (04 indicators). According to expert opinions, indicators 2 and 3 have been refined for clarity, reflecting the distinct characteristics and objectives of CE. A 5-point Likert scale is used with the following values: 1. Never; 2. Rarely; 3. Occasionally; 4. Frequently; 5. Very frequently. These indicators were designed to solicit expert opinions on their relevance and the ability of respondents to provide information. The summary of in-depth interview results is presented in the following table:

**Table 2 - Summary of Measurement Scale for the Factor Management Accounting Practices Implementation**

| Code | Indicator | Notes |
|---|---|---|
| | **A. PLANNING** | |
| | **I. Cost Budgeting** | |

| Code | Indicator | Notes |
|---|---|---|
| MAP1 | Budgeting costs for waste recovery | |
| MAP2 | Budgeting costs for waste treatment for recycling | Added phrase: "for recycling" |
| MAP3 | Budgeting costs for material replacement/improvement to reduce energy consumption | Added phrase: "to reduce energy consumption" |
| MAP4 | Budgeting costs for renewable energy exploitation | |
| | **II. Revenue Budgeting** | |
| MAP5 | Budgeting revenue from waste reuse within the enterprise | |
| MAP6 | Budgeting revenue from material replacement/improvement to reduce energy consumption | |
| MAP7 | Budgeting revenue from renewable energy exploitation | |
| | **B. IMPLEMENTATION AND CONTROL** | |
| MAP8 | Accounting for detailed monitoring of waste recovery and treatment costs | |
| MAP9 | Accounting for detailed monitoring of material replacement/improvement costs | |
| MAP10 | Accounting for detailed monitoring of renewable energy exploitation costs | |
| MAP11 | Accounting for detailed monitoring of revenue from waste reuse | |
| MAP12 | Accounting for detailed monitoring of revenue from reduced energy consumption | |
| MAP13 | Accounting for detailed monitoring of revenue from renewable energy exploitation | |
| | **C. EVALUATION** | |
| MAP14 | Accounting for comparing actual costs with budgeted costs | |
| MAP15 | Accounting for comparing actual revenue with budgeted revenue | |
| MAP16 | Accounting for variance analysis to determine causes | |
| | **D. DECISION-MAKING** | |
| MAP17 | Accounting for preparing variance reports on costs and causes | |
| MAP18 | Accounting for preparing variance reports on revenue and causes | |
| MAP19 | Managers frequently use cost information for decision-making | |
| MAP20 | Managers frequently use revenue information for decision-making | |

*Source: Compiled by the author*

**2.2.3. Information Technology**

To measure the IT variable, studies often consider two aspects: Information System Quality and User Satisfaction (Petter et al., 2008). In-depth interview results reveal the following insights:

Information System Quality is evaluated based on the following factors: Accuracy, Security, Responsiveness to User Needs, and Technical Capability.

Experts agreed that Responsiveness to User Needs is a fundamental requirement of any IT system. However, enterprises and even IT providers today are increasingly focusing on technologies that support financial accounting rather than MA. This is understandable since financial accounting is mandatory. Therefore, to ensure clarity, this indicator should be explicitly stated as: Responsiveness to Management Accounting Technical Requirements to ensure that respondents evaluate the IT system's capability in supporting MA rather than financial accounting.

Technical Capability was also unanimously recognized as an important indicator. However, since most interview respondents are not IT specialists, it is challenging for them to assess the technical capacity of an IT system at a given

time. Moreover, since respondents include business managers who are not direct IT users, they typically evaluate the technical capability of accounting technology solutions based on publicly available information rather than firsthand experience.

Therefore, experts agreed to refine the indicator as: Publicly Recognized Technical Capability. User Satisfaction is measured through two key dimensions: Satisfaction with reports generated by the IT system and Satisfaction with IT support services. Experts reached a consensus on refining the first indicator to: Satisfaction with Management Accounting Reports to ensure the focus remains on MA rather than general IT reports. Additionally, in the context of small and medium-sized enterprises (SMEs), which often face financial constraints, the cost-effectiveness of IT implementation is a crucial factor influencing investment decisions. Business owners prioritize IT systems that offer reasonable implementation costs. As a result, experts agreed to introduce an additional indicator: Reasonable Implementation Cost.

Thus, in this study, the IT variable is measured using the following seven indicators:

**Table 3 - Summary of Measurement Scale for Information Technology Factor**

| Code | Indicator | Source |
|---|---|---|
| IT1 | Accuracy | Petter et al. (2008) |
| IT2 | Security | |
| IT3 | Responsiveness to Management Accounting Technical Requirements | |
| IT4 | Publicly Recognized Technical Capability | |
| IT5 | Satisfaction with Management Accounting Reports | |
| IT6 | Satisfaction with Support Services | |
| IT7 | Reasonable Implementation Cost | Added based on expert interviews |

*Source: Compiled by the author*

### 3. Scale Reliability Testing

#### 3.1. Results of Scale Reliability Testing Using Cronbach's Alpha

Based on the complete dataset collected and processed using **SPSS 26**, the author conducted **Cronbach's Alpha** reliability testing to eliminate irrelevant variables from the scale. The analysis results are as follows:

The reliability assessment of the **CE scale** showed **Cronbach's Alpha = 0.724** (greater than 0.6), with all item-total correlations exceeding 0.3, except for **CE6.** After removing **CE6,** another reliability test was conducted, revealing that **CE5** had an item-total correlation below 0.3. After two rounds of testing, **Cronbach's Alpha increased to 0.800**, ensuring the reliability of the scale.

The **MAP scale** reliability assessment yielded **Cronbach's Alpha = 0.890** (greater than 0.6), with all item-total correlations exceeding 0.3, except for **MAP17** and **MAP18**. These items were removed, and after re-running the test, **Cronbach's Alpha increased to 0.901**. However, additional items (**MAP6 and MAP10**) were identified as potential outliers that, when removed, would further enhance reliability. After their removal, **Cronbach's Alpha reached 0.906**, confirming the scale's reliability.

The **IT scale** reliability assessment resulted in **Cronbach's Alpha = 0.854** (greater than 0.6), with all item-total correlations exceeding 0.3, ensuring scale reliability. However, **IT7** was identified as an item whose removal would increase Cronbach's Alpha. After removing **IT7** and re-running the test, **Cronbach's Alpha improved to 0.863.**

**Table 4 - Cronbach's Alpha Coefficients of the Measurement Scales in the Study**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| **Level of Corporate Participation in the Circular Economy** (CE): Cronbach's Alpha = 0.800 | | | | |
| CE1 | 9.50 | 4.968 | .540 | .788 |

| | | | | |
|---|---|---|---|---|
| CE2 | 9.27 | 5.242 | .577 | .768 |
| CE3 | 9.45 | 4.452 | .660 | .727 |
| CE4 | 9.39 | 4.859 | .692 | .715 |
| Management Accounting Practices (MAP): Cronbach's Alpha = 0.906 | | | | |
| MAP1 | 54.99 | 61.260 | .382 | .906 |
| MAP2 | 54.90 | 58.021 | .727 | .896 |
| MAP3 | 55.15 | 60.785 | .391 | .906 |
| MAP4 | 54.94 | 58.072 | .699 | .896 |
| MAP5 | 54.95 | 57.909 | .734 | .895 |
| MAP7 | 54.96 | 58.294 | .658 | .898 |
| MAP8 | 54.77 | 57.269 | .713 | .895 |
| MAP9 | 54.95 | 59.632 | .514 | .902 |
| MAP11 | 54.86 | 59.263 | .576 | .900 |
| MAP12 | 54.67 | 57.189 | .712 | .895 |
| MAP13 | 55.11 | 59.058 | .508 | .903 |
| MAP14 | 54.81 | 57.411 | .720 | .895 |
| MAP15 | 54.80 | 58.355 | .624 | .899 |
| MAP16 | 54.93 | 59.401 | .456 | .905 |
| MAP19 | 54.81 | 58.139 | .572 | .900 |
| MAP20 | 54.85 | 60.630 | .412 | .906 |
| Information Technology (IT): Cronbach's Alpha = 0.863 | | | | |
| IT1 | 16.34 | 10.860 | .599 | .849 |
| IT2 | 16.05 | 10.244 | .738 | .825 |
| IT3 | 16.15 | 9.869 | .699 | .832 |
| IT4 | 15.86 | 10.453 | .691 | .834 |
| IT5 | 15.88 | 10.246 | .683 | .835 |
| IT6 | 16.32 | 11.046 | .534 | .861 |

*Source: Author's calculations*

**3.2. Results of Scale Testing Using Exploratory Factor Analysis**

After assessing the reliability of the measurement scale using Cronbach's Alpha, nine observed variables were eliminated. Subsequently, the author continued evaluating the remaining observed variables using EFA to uncover the latent factor structure among the observed variables and identify low-quality variables.

Several observed variables were removed due to the following reasons: Low factor loadings (below the research threshold of 0.5), indicating that the variable contributed minimally to the study. Loading on a single factor in isolation, suggesting that the observed variable represented a distinct concept unrelated to the theoretical foundation. Cross-loading on two or more factors with a difference in factor loadings greater than 0.3, implying that the variable exhibited characteristics of multiple constructs and lacked clarity, which could create obstacles in evaluating discriminant validity of the scale.

Following this stepwise variable elimination process, the results were as follows: KMO value = 0.821, satisfying the condition $0.5 < 0.821 < 1$, indicating sampling adequacy. Bartlett's test result showed p-value = $0.000 < 0.05$, confirming the suitability of EFA for the dataset. The analysis identified three extracted factors, with Total Variance Explained (TVE) exceeding 50%, ensuring that these three factors account for a significant portion of variance in the data.

The three factors identified are:

Factor 1 (MAP): Consisting of five observed variables MAP8, MAP13, MAP14, MAP15, MAP19.

Factor 2 (CE): Consisting of four observed variables CE1, CE2, CE3, CE4.

Factor 3 (IT): Consisting of six observed variables IT1, IT2, IT3, IT4, IT5, IT6.

**Table 5 - EFA Analysis Results**

| Pattern Matrix[a] | | | |
|---|---|---|---|
| | Factor | | |
| | 1 | 2 | 3 |
| IT5 | .751 | | |
| IT6 | .749 | | |
| IT3 | .737 | | |
| IT2 | .734 | | |
| IT4 | .704 | | |
| IT1 | .530 | | |
| MAP8 | | .873 | |
| MAP14 | | .751 | |
| MAP19 | | .735 | |
| MAP15 | | .645 | |
| MAP13 | | .625 | |
| CE3 | | | .773 |
| CE4 | | | .769 |
| CE2 | | | .691 |
| CE1 | | | .619 |
| Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. | | | |
| a. Rotation converged in 5 iterations. | | | |

*Source: Author's calculations*

## IV. CONCLUSION

The level of participation in CE and information technology is expected to influence the implementation of MAP in enterprises. The measurement scales for each variable were developed and refined based on a literature review and expert interviews, comprising 39 observed variables. A survey was conducted in Sơn La province with 228 participants, and the scale validation process retained 20 observed variables across the three aforementioned constructs. The research findings serve as a foundation for subsequent analyses, providing further insights into MAP within the context of CE.

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# BIG DATA, BIG DATA ANALYTICS FOR AUDITING ACTIVITIES IN THE CURRENT PERIOD

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**ABSTRACT**

In recent times, big data and big data analytics have achieved some achievements and had a certain impact on business fields, including accounting and auditing. Big data and data analytics bring some benefits, new opportunities and at the same time face many challenges. Therefore, this study was conducted with the desire to provide an overview of big data, big data analytics in financial statement auditing activities. The study uses a systematic document review method and has provided some results according to the objectives. The article mentions the reasons for applying big data, big data analytics; the role of big data, big data analytics in auditing activities and the study also mentions the challenges when applying big data, big data analytics in financial statement auditing

*Keywords*: "Big Data", "Big data analytics", "financial statement auditing".

## I. INTRODUCTION

In the present stage, big data (BD) and big data analytics (BDA) have made significant advances in many fields from business to scientific research (Ajana, 2015). The use of large datasets that can reveal individual or group behavioral patterns along with the promising applications of BDA have attracted the attention of researchers (Mikal et al., 2016). BD promises to solve a number of challenges in the world, and it is prevalent in most disciplines: social sciences, psychology, geography, humanities, and healthcare (Favaretto et al., 2020). Therefore, the accounting and auditing field is no exception when companies must use and manage huge volumes of semi-structured and unstructured data to be innovative, efficient, and competitive (Dagilienė & Klovienė, 2019). Therefore, ICAEW identified big data as the heart of the accounting profession. Big data is expected to be used extensively in business in the future (Hartmann et al., 2016; Li Yan, 2022). Big data can be used to improve efficiency in accounting activities such as management accounting, financial accounting (Warren, 2015) and improve auditing activities (Brown-Liburd & Vasarhelyi, 2015; Iqbal et al., 2020). At the same time, professional organizations have emphasized that BDA can play a major impact in changing audit practices and increasing the quality of financial audits. Similarly, Wang & Cuthbertson (2015) also argued that BD, BDA is of great significance to improving auditing practices. Many studies have been conducted to evaluate the areas of activities related to BD and BDA in auditing (Ajana, 2015; M. G. Alles, 2015; Earley, 2015). Audit firms can use data analytics to reduce the risk of making inappropriate conclusions and gain a better understanding of their clients' business environments (Yoon et al., 2015). Studies (Brown-Liburd & Vasarhelyi, 2015; Dagilienė & Klovienė, 2019; Dubey & Gunasekaran, 2015; Vasarhelyi et al., 2015) acknowledge that the use of BDA can ensure audit quality. The effectiveness and efficiency of financial statement audits are enhanced through the use of BDA (Cao et al., 2015; Gepp et al., 2018; KPMG, 2017; Yoon et al., 2015) and reduce audit risk (Li Yan, 2022). Furthermore, BD, BDA can help auditors comply with auditing standards and increase the overall level of assurance, reducing audit risk by collecting more relevant and complete audit evidence (Moffitt & Vasarhelyi, 2013; Yoon et al., 2015). At the same time, BD also allows auditors to test 100% of the whole, so the audit risk will be reduced to almost zero (Brown-Liburd & Vasarhelyi, 2015). In addition, big data, data analytics and artificial intelligence have enabled accountants and auditors to increase business value, increase revenue and optimize operations (Bose et al., 2023).

Despite these claims, Austin et al. (2021), Gepp et al. (2018) acknowledge that BD and BDA are not yet as widely used as in other business sectors, possibly due to a lack of legitimacy (De Santis & D'Onza, 2021). Studies investigating the motivations for auditing firms to use BDA in auditing practice are limited (Dagilienė & Klovienė, 2019). Therefore, the study needs to answer the question of why it is necessary to apply BD, BDA in auditing activities? What benefits do auditing firms bring when investing in BD, BDA in the process of auditing financial

statements? Therefore, to clarify this issue, the article systematically summarizes articles published in prestigious journals from 2010 to 2023 to answer the above questions.

Although the research perspective is only through a brief review and analysis of previous studies, this study also contributes in the following aspects: (1) providing a comprehensive picture of the relevance of BD and BDA to financial statement auditing activities as well as the impact of BD and BDA on innovation in auditing activities; (2) assessing the role of BD and BDA in the steps of the auditing process in the new period; (3) Commenting on the challenges involved in applying BD and BDA in auditing.

The structure of the article is arranged as follows: Part 1 mentions the introduction for research. Part 2 presents an overview of the research including related background theories, concepts and related studies. Part 3 is the research method and part 4 is the results of the systematization process of related documents. The final part is the conclusion and related challenges when researching big data, big data analytics in auditing financial statements.

## II. DEFINITIONS ABOUT BIG DATA AND BIG DATA ANALYTICS

Big Data : Although the concept of big data has been popularized, the concept is still young and has uncertain origins (Gandomi & Haider, 2015). Ernst & Young (2024) suggested that BD is a huge spatial dimension of structured and unstructured data originating from various sources. Structured data refers to organized information stored in an organization's database, while unstructured data refers to data from unorganized sources such as photos, videos, presentations, social media posts, but makes up 85% of the world's information today (Mills, 2014). Previously, BD had 3 characteristics: volume (large quantity), velocity (high-speed processing), variety (heterogeneous data) (Laney, 2001). According to Gartner, Inc., BD is defined as volume, high-velocity, and diverse information assets that require innovative, cost-effective forms of information processing to enhance insights and decision making. Volume refers to the size of the data and is measured in terabytes, petabytes. A data larger than a terabyte is considered big data and a terabyte stores 1500 CDs or 220 DVDs or about 16 million photos stored on Facebook and a petabyte is equal to 1,024 terapytes. However, the standard of big data volume is relative and varies depending on factors (Gandomi & Haider, 2015). Therefore, the definition of big data also depends on the industry and determining a specific threshold for big data volume is impractical. Variety is the second characteristic of big data. Data is structured, semi-structured and unstructured with the structured portion accounting for only 5% of the total data (Cukier, 2010). Text, images, audio and video are examples of unstructured data while language with XML, a text language for data interchange on the web is semi-structured data (Gandomi & Haider, 2015). In addition, a defining feature of big data is the velocity of data. The increasing popularity of digital devices has led to unprecedented data generation rates, with Wal-Mart processing over a million transactions per hour (Cukier, 2010), so traditional data management systems are not capable of handling such huge data sources instantly. Hence, BD technology comes into play and enables companies to create real-time insights from large volumes of data. However, as larger amounts of data became available, the concept of big data was expanded and developed to include additional dimensions such as authenticity (IBM, 2024); value (Ishwarappa & Anuradha, 2015), variability (Fan & Bifet, 2013) or also comprehensiveness (Mayer-Schönberger, 2013) extensibility (Warren, 2015), and complexity (Perry, 2014).

*Big data analytics* : Big data itself does not provide meaning (Gandomi & Haider, 2015), it only provides value when used for decision making. Therefore, to be able to make decisions based on big data, companies need to have a processing process to transform big data from diverse, constantly changing data into meaningful and valuable data (Gandomi & Haider, 2015). Therefore, BDA can be defined as the processes by which detailed information is collected and processed from operations, financial transactions, and other forms of electronic data within or outside an organization (KPMG, 2017). The three distinct characteristics of data analytics are data, analysis, and presentation of results that provide commercial value (Gantz, 2012). Furthermore, Furthermore, BDA is also the process of visualizing big data and presenting BD through the use of tools and methods to better understand BD (Mikalef et al., 2015). Another definition of big data analytics is the process of examining, cleaning, transforming, and then modeling large amounts of data to discover and communicate useful information for decision making (Cao et al., 2015). Various techniques are used in BDA such as statistical analysis, quantitative methods, explanatory models and extrapolation models to investigate structured and unstructured data to provide useful informationto for decision making. Typically, executives and senior managers apply data analytics to evaluate operational performance or tax professionals analyze

data to detect tax fraud (DaBruzzo, 2013).

BDA techniques for analyzing structured and unstructured data in real time proposed by Gandomi & Haider (2015) include:

– Text analysis: This is a technique for extracting information from text data such as emails, online forums, blogs, social networks, diaries, etc. This technique allows converting large volumes of text into meaningful summaries, supporting decision making (Chung, 2014). Text analysis uses methods such as: (1) information extraction techniques to extract structured data from structured and unstructured text; (2) text summarization techniques to create concise summaries of one or more documents; (3) question answering techniques; (4) sentiment analysis techniques.

– Audio analytics is a technique for analyzing and extracting information from unstructured audio data. Call centers and healthcare are the main application areas of audio analytics. This technique follows two common technological approaches: transcript-based and phonetic-based (Gandomi & Haider, 2015).

– Video analytics is a technique for monitoring, analyzing, and extracting meaningful information from video streams (A. S. Das Abraham, 2010) and is still in its infancy compared to other techniques. According to Manyika et al. (Manyika, 2011), one second of high-definition video is equivalent to 2,000 pages of text, so the huge size of video is a challenge for video analytics. However, big data technology turns this challenge into an opportunity (Gandomi & Haider, 2015) by automatically screening and extracting important information from thousands of hours of video. Therefore, big data technology is a factor contributing to the development of video analytics. Therefore, video analytics is used in automated security and surveillance systems.

– Social media analytics is one of the BDA techniques. This technique uses structured and unstructured data collected from social media channels. Social media is a broad term that includes many online platforms that allow users to create, exchange content and is classified into many different types such as: social networks, blogs, social news, media sharing, social bookmarking, wikis, Q&A sites, etc. Social media analytics is characterized by being data-centric, spanning many fields, including: psychology, sociology, anthropology, computer science, mathematics, physics, and economics.

– Predictive analytics is used to predict future outcomes through the analysis of historical and current data. Predictive analytics uses a variety of techniques to discover data patterns and thereby predict relationships within the data. For example, through linear regression results, it is possible to understand the dependence relationship between outcome variables and explanatory variables and thereby make predictions.

## III. BIG DATA AND BIG DATA ANALYTICS IN FINANCIAL STATEMENT AUDITING

### 3.1. The context of big data analytics in financial statement auditing

The development of auditing technology is considered a technique to improve audit quality (M. K. Power, 2003) so the auditing process has gone through many processes of objectification, formalization and rationalization (Fisher et al., 2002; Newton, 1989). With the risks and economic characteristics of the company, there is pressure to establish many methodologies to promote efficiency and cost savings (Newton, 1989). Previous studies have argued that the introduction of auditing methods such as statistical sampling, audit risk models, business risks ...Matthews (2006) acknowledged that statistical sampling methods in the early 1960s were considered effective in solving the lack of evidence due to evidence collection methods at a time when there was a significant growth in transaction volume. The rise of statistical sampling has provided auditors with the opportunity to legitimize the reduction in the amount of audit evidence. At the same time, the use of confidence levels in statistical sampling applications provides data on which auditors can draw conclusions that are convincing enough to the client (Carpenter & Dirsmith, 1993; Elliott, 1987; Matthews, 2006) as well as protects auditors from potential risks when drawing conclusions (Sully, 1974). Similarly, auditing has evolved with the advent of the audit risk model and then the business risk approach, so the audit process has changed towards increased legitimacy (Curtis & Turley, 2007; Hansen & Messier, 1986; M. Power, 1999; Robson et al., 2007). Typically, in the late 1990s, leading auditing firms made efforts to change the public's perception of the business risk approach as a method of auditing. New methods increase audit efficiency (Curtis & Turley, 2007) and are the best way for auditors to recognize management fraud and business failure risks. Therefore, the application of data analytics in auditing should be understood in the historical context of the desire for audit technology to develop for the

sake of maintaining the legitimacy of the audit function.

Although the development of BDA in the auditing field is still in its early stages, the use of analytics in the auditing process is not a new phenomenon. Audit firms have been using computer-based analytical tools since the early 1960s when firms developed computer-assisted audit techniques (CAAT) in audit sampling (Cushing, 1986) and auditors used 100% automated equipment to evaluate computer processes, software, and hardware (Byrnes et al., 2018). Then in 1990, the Enterprise Resource Planning (ERP) system was introduced, which could combine different databases into one large integrated repository (Rashid, 2002). In the following years, analytical tools such as audit logs (ACLs) became available; Interactive Data Extraction and Analysis (IDEA) is used largely in audit firms. The ACL and IDEA tools may have been the prototypes of BDA, paving the way for current BDA.

According to KPMG's 2014 Transparency Report, Big 4 audit firms have invested significant amounts of money to develop BDA tools through a partnership with technology company McLaren Technology Group to establish a $100 million company to develop data analytics capabilities to significantly change audits and create value for clients. Similarly, EY committed to spending $400 million to develop audit innovation through BDA (Ernst & Young, 2024) . Or as PwC announced that they developed an internal analytics tool Halo to replace ACL and IDEA and Halo will be the tool that uses analytics software and ensures data through algorithms. Meanwhile, smaller audit firms often use existing analytics tools such as Spotlight, Lavatorm and Alteryx to take advantage of BDA capabilities.

In the modern and complex environment where information technology and big data dominate, the evidence auditors collect has changed in nature and capacity (D. Appelbaum, 2016; Warren, 2015). Therefore, PwC stated that big data analytics is changing the way the audit process is performed, auditors have new tools to extract and visualize data, allowing machine learning to access large and non-traditional data sets. Therefore, in response to the above-mentioned developments in auditing methods and practices, recent audit literature reviews reveal some initial assessments of the potential relevance of BDA in auditing, particularly in the areas of risk assessment and performance of analysis and evaluation activities (M. G. Alles, 2015; M. Alles & Gray, 2016; D. Appelbaum, 2016; Cao et al., 2015; Yoon et al., 2015). BDA provides the opportunity for auditors to process various data at a faster pace to provide a visual picture of the risks associated with the entity in order to assess their magnitude (Cao et al., 2015). DBA is seen as a form of evidence that complements traditional evidence that is evaluated according to criteria such as reliability, completeness, relevance, and cost-benefit (Yoon et al., 2015)[14]. At the same time, Yoon et al (2015) study suggests that BDA technology applied in auditing can also be a challenge when a large amount of information can affect the auditor's professional judgment. Earley (2015) acknowledges that BDA used in auditing helps auditors analyze larger amounts of data, detect fraud more easily, and conduct quality audits based on strong evidence. Therefore, BDA creates opportunities to add value to the audit and increase the auditor's confidence (IBR, 2018). However, the ambiguous, overloaded, and difficult-to-navigate nature of information can reduce the benefits of using BDA in auditing, although BDA provides auditors with many different ways to analyze data (Brown-Liburd & Vasarhelyi, 2015). Therefore, there is a need to address the need for BDA to be considered as a formal auditing standard in approved documents to eliminate uncertainty in judgment (Krahel & Titera, 2015). Therefore, auditing regulators at the national and international levels have also acknowledged the potential impacts of big data on auditing activities.

### 3.2. Research methods

To achieve the objectives of the study, the author used a systematic literature review method. This method is a valuable strategy for identifying, evaluating, and synthesizing research data comprehensively to gather a complete picture of related studies to identify the central problem (Cook, 1997; Petticrew, 2008).

According to Agustí & Orta-Pérez (2023), the PRISMA statement addresses the problems of poor reporting in studies using systematic literature reviews. Therefore, PRISMA 2020 is a methodology for identifying, selecting, evaluating, and synthesizing articles (Page et al., 2021) and through this method, the study will explore the benefits, roles, and challenges of using big data analytics in auditing. Therefore, the steps taken in a systematic literature review include (Page et al., 2021): (1) step 1: Identify the research problem; (2) step 2: identify the research question; (3) step 3: identify keywords; (4) step 4: identify and search for documents by keywords; and (5) step 5: read and access publications; and step 6: publish the findings.

Thus, to solve the problems according to the systematic literature review method (Page et al., 2021), the study searched for articles focusing on three important contents: keywords, screening information and meeting the conditions. With the keywords big data analytics, analysis in auditing, future auditing practice, accounting - auditing profession, the study searched for studies related to data analysis in auditing from the websites of prestigious journals. Therefore, the articles must satisfy the criteria:

- Criterion 1: The research must be related to data analytics in auditing.
- Criterion 2: studies published from 2010 to 2024
- Criterion 3: Research in English
- Criterion 4: Research published in prestigious journals with high citation rates.

Therefore, after collecting the initial sample of 116 articles, the author filtered all the archives and deleted 7 duplicate archives. Next, the author briefly read the titles and abstracts and eliminated 11 articles because they did not meet the above 4 criteria (3 articles were not related to data analytics in auditing, 4 articles did not answer the research questions; 2 were published before 2010; and 2 articles were not published in reputable journals). Therefore, the number of articles that fully met the 4 criteria was determined to be 45 articles that were eligible for summary and 53 articles that were not included in the above requirements but could be used to mention the basic theories as well as concepts related to the research problem.

## IV. RESEARCH RESULTS

### 4.1. Reasons for applying big data and big data analytics in financial statement auditing

With the rapid advancement of technology, companies are continuously developing technology to improve their business strategies and daily operations. Among these technologies, big data and big data analytics have become popular in many organizations, from businesses to governments, from science and academia including accounting and auditing (Dagilienė & Klovienė, 2019). Therefore, businesses are also implementing big data to gain more valuable insights into the business processes of the unit. Internal auditors are using BDA to provide better and faster services. According to M. G. Alles (2015) and D. Appelbaum (2016) , external auditors also apply BD and BDA to financial statement audits for two reasons: pressure and opportunity.

(1) Pressure: The first reason why BD and BDA are applied to audit financial statements is external pressure. As the Enterprise Resource Planning (ERP) system evolves the way businesses are run and records are kept, computer-based auditing is no longer an optimal option, and computer-based auditing is a natural choice (M. G. Alles, 2015). With the increasing demands in today's technologically advanced world, auditors must provide more insights, quality, and value to users of financial statements (Ramlukan, 2015). Therefore, auditors must implement BD and BDA into their own audit procedures.

(2) Opportunities: In addition to external pressure forcing auditors to apply BD and BDA to financial statement audit processes, the application of BD and BDA also creates many opportunities. M. Alles & Gray (2016) believe that when auditors use BD and BDA, the audit will be more effective and of higher quality, and the value of BD and BDA will be clearly understood. When using BD and BDA, the possibility of errors can be reduced because auditors can analyze evidence more carefully (Larcker & Zakolyukina, 2012; Yoon et al., 2015). The use of BDA helps detect unusual transactions, reduces false positive results, and thus increases audit efficiency (Cao et al., 2015).

The application of BDA in financial statement audits not only maximizes the efficiency of audit activities but also involves human factors (IBR, 2018). When applying BDA to audits, the automation of the audit process has increased, so auditors have more time to focus on audit procedures, focus more on complex operations, and on risk areas. Moreover, the automation process thanks to the integration of BDA helps auditors have time to focus on judgments and analysis, creating time to focus on other aspects of the client's business operations.

### 4.2. The role of BD and BDA in financial statement audit

The way businesses are run is being transformed to become more agile, customer-oriented and efficient with the use of big data (Rydning, 2018) and big data analytics is also recognized as a potential tool that can transform the way financial statement audits are conducted more effectively (Arnold, 2018; Gepp et al., 2018; Krahel & Titera, 2015;

Zhang et al., 2015). The discrepancy between diverse accounting and reporting standards is eliminated with the help of BDA (Warren, 2015). The use of BDA to improve the auditing process is a convergence of significant advances in data science, increased computing power and access to large amounts of data and information. Stewart (2015) argues that such convergence has created a favorable environment for the adoption of BDA, stimulating transformation in the auditing industry.

For the pre-audit stage, auditors can use text mining techniques to examine press releases and social media posts to assess the reputation of potential clients and their leaders. At the same time, in this stage, auditors can use clustering techniques to compare the financial statements of potential clients with those of companies in the same industry to get a preliminary assessment of the financial situation of potential clients and from there can make a decision whether to accept the client or not (D. A. Appelbaum et al., 2018; Rose et al., 2017). Furthermore, auditors can use BDA techniques to estimate audit fees (De Santis & D'Onza, 2021).

During the audit planning stage, BDA tools with clustering techniques, descriptive analysis and regression techniques replace traditional analysis techniques to obtain a detailed visual image of the client's business environment to assess related risks and determine overall materiality as well as determine implementation materiality (Cao et al., 2015; Earley, 2015). In addition, using BDA helps audit firms better understand the client's business environment, thereby reducing the risk of making incorrect conclusions (Balios et al., 2020).

During the audit implementation phase, BDA is used to evaluate the internal control system. According to Jans et al (2013) process mining tools can be used to conduct compliance checks on control procedures and can detect deviations from the issued control procedures. BDA contributes to expanding the scope of the audit (Dai & Vasarhelyi, 2016). The use of BDA allows auditors to automate the audit of transactions, the entire audited data, or in other words, the entire audit population and the visualization analysis of the entire transaction to detect anomalies (Brown-Liburd & Vasarhelyi, 2015; Capriotti, 2014); Outlier detection should provide sufficient, relevant, and real-time evidence thus providing more opportunities for auditors to detect accounting fraud and errors (Cao et al., 2015; Gamage, 2016; Gray & Debreceny, 2014; Lin et al., 2015; Yoon et al., 2015).

In addition, the BDA tool enhances audit activities, supporting the identification and assessment of audit risks including bankruptcy risks and financial reporting risks (Cao et al., 2015). Furthermore, BDA provides the potential for continuous auditing. Continuous auditing is considered useful to ensure continuous monitoring and ensure continuous data (M. Alles et al., 2006). At the same time, automated internal audit processes at companies allow them to save costs, conduct frequent audits, and reduce the involvement of independent auditors (M. G. Alles et al., 2002; Balios et al., 2020).

In addition to the view of considering the impact of BDA on the audit process at each stage, Yoon et al (2015) believes that a successful audit must meet two factors: "adequacy and relevance". Meanwhile, big data provides rich information in many forms and in large quantities (Russom, 2011). Big data is more reliable and relevant than data from traditional sources, so it meets the relevance requirement (Russom, 2011; Yoon et al., 2015). Moreover, some big data can also contribute to assessing the reliability of information from traditional audits (Dhillon & Modha, 2001) . Big data can provide important non-financial evidence to assess the financial situation of a typical entity such as information on social networks mentioning negative comments about a product but the sales of that product on the financial report are quite good, it can be an abnormal sign (Yoon et al., 2015). Similarly, relevance is also a requirement related to suitability. In a global financial environment with new business models such as e-commerce, big data can be a useful evidence (Yoon et al., 2015) and big data provides independent, timely evidence so they become relevant (Cao et al., 2015). BDA can be used to evaluate different types of businesses and can also evaluate different forms of evidence.

Thus, BD and BDA with their diverse tools have made great contributions in all stages of auditing activities, contributing to increasing audit quality through continuous auditing, risk assessment and detecting abnormalities when checking 100% of the whole.

**4.3. Auditing challenges when applying BD and BDA in financial statement auditing**

*(a) Challenges in information processing* : M. Alles & Gray (2016) acknowledge that BD transforms structured data into unstructured data, from financial data to non-financial data, and from data obtained from within the enterprise

to data from external sources. This shows that auditors face the challenge of processing external data whose reliability and relevance are difficult to ensure. The completeness and accuracy of data obtained from third parties are also difficult to ensure (IAASB, 2016), which is in contrast to the traditional method of data collection because evidence obtained from third parties is often highly reliable. The development of BD as well as the completely computerized auditing has led to doubts about the authenticity and origin of data (D. Appelbaum et al., 2017; Rydning, 2018). Therefore, IAASB (2016) believes that auditors when using external data need to satisfy: (1) The audit evidence obtained is accurate and complete; (2) the information must be accurate and detailed for the auditor's purposes. For big data, auditors need to collect, extract, and process information in a useful way from the data warehouse, and this creates new challenges in information processing such as: information overload, relevance, pattern recognition, and privacy and security issues.

Although BDA allows for the extraction of large volumes of data, it is difficult to analyze and process a large amount of information (Brown-Liburd & Vasarhelyi, 2015). Auditors find it difficult to track every error finding (Krahel & Titera, 2015), hindering the identification of fraud (D. Appelbaum et al., 2017) if the information is overloaded. Similarly, the increased volume of information can make it difficult for auditors to distinguish patterns, leading auditors to spend significant time investigating irrelevant or ineffective information (Brown-Liburd & Vasarhelyi, 2015; Rose et al., 2017). At the same time, BD includes both structured and unstructured data, financial and non-financial data where auditors only use financial and structured data when forming opinion on the financial statements. Because it may be impossible for the auditor to separate relevant data from irrelevant data, whether internal or external (Brown-Liburd & Vasarhelyi, 2015).

Furthermore, there is a concern about security and privacy due to the availability of big data (Cao et al., 2015). M. G. Alles (2015) argue that auditors must ensure the confidentiality of sensitive information that needs to be protected related to customers such as complaints, proprietary information in the supply chain, employee data, customer data, health care records. Meanwhile, according to the law of a country, certain data may be prohibited from leaving the jurisdiction of an entity (IAASB, 2016). Therefore, this is also a challenge for auditors when auditors need to transfer data to a location that is outside the jurisdiction of an entity. Therefore,Dai & Vasarhelyi (2016) propose solutions to create a strict policy for data security, encrypt sensitive information, use secure channels to communicate information, and assess security and privacy risks over time.

*(b) Challenges due to technological changes* **:** this is also a challenge when applying BD, BDA to auditing. Technology in auditing procedures needs to be adjusted to suit the change of big data (Yoon et al., 2015). Two issues related to technological changes: BDA tools and audit scope.

*Changes in audit tools* : Audit tools have changed from the initial stages of stage 1.0 with pencil and abacus to the current stage 4.0 (Dai & Vasarhelyi, 2016). According to Dai & Vasarhelyi (2016) four generations of audit using different tools are illustrated in the table 1

**Table 1: Stages of development of auditing**

| **Audit 1.0** | **Audit 2.0** | **The generations of the Audit Audit 3.0** | **Audit 4.0** |
|---|---|---|---|
| **Manual audit Tools: pencils, calculators** | IT audit Tools: Excel, CAAt software | Inclusion of Big Data in audit analytics Tools: analytical apps | Semi – and progressive automation of audit Tools: sensors, CPS, IoT/IoS, RFID, GPS |

*Source: from Dai et al., (2016)*

In the audit phase 1.0, the main tools used for auditing activities were pencils and spreadsheets. In the audit phase 2.0, two tools, Excel software and CAAT, were used in auditing financial statements. CAAT is all the techniques and support tools that allow auditors to access and view system data or software operations using their own computers. CAAT includes features specifically designed for auditors with the characteristics of not modifying source data, all commands can be tracked and repeated, and used for all data, even in text format (DeKroon, 2013). Meanwhile, audit 3.0 uses advanced technologies such as data mining. Data mining uses various techniques to search through large amounts of data to identify unknown information, unknown patterns, and unknown relationships; build predictive

models (Gray & Debreceny, 2014). Data mining techniques help auditors analyze external data to assess business risks, fraud risks, internal controls, and business continuity (Brown-Liburd & Vasarhelyi, 2015) with tools such as Excel, IDEA, ACL, and SAS. These tools are also commonly used for BDA, but auditors must have controls and follow a certain process to ensure proper operation with controlled changes (IAASB, 2016). The final stage – audit 4.0 stage is the semi-automated or automated audit stage. In this stage, auditors use sensors, GPS systems, and the Internet of Things (IoT) during the audit process.

*Changing sampling methods:* Auditors traditionally access historical data and test it once a year, and this approach is considered completely obsolete with the advancement in CAAT computer software (Byrnes et al., 2018). CAAT supports the analysis of the entire population (D. Appelbaum et al., 2017), leading to the collection of more relevant and higher quality evidence, thus providing professional confidence to auditors (Ramlukan, 2015). However, analyzing the entire population is a challenge for auditors because it can negatively impact audit procedures (AICPA, 2015). For example, during a comprehensive audit of the entire population to search for unusual transactions and operations, the results of collecting a large number of unusual and outlier points can discourage the auditor from analyzing and processing a large volume of unusual points at the beginning (AICPA, 2015). At the same time, this leads to even more judgment and professional skepticism than with non-100% comprehensive audit techniques.

*(c) Challenges related to regulations*

M. G. Alles (2015) argues that regulations and standards have not been established for data analytics in financial statement auditing although current standards do not restrict the implementation of data analytics in auditing. A pressing issue today is that there is no specific law for the use of data analytics (Dubey et al., 2018). Current standards do not provide clear guidance on how to use BDA to conduct audits (M. G. Alles, 2015), (Cao et al., 2015) and improve audit quality. The lack of standards will negatively affect the legitimacy of using BDA in auditing (De Santis & D'Onza, 2021). The promulgation of standards and laws can take time, limiting the willingness to use BDA and potentially reducing the growth of big data in auditing (Manson et al., 2007).

## V. CONCLUSION

With the aim of assessing the impact of big data and big data analytics on auditing activities in the new trend, the study through a systematic review of documents has drawn important conclusions. The study emphasizes that BD and BDA make great contributions to the stages of auditing activities, contributing to increasing audit quality through continuous auditing, risk assessment and detecting abnormalities when checking 100% of the whole. In addition, the study also mentions the challenges related to information processing, technology and regulations when applying BD and BDA in auditing financial statements.

Although the study used a systematic overview method to achieve the set objectives, the study still could not make more general comments on other aspects related to BD, BDA in financial statement auditing. Therefore, future studies can consider additional issues that have not been mentioned when studying the impact of BD, BDA in financial statement auditing such as political institutions, characteristics of auditing companies, leaders' perspectives, etc.

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# RISK SPILLOVER BETWEEN BITCOIN AND TRADITIONAL STOCK MARKET: EMPIRICAL EVIDENCE FROM EMERGING MARKET INDEX

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**ABSTRACT**

This paper investigates the dynamic volatility transmission between the emerging stock index and Bitcoin by applying the multivariate BEKK-GARCH and DCC-GARCH models. For this purpose, I collect the daily data from Bitcoin and Morgan Stanley Capital International (MSCI) Emerging Markets Index covering the period from January 2017 to November 2024, including the COVID-19 outbreak and the recent Ukraine-Russia war. Before and during the coronavirus pandemic, the results provided compelling evidence of the existence of the unidirectional spillover effect from the emerging traditional equity market to the crypto market; however, the transmission is mostly found in the long term. On the other hand, for the Ukraine-Russia war subperiod, most element estimations are insignificant statistically, which emphasizes the safe-haven property of Bitcoin to emerging equity. These research implications are useful for investors interested in investing in the two markets and for public and regulatory authorities concerned about the fluctuation of Bitcoin and its potential spillover into the traditional investment market.

*Keywords*: "Bitcoin", "cryptocurrency", "emerging market index", "volatility spillover".

## I. INTRODUCTION

Cryptocurrency is likely to be a financial market innovation and has arguably reformed the conventional sector. According to Nakamoto (2008), in a whitepaper titled "Bitcoin: A Peer-to-Peer Electronic Cash System", cryptocurrencies are attributed to an alternative means of exchange to fiat currency within the electronic transaction system, but more commonly serve as a financial instrument. Conceptually, both the Bitcoin and traditional equity markets involve trading financial instruments and facilitate the transactions between those with excess capital and those who need capital. However, the centralized traditional funding system is opposite to the cryptocurrency trading system, which is mostly decentralized and aims to support crowdfunding at a cheaper transaction cost (Ghorbel et al., 2012). This situation indicates that capital circulation can go beyond the control of the government and other regulatory authorities (Halaburda et al., 2020). All these above-mentioned features lead to cryptocurrencies' rapid growth in trading volume, prices, and volatility (Corbet et al., 2019).

Cryptocurrencies' uncertainty could threaten the whole financial system, which may be also harmful to the world economy, given interdependence with conventional assets and the surge in their trading volume led by Bitcoin (International Monetary Fund, 2022). This paper aims to investigate the interconnectedness between Bitcoin and stock in emerging markets, because of the growing popularity of cryptocurrency in emerging countries. As a matter of fact, a recent report by Chainanalysis indicates that eighteen of the top twenty in the 2024 Global Crypto Adoption Index (CAI) are emerging countries. In other words, emerging markets rank above advanced markets regarding cryptocurrency adoption, thus the former have higher exposure to cryptocurrency risk. As a result, financial investors must be concerned about hedging emerging market risks to maintain global financial stability. For the sake of coherence, the literature review can be divided into two specific aspects. The first focuses on identifying the evidence of whether Bitcoin is a diversifier, hedger, or safe haven against other financial systems. The second strand of literature investigates the spillover effect between Bitcoin and stock markets.

**Diversification, Hedging, and Safe Haven Roles of Bitcoin for Traditional Financial Market**

Investors naturally want to manage the risk of their investment portfolio through diversification. Conventional emerging and developed markets have become substantially interdependent in the last twenty years (see Arouri et al., 2012; Narayan et al., 2014; Aftab et al., 2021). Bitcoin is considered as an alternative financial instrument against equity, which comes from the fact that the changing returns volatility of Bitcoin and the equity market facilitates the use

of Bitcoin as a potential diversifier (Bouri et al., 2020). A variety of studies like Okorie and Lin (2020); Majdoub et al. (2021); Kozak and Gajdek (2021); and Lavelle et al. (2021) determine the diversification property of Bitcoin for the investment portfolio of stock and other financial instruments, as return of Bitcoin have low but positive correlation with that of traditional assets. Likewise, Sebastian and Alenka (2020) employ the Pearson correlation coefficient to document the interconnection of leading cryptocurrencies with the confirmation of the effective diversification role of cryptocurrency in decreasing the risk of a portfolio. On the other hand, a study carried out by Iyer (2022) reveals that the correlation between the two markets of Bitcoin and equity assets is initially low, but has witnessed a rapid growth of 20% which makes it difficult to consider cryptocurrency as a diversifier.

There is also a rising strand of literature examining Bitcoin's hedging and safe haven properties rather than diversification role, but the results differ from study to study. For example, before the recent COVID-19 pandemic, using US stock data, Baur et al. (2018) conclude that Bitcoin is neither a safe haven nor a hedging tool against fiat currencies. Similarly, the studies by Conlon and McGee (2020) and Prichat et al. (2023) confirm that during the crisis outbreak, Bitcoin's price dropped dramatically in the same direction with the stock price, thus rejecting the existence of safe haven role of Bitcoin, and its inclusion in an investment portfolio increase the downside risk. This supports the findings of Lavelle et al. (2021) who estimate the interconnectedness between the aggregate cryptocurrency market and other traditional assets like stocks, bonds, commodities, real estate, gold, and the US dollar during the pandemic. They derive the conclusion that there is no evidence confirming a strong or weak safe haven for cryptocurrency. On the other hand, despite Bitcoin's extreme volatility, portfolio managers have considered this cryptocurrency as an investable asset given the ability to offer a high rate of return (Ji et al., 2019). Besides that, a considerable amount of research in 2020 has been carried out in the context of the US market with the S&P 500 index. Studies by Bouri et al. (2020a, 2020b, 2020c, 2020d, 2020e) and Mariana et al. (2020) attempt to analyze various types of cryptocurrency and come up with different results. While Bouri et al. conclude that Bitcoin presents safe haven role, Mariana et al. discover that both Bitcoin and Ethereum act as haven instruments in the short run, with Ethereum being a better hedger than Bitcoin. These contradictory findings lead to doubt surrounding Bitcoin's financial role, which requires further investigation to refine the conclusion.

**Spillover effect between Bitcoin and stock markets**

Various studies have dwelt on validating the degree of transmission between Bitcoin and equity in different methodologies and contexts. However, a significant number of different conclusions have to be presented. Zhang et al. (2018) find an insignificant bidirectional spillover effect between Bitcoin and the Dow Jones Industrial Average. Likewise, after utilizing the multivariate GARCH for Bitcoin, Ripple, and G20 equity markets, Omane-Adjepong and Alagidede (2020) argue that the two cryptocurrencies are unrelated to stock market indices. At about the same time, Bouri et al. (2020a) apply the wavelet analysis to investigate the financial dependence between Bitcoin, commodity index and gold, and the developed and emerging stock indices. One of their empirical results provides an insignificant stock market dependence on Bitcoin.

However, Ünvan (2021) investigates the bidirectional financial contagion between Bitcoin and Japan, Turkey, China, and the USA's stock indices covering weekly data from 2016-2018 using Granger causality estimation. The findings indicate that only two-way dependence was found between Bitcoin and Borsa Istanbul 100 (BIST 100). Moreover, Jiang et al. (2021) examine the cross-correlations between six developed and emerging markets and major cryptocurrencies through a generalized orthogonal GARCH model over the period 2015-2020. The study finds that Bitcoin negatively influences the equity market indices and the relationship is also held in reverse.

On the other hand, other studies well pronounce the asymmetric spillover from cryptocurrency to conventional assets in different contexts. For example, Hsu et al. (2021) and Umar et al. (2021) conclude that a moderate information flow was found from Bitcoin to global equities under different economic conditions. On the other hand, Symitsi et al. (2018) and Bouri et al.(2020) confirm a unidirectional spillover effect from traditional assets to Bitcoin rather than a financial outbreak transmission from Bitcoin to conventional equity. Similarly, Asafo-Adjei et al. (2021) find that returns of global equities are negatively affected by those of cryptocurrencies.

Within the context of emerging stock markets, a number of empirical studies conducted focus on specific regions.

For example, after using the GARCH model covering daily data from 2010 to 2017, Bouri et al. (2019) find a state-dependent time-varying link between the emerging equity markets and the Bitcoin market. Likewise, in a multidimensional study, Mensi et al. (2019) analyze financial contagion between Bitcoin and twelve Middle East and North Africa (MENA) stock markets for the 2014-2017 period. Their empirical results show a lingering relation between stock market indices and Bitcoin. In a different setting, Azza et al. (2023) present compelling evidence of dynamic interdependence between Gulf stock market indices and digital assets, especially during health and geopolitical turbulence. Furthermore, several studies have been conducted in the context of ASEAN equity markets (see Mand and Thaker, 2020; Karim et al., 2021; Parichat et al., 2023). Their results confirm a significant volatility spillover between ASEAN stocks and Bitcoin returns in both directions.

Nonetheless, despite the extensive works on emerging economies done, those studies mainly tackle the issue within geographic regions, and thus the investigation of whole emerging economies remains relatively under-explored. After using DCC-GARCH estimation, a study by Bouri et al. (2018) confirms asymmetric spillover effects between returns of BTC and MSCI emerging market index in both bullish and bearish markets from 2010 to 2017. Later, enriching the literature regarding the contagion between BTC and emerging market index, Iyer (2022) uses VAR and finds the growing volatility transmission between the pre-COVID and post-COVID periods from 2017 to 2021. Overall, there is a lack of literature focusing on the overall emerging stock index, especially with the inclusion of the Ukraine-Russia war.

This study intends to examine the interconnectedness between Bitcoin and the emerging stock index, which then indicates whether Bitcoin can be utilized as a hedge for investment risks in emerging markets and how extreme events like the COVID-19 pandemic and the Ukraine-Russia war affect its hedging capacity.

Overall, this present study contributes in two ways to the extant academic debate about the cryptocurrency market and financial contagion. The first novelty is an analysis of the integration between Bitcoin and MSCI emerging stock market index and the degree of dynamics volatility spillover effect between them. To the best of my knowledge, most previous studies accounted for dynamic linkages between Bitcoin and stock market indices at the country level. Therefore, this study's purpose is to fill the gap by examining the index representing the whole emerging countries. Secondly, our sample data covers the period from the first of January 2016 till November 2024, witnessing shocks of the Covid-19 crisis and the ongoing Russia- Ukraine War that led to economic uncertainty and financial markets turbulences (Gupta et al., 2021; Shahzad et al., 2021). In fact, despite a few works for economic break covering the period before and after COVID-19 and immense rationales put forward (Abakah et al., 2020; Ji et al., 2018; Balcilar et al., 2022; Parichat et al., 2023), the Russia- Ukraine war does not draw sufficient attention. Therefore, this paper tackles structural breaks caused by these two extreme financial disruption events, which hit the market since Bitcoin was launched. As a result, we will determine whether Bitcoin could effectively serve as a diversifier against conventional assets, more particularly, stocks in emerging countries region (Akhtaruzzaman et al., 2021; Conlon & McGee, 2020; Conlon et al., 2020; Corbet et al., 2020; Maasoumi & Wu, 2021; Yoshino et al., 2021).

The rest of this paper is structured into 3 sections. Section 2 " Material and Methodology" presents the data sample and model and research approach of analysis. The empirical results and further discussion are stated in Section 3 "Result and Discussion" section. The last section concludes the research paper and contextualizes the policy implications, followed by references.

## II. MATERIAL AND METHODOLOGY

### 2.1. Data and sources

This study selects the daily data of Morgan Stanley Capital International Emerging Markets Index (EM). MSCI Emerging Market Index is a capitalization-weighted index made up of 23 emerging country indices in the MSCI classification. The index is adopted because it represents overall emerging stock market performance, thus ensuring the generalizability of research. I source the data of daily EM from the MSCI website (https://www.msci.com/), and the prices of Bitcoin (BTC) extracted from the Coin Market Cap website (https://coinmarketcap.com/). The coinmarketcap should be used by scholars as a cryptocurrency data source, as stated in the study by D. Vidal-Tomas (2022), which results from the consistency between its data and main exchange platforms. Following Kumar et al. (2022) and Bouri et

al. (2021), this paper examines daily frequency data to obtain sufficient observations, which derives deeper and more reliable empirical results.

The sample period covers from January 1st, 2017 to November 25th, 2024. This yields a total of 2061 time series observations. The sample period is selected based on the fact that by January 2017, the market capitalization and price of Bitcoin witnessed insignificant fluctuation (Joseph et al., 2024). Furthermore, to investigate the effect of two major outbreaks of COVID-19 and Russia-Ukraine war, this study splits the data into three subperiods: The pre-COVID-19 period (January 1st, 2017 to December 30th, 2019), the post-COVID-19 period (December 31st, 2019 to February 23rd, 2022), beginning on the day of the first case of COVID-19 being reported in China, and the Ukraine-Russia war (February 24th, 2022 to November 25th, 2024), starting on the day when Russian military forces entered the country from Belarus, Russia and Crimea.

The daily closing prices of the index and the Bitcoin (BTC) are used as sample data. The data spans 5 days a week (Monday to Friday) excluding weekends when the stock market is closed. This paper examines the fluctuation of the two markets, taking the daily rate of return as the inspection time series variable. As stated in a paper by Mensi et al. (2020), the measure of the daily rate of return is defined as follows:

The return in period t, $R_t = \ln(P_t) - \ln(P_{t-1})$ (1)

where $R_t$ is daily returns for day t, $P_t$ and $P_{t-1}$ are daily closing prices for day t and t-1, and ln is natural logarithm.

**Data description**

Table 1 reports some descriptive statistics and preliminary tests related to the daily returns under three subperiods. It is worth noting that, the mean daily returns of both the MSCI Emerging Markets (EM) Index and Bitcoin (BTC) present positive values before the COVID-19 pandemic and then increase with the outbreak of COVID-19. Nevertheless, during the stage of the Russia-Ukraine war, the mean index returns of both assets drop dramatically, with the average return of the EM index becoming negative. This clearly shows the homogeneous reaction between the emerging stock market and the Bitcoin market to the different unprecedented health and political crises. The negatively skewed return distribution of both the BTC and EM index implies recurrent small wins and a few large losses during turbulent periods. With the positive kurtosis being larger than that of a normal distribution in all sub-periods, the time series of daily return have leptokurtic distribution. In other words, the investor can experience broader fluctuations. The null hypothesis that data for all series are normally distributed is rejected by the Jarque–Bera test. A unit root is not present in all samples given that the Augmented Dickey-Fuller (ADF) test and the Phillips–Perron (PP) test statistics are significant at a 1% level.

Figure 1 shows the price volatility in the price of Bitcoin, MSCI EM index. Up until 2020, Bitcoin prices remain stable. In the advent of COVID-19, the price of BTC increased sharply and hit the highest point at the end of 2021. After the Ukraine-Russia war began, BTC witnessed a drop to the bottom in 2022, followed by significant growth given that the price continues pushing boundaries. Regarding the stock index, during the reporting period, there were notable movements. However, in 2024, unlike BTC, the EM index keeps fluctuating around 1200. A return series is revealed in Figure 2, clearly capturing the volatility clustering, which refers to the phenomenon that high volatility tends to be followed by high volatility. This characteristic advocates the use of GARCH models to investigate the dynamic conditional volatility of the return series accurately. Moreover, in line with the findings of Joseph et al. (2022), Fig. 2 and Table 1 also plot the evidence of higher volatility witnessed in the Bitcoin market compared to the stock market.

**Table 1. Descriptive statistics of daily returns.**

| | Pre-COVID-19 period | | COVID-19 period | | Ukraine-Russia war period | |
|---|---|---|---|---|---|---|
| | DEM | DBTC | DEM | DBTC | DEM | DBTC |
| Mean | 0.0003 | 0.0026 | 0.0001 | 0.0029 | -0.0001 | 0.0013 |
| Median | 0.0008 | 0.0026 | 0.0022 | 0.0023 | 0.0007 | -0.0005 |
| Maximum | 0.0262 | 0.2251 | 0.0557 | 0.1915 | 0.0515 | 0.1812 |
| Minimum | -0.032 | -0.2387 | -0.0694 | -0.4647 | -0.044 | -0.2572 |
| Std. Dev. | 0.0077 | 0.0497 | 0.0122 | 0.0477 | 0.0101 | 0.0351 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Skewness | -0.392*** | 0.0026 | -0.9349*** | -1.7127*** | 0.0537 | -0.4344*** |
| Kurtosis | 1.2169*** | 3.3076 *** | 6.3786*** | 17.2459*** | 2.7493*** | 7.1703*** |
| Jarque-Bera | 68.27*** | 356.01*** | 1034.61*** | 7239.34*** | 226.47*** | 1560.69*** |
| Observations | 781 | 781 | 562 | 562 | 718 | 718 |
| ADF | -23.44*** | -27.14*** | -22.78*** | -25.38*** | -25.77*** | -26.99*** |
| PP | -23.55*** | -27.19*** | -22.92*** | -25.36*** | -25.79*** | -27.04*** |

*Note: DEM and DBTC refer to the MSCI Emerging Markets Index daily return and BTC daily return, respectively.*

**** denotes the statistical significance at a 1% level*

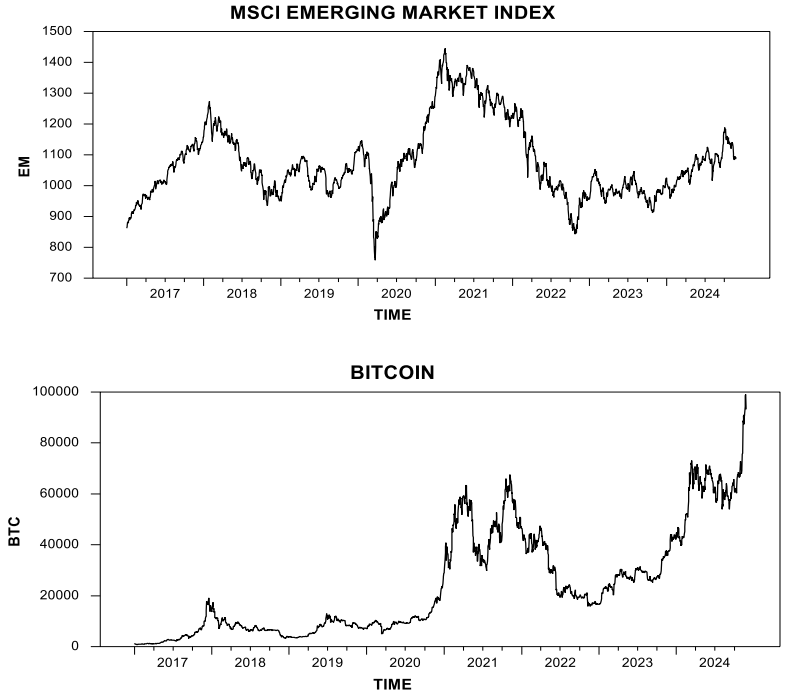



**Figure 1. Prices dynamics of Bitcoin and Emerging Market Index**

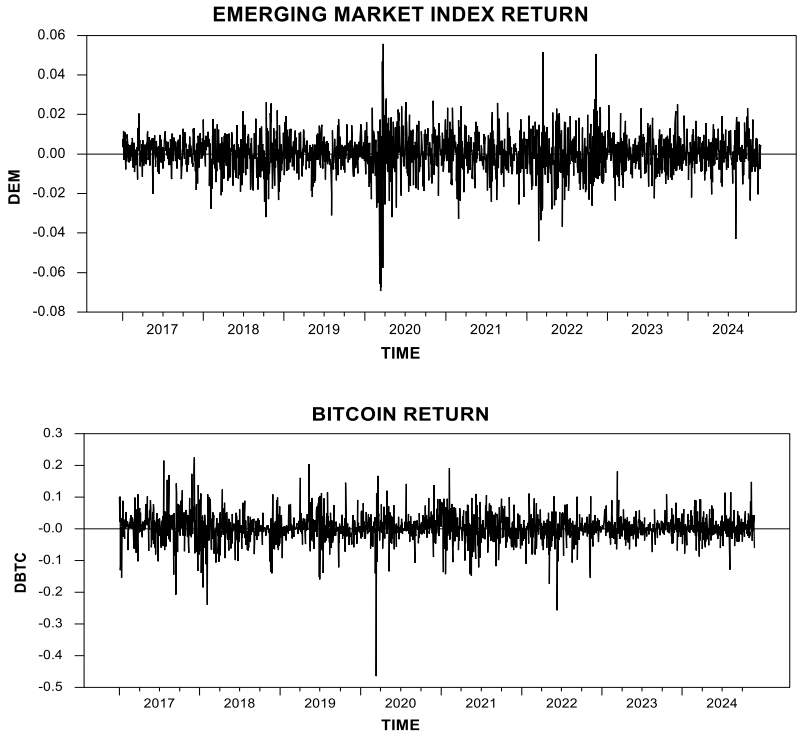



**Figure 2. Returns of Bitcoin and Emerging Market Index**

### 2.2. Model and research approach

#### 2.2.1. BEKK-GARCH model

The primary purpose of this paper is to investigate whether Bitcoin may act as a diversifier for Vietnam stock markets and/or a safe haven for investors during stock market turmoil, which needs to be analyzed by an appropriate model to capture the volatility transmission between Bitcoin and Vietnam stock market. For this aim, the two most widely used multivariate estimation techniques of conditional and dynamic covariances and correlations between different assets are BEKK-GARCH (Baba, Engle, Kraft, and Kroner) and DCC-GARCH (Dynamic Conditional Correlation GARCH) model, first used by Engle and Kroner (1995) and Engle (2002), respectively. These models also capture the volatility clustering of time-series return of assets as a univariate model. Some of the recent papers mention a pertinent question: which model outperforms in estimation, DCC-GARCH or BEKK? with inconclusive debate. Huang et al. (2010) report the superiority of the BEKK model thanks to the goodness of fit, which comes from the larger number of estimated parameters. Regarding computational complexity, the paper of Caporin and MacAleer (2012) indicates that constraints imposed in the DCC model with "targeting" are similar to those in the Scalar BEKK model. The "targeting" is defined as a tool to reduce substantially the number of coefficients estimated and applied to both BEKK and DCC. Therefore, to gain a better result, the bivariate BEKK approach is employed in this study.

The simplest BEKK class with both ARCH and GARCH lag set to 1 is given below:

$$H_t = C^T C + A^T y_{t-1} y_{t-1}^T A + B^T H_{t-1} B \quad (2)$$

where $H_t$ denotes the multivariate conditional variance-covariance matrix, $y_{t-1}$ denotes the matrix of the error term with t-1 time dimension, and C, A, and B are coefficient matrices represented as:

$$C = \begin{bmatrix} c_{11} & 0 \\ c_{21} & c_{22} \end{bmatrix}, A = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix}, B = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \quad (3)$$

where C is a lower triangular matrix of constants, whereas A and B are 2x2 parameter matrices.

While the coefficient $\alpha_{11}$ and $\alpha_{22}$ capture the effect of lagged shock on the current conditional volatility of the respective market returns, the coefficient $\beta_{11}$ and $\beta_{22}$ capture the dependence of the current volatility and its lagged value. Furthermore, $\alpha_{12}$ and $\alpha_{21}$ represent the spillover effect of shock news between two assets, while $\beta_{12}$ and $\beta_{21}$ describe the information regarding volatility co-movement between two assets.

The maximum likelihood of the BEKK model is calculated using the BFGS (Broyden- Fletcher-Goldfarb-Shanno) algorithm with an assumption of generalized error distribution of residuals. The conditional covariance $h_{12,t}$ between the return of Bitcoin and EM index ($r_1$ and $r_2$) can be calculated as in Eq. (4):

$$h_{12,t} = \tilde{c}_{12} + \alpha_{11}\alpha_{22} y_{1,t-1} y_{2,t-1} + \beta_{11}\beta_{22} h_{12,t-1} \quad (4)$$

where $\tilde{c}_{12}$ represents element of $C^T C$ matrix.

Finally, the correlation between two time-series variables is indirectly given as

$$r_{12,t} = h_{12,t} / \sqrt{h_{11,t} h_{22,t}}$$

#### 2.2.2. DCC-GARCH model

In contrast with Huang et al. (2010), Bauwens et al. (2006) and Katsiampa et al. (2022) report that DCC is preferred to BEKK because the latter suffers from the curse of dimensionality given that the number of parameters in BEKK increases exponentially associated with more variables. Therefore, following a recent study on the level of spill-over effect between cryptocurrency and stock markets, this paper employs the DCC model to come up with a dynamic correlation (following: Wang et al. 2021, Ali et al. 2021, 2022; Parichat et al. 2023, Joseph et al. 2024).

The DCC-GARCH process includes two-stage regression. The first step empirically analyze the single GARCH(1,1) equation. Let the return in Bitcoin and Vietnam stock market be ($r_{1,t}$) and ($r_{2,t}$), respectively. Let $r_t$ be a 2x1 vector of log return at time t such that $r_t = (r_{1,t}, r_{2,t})^T$. Thus, the GARCH(1,1) is expressed as follows:

$$r_t = \mu_t + y_t \quad (5)$$

$$y_t = h_t^{1/2} \varepsilon_t \quad (6)$$

$$y_t \mid \psi_{t-1} \sim N(0, h_t)$$

$$h_{i,t} = \gamma_{i0} + \gamma_{i1} y_{i,t-1}^2 + \gamma_{i2} h_{i,t-1} \quad (7)$$

where μt is the expected value of the conditional mean of the market return (rt), yt is the error terms vector, $\varepsilon_t$ is the vector of standardized residual, ψt-1 is the information set at time t-1, and ht is conditional variance of yt

The second step estimates the parameters driving DCC-GARCH process:

$$H_t = D_t R_t D_t \quad (8)$$

where $H_t$ is conditional variance matrix of return, $D_t$ is diagonal matrix of conditional standard deviation of fitted univariate GARCH model of each asset, s.t. Dt = [diagonal·$(h_t)$]$^{1/2}$. Similarly, $R_t$ is a 2*2 matrix of conditional correlation between 2 assets.

$R_t$ is on the form:

$$R_t = \begin{bmatrix} 1 & \rho_{12t} \\ \rho_{21t} & 1 \end{bmatrix} \quad (9)$$

Further, Rt can be expressed as in Eq. (10).

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1} \quad (10)$$

where $Q_t$ denotes a matrix of time-varying conditional variance-covariances of error terms, and $Q_t^{*-1}$ denotes the inverted matrix of diagonal element square root of $Q_t$, thus is given as:

$$Q_t^{*-1} = \begin{bmatrix} 1/\sqrt{q_{11t}} & 0 \\ 0 & 1/\sqrt{q_{22t}} \end{bmatrix} \quad (11)$$

Thus, the process of DCC-GARCH is illustrated as in Eq. (12)

$$Q_t = (1 - \alpha - \beta)\bar{Q} + \alpha \varepsilon_{t-1} \varepsilon_{t-1}^T + \beta Q_{t-1} \quad (12)$$

where α and β are non-negative DCC-GARCH parameters to ensure positive definitive requirement of $R_t$ with α + β <1, and $\bar{Q}$ represents unconditional variance matrix of $y_t$.

Therefore, the DCC conditional correlation is estimated as in Eq. (13):

$$\rho_{12,t} = q_{12,t} / \sqrt{q_{11,t} q_{22,t}} \quad (13)$$

**2.2.3. Diagnostic tests**

**2.2.3.1. Univariate model diagnostics**

Ljung- Box test (Q(m) test): This test is used to investigate the serial correlation in the residuals of univariate GARCH(1,1) models and the Q statistic is computed as:

$$Q(m) = T(T+2) \sum_{l=1}^{m} \frac{\hat{\rho}_l^{\,2}}{T-1} \quad (14)$$

where $\hat{\rho}_l$ represents the autocorrelation function (ACF) of standardized residual at lag l, m is the number of lags being tested.

Under H0 the Q-statistics follow a $\chi_{(m)}^2$. With the Ljung-Box statistics, we can test whether the residuals after GARCH process behave like a white noise.

Q2(m) test: It is used to test for the autocorrelation in the squared residuals series, thus checking whether the residuals show ARCH behavior. If the variance equation is fitted, no serial dependence should remain in the standardized residuals.

Lagrange multiplier (LM) test: This test is one of the principal tools to detect the significant of ARCH effects. The test statistic is calculated as LMm=T$R_m^2$. If the LM statistic excess critical value at order m of ARCH effect , i.e. $\chi_{(m)}^2$, we reject the null hypothesis (Greene, 2012)

**2.2.3.2. Multivariate model diagnostics**

In order to test the adequacy of fitted DCC-GARCH and BEKK-GARCH models, there is a critical requirement of investigation on serial correlation in squared residual (i.e. ARCH effect) (Minovic', 2007; Tse, 2002). This paper use a multivariate approach of the Ljung-Box test proposed by Bauwens (2003) to test for residual diagnostics.

Let $\varepsilon_t$ be the vector of standardized residuals, and be given as εt $=h_t^{-1/2}$ yt. The Ljung-Box statistic can be expressed as follows:

$$HM(M) = T^2 \sum_{t=1}^{M} (T-j)^{-1} tr\{C_{E_t}^{-1}(0) C_{E_t}(j) C_{E_t}^{-1}(0) C_{E_t}'(j)\} \qquad (15)$$

where Et =VECH($\varepsilon_t$ $\varepsilon_t'$) and $C_{E_t}(j)$ implies the matrix of autocovariance of order j, thus is illustrated by:

$$C_{E_t}(j) = T^{-1} \sum_{t=j+1}^{n} (E_t - \bar{E})(E_{t-j} - \bar{E})', \text{ j=0,1,2,…, T-1} \qquad (16)$$

where $\bar{E}$ = (E1 + E2 + …+ ET)/T.

The test statistic has an asymptotical $\chi^2$ -distribution with N2M degrees of freedom under the null hypothesis of no ARCH behaviors (Bauwens et. al., 2006).

## III. RESULT AND DISCUSSION

### 3.1. Modeling of BEKK-GARCH and DCC-GARCH

In this section, we present the estimation of DCC-GARCH and BEKK-GARCH models. First, the estimation results from the BEKK model for three sub-periods are presented in Table 2. The data from all periods confirm the significance of $\alpha_{11}$, depicting that structural breaks in the Bitcoin market significantly and positively affect its current variance. Similarly, the significant $\alpha_{22}$ in all stages implies that Bitcoin's current price fluctuation is primarily influenced by its lagged shock with the interdependence level having gradually increased over stages. The GARCH effects $\beta_{11}$are significant for three stages, which demonstrates that the emerging stock market is greatly influenced by its past volatility, accounting for about 92.5%, 77.03%, and 61.42% for each period. The estimate of $\beta_{22}$ of around 0.98, except for the post-COVID-19 period, reveals that around 98% of past volatility in MSCI EM persists until the next day. In short, Table 2 reveals that the lagged shock and volatility of both assets mainly influenced their own current volatility.

In terms of the magnitude of cross-market shock and volatility spillover, the empirical results provide persuasive evidence of a unidirectional relationship between emerging stock index and Bitcoin price. It follows that the volatility transmission originates from the emerging stock markets rather than the Bitcoin market. Taking into account the short-run volatility impact, $\alpha_{12}$ and $\alpha_{21}$ are either insignificant or negligibly significant (0.0233), except for $\alpha_{21}$ in the pre-COVID-19 period (0.6156***). In most of the cases, this study does not find evidence of shock spilled between two markets in the short term. Besides that, $\beta_{21}$ is significant in all cases, meaning that all three investigated stages witness the tendencies of volatility to spill in the long-run from the emerging stock market to Bitcoin. However, the coefficient $\beta_{12}$ has an insignificant value, indicating that the BTC market is not strong enough to spill volatility to the market of emerging stocks. Bitcoin ($\beta_{12}$) after the coronavirus outbreak appears significant at 1%, with negligible and around 10% of its volatility negatively influencing emerging markets.

This finding is opposite to copious empirical researchers, who confirm the spillover effect from the cryptocurrency market to the emerging stock market (Joseph et al., 2024, Frankovic et al., 2022). Meanwhile, this study is partially similar to the findings of Parichat et al. (2023) and Bouri et al. (2020), who find bidirectional cross-market movement between cryptocurrency and the stock market; however, only transmission from BTC to traditional stock to be confirmed in this paper. This spillover effect can be explained by the global financial integration and contagion, such that shocks and fluctuations in one market can spill to others. Additionally, unstable macroeconomic conditions, such as high inflation, political uncertainty, or exchange rate crises, in emerging economies have led to a shift in investors' portfolios to cryptocurrency in order to safeguard their wealth.

Other than that, it is especially worth noting that the cross-market coefficients in the third stage become either insignificant or lower compared to the previous stage, which states higher independence between the assets. In other words, after investigation of the BEKK cross-market coefficient, BTC could effectively act as safe haven, given its uncorrelation with the MSCI EM index during times of the Ukraine-Russia war.

**Table 2: BEKK-GARCH estimation results between Bitcoin and EM index**

| | Pre COVID-19 | COVID-19 | Ukraine-Russia war |
|---|---|---|---|
| $c_{11}$ | 0.0109*** | 0.0214*** | 0.0196*** |

| | | | |
|---|---|---|---|
| $c_{21}$ | 0.0000 | 0.0031** | -0.0003 |
| $c_{22}$ | 0.0009** | -0.0000 | -0.0000 |
| $\alpha_{11}$ | 0.2967*** | 0.1578*** | 0.3477*** |
| $\alpha_{12}$ | 0.0048 | 0.0233** | -0.0196 |
| $\alpha_{21}$ | 0.6156*** | 0.1215 | 0.2352 |
| $\alpha_{22}$ | 0.1564*** | 0.4512*** | 0.7214*** |
| $\beta_{11}$ | 0.9250*** | 0.7703*** | 0.6142*** |
| $\beta_{12}$ | -0.0024 | -0.1009*** | -0.0149 |
| $\beta_{21}$ | 0.1181* | 1.1532*** | 0.3216*** |
| $\beta_{22}$ | 0.9805*** | 0.8022*** | 0.9785*** |

*Note: ***, **, * denote the significant level at 1%, 5% and 10%*

Next, this study represents the evidence from the DCC-GARCH estimation in Table 3 to support BEKK-GARCH. The conditional mean is represented by "$\mu$", while the constant in the univariate GARCH model is denoted by $\gamma_0$. Besides that, in the first stage of DCC-GARCH estimation, we capture the effect of past news by the term "ARCH", while the impact of previous volatility is captured by the term "GARCH". Additionally, DCC(α) and DCC(β) depict conditional correlation in DCC estimation. Table 3 suggests that the existence of interconnection and volatility transmission are found to be, more or less, consistent with the BEKK model. For instance, this paper observes the significant ARCH and GARCH parameters for all three periods, which indicates that the volatility of both markets is affected by their own past news and lagged volatility. In the first two stages, the DCC(α) appears insignificant while the DCC(β) is significant. It implies that there is no information transmission between BTC and emerging markets in the short run, where the lingering transfer of information is significantly high. Conversely, in case of spillover after the invasion of Russia into Ukraine in 2022, only moderate short-run volatility impact between BTC and emerging markets is found, given significant DCC(α) with under 10% of spilling and insignificant DCC(β). In other words, BTC fails to maintain influence on emerging markets after the Ukraine-Russia war.

**Table 3: DCC-GARCH estimation results**

| | | **Pre-COVID-19** | **COVID-19** | **Ukraine-Russia war** |
|---|---|---|---|---|
| BTC | $\mu$ | 0.0028* | 0.0029* | 0.0026** |
| | $\gamma_0$ | -0.0006 | 0.0059*** | 0.0002** |
| | ARCH | 0.0988*** | 0.0062*** | 0.1588*** |
| | GARCH | 0.8508*** | 0.7910*** | 0.6592*** |
| EM | $\mu$ | 0.0006*** | 0.0003 | 0.0002 |
| | $\gamma_0$ | 0.0000 | 0.0000 | 0.0000** |
| | ARCH | 0.1052*** | 0.1282*** | 0.1083*** |
| | GARCH | 0.8192*** | 0.7802*** | 0.8226*** |
| DCC | α | 0.0134 | 0.0395 | 0.0828** |
| | β | 0.9574*** | 0.4468* | 0.1208 |

*Note: ***, **, * denote the significant level at 1%, 5% and 10%*

### 3.2. Diagnostic tests

For residual diagnostic checking, this paper employs Ljung-Box tests, where we extract the statistics of residuals, squared residuals, and residuals of cross-return series. Table 4 exhibits the Q(m) and Q2(m) statistics for each return series. From Table 4, it is evident that the Q-statistics for residuals and squared residuals for Bitcoin are not significant, except for the pre-COVID-19 period on lag 36, which ignores the presence of ARCH effects in its variance equation. Under diagnostic check of the log returns on the MSCI index over three sub-periods, the insignificant Q-statistics across all lag lengths in conditional residuals squared infer no ARCH effects in variance, but significant Q-statistics in residuals suggest that the model's residuals exhibit serial correlation. In other words, the models have autocorrelation structures left in residuals in the variance equation of the MSCI index. On the other hand, the ARCH-LM test exhibits no ARCH effect up to order 5 for both series across all phases with both F-statistics and LM-statistics being strongly

insignificant (see Table 5).

**Table 4: The Ljung-Box statistics (Q-statistics) of standardized residuals and its squared for return of Bitcoin and MSCI Emerging Market Index**

| | Pre-COVID-19 | | | | COVID-19 | | | | Ukraine-Russia war | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Q(2)** | **Q(5)** | **Q(9)** | **Q(36)** | **Q(2)** | **Q(5)** | **Q(9)** | **Q(36)** | **Q(2)** | **Q(5)** | **Q(9)** | **Q(36)** |
| BTC | 0.3543 | 0.7279 | 4.9812 | 35.637 | 2.1086 | 11.972 | 26.320 | 46.025 | 5.0189 | 7.4187 | 16.163 | 49.347 |
| EM | 13.145* | 16.304* | 22.484* | 66.343* | 8.6559* | 12.990* | 14.627 | 30.959 | 29.332* | 30.465* | 33.573* | 67.767* |
| | **$Q^2$(2)** | **$Q^2$(5)** | **$Q^2$(9)** | **$Q^2$(36)** | **$Q^2$(2)** | **$Q^2$(5)** | **$Q^2$(9)** | **$Q^2$(36)** | **$Q^2$(2)** | **$Q^2$(5)** | **$Q^2$(9)** | **$Q^2$(36)** |
| BTC | 0.2497 | 0.6769 | 2.2206 | 51.329* | 1.0332 | 10.950 | 14.349 | 40.564 | 0.2782 | 0.6560 | 4.5435 | 31.675 |
| EM | 1.1154 | 2.4552 | 3.4536 | 24.640 | 1.1557 | 3.3020 | 5.2215 | 22.766 | 0.1469 | 7.7112 | 9.4549 | 36.504 |

*Note: * denotes the significant level at 5%*

**Table 5: ARCH-LM(5) test for standardized residuals of Bitcoin and MSCI Emerging Market Index**

| | Pre-COVID-19 | | COVID-19 | | Ukraine-Russia war | |
|---|---|---|---|---|---|---|
| | **F-statistics** | **LM-statistics** | **F-statistics** | **LM-statistics** | **F-statistics** | **LM-statistics** |
| BTC | 0.1252 | 1.5181 | 2.0881 | 12.3435 | 0.1416 | 1.5231 |
| EM | 0.4821 | 4.3563 | 0.7137 | 4.0280 | 1.6153 | 13.7164 |

*Note: * denotes the significant level at 5%*

**Table 6: The Ljung-Box statistics (Q-statistics) of cross-product of standardized residuals for returns of Bitcoin and MSCI Emerging Market Index**

| **$Q^2$(36)** | **Pre-COVID-19** | **COVID-19** | **Ukraine-Russia war** |
|---|---|---|---|
| BEKK-GARCH | 32.976 | 27.311 | 47.675 |
| DCC-GARCH | 30.429 | 32.340 | 69.310 |

*Note: * denotes the significant level at 5%*

We see from Table 6 that autocorrelation in cross-product residuals is insignificant for BEKK-GARCH and DCC-GARCH models across all sub-periods. These above-mentioned test results emphasize the appropriation of both models for describing the autocorrelation structure of the sample data.

## IV. CONCLUSION

The present study examines the interdependence and volatility transmission between the Bitcoin market and the emerging stock market. For econometric estimations, this paper has employed the BEKK-GARCH and DCC-GARCH models for selected daily returns from January 2nd,2017 to November 25th,2024. These models enable us to take into account volatility clustering arising in return times series. The results of both models reveal strong proof of the dependence of the current conditional volatility of BTC and MSCI EM on the lagged volatility and past shock in their respective markets. The empirical results also offer evidence that the correlations between Bitcoin and equity markets diminished after the war outbreak in Ukraine. Another notable feature is that, after considering cross-market BEKK parameters, the volatility long-run transmission is found to be in one direction from Emerging stock returns to Bitcoin returns.

To financial investors seeking to protect themselves under unpredicted disruption events, our findings reveal the diversifier property of Bitcoin, given the high positive spillover between Bitcoin and traditional equity in emerging economies especially in the long run before and after the COVID-19 pandemic. However, after the emergence of geopolitical uncertainty, i.e. Ukraine- Russia war, Bitcoin appears to be uncorrelated or weak positively correlated to emerging market stock, which indicates that Bitcoin can be considered as a hedge or safe haven. Such information enables stock market participants in the emerging equity market to alter their portfolio optimization strategies and hedging techniques.

To financial regulators in emerging economies, this empirical finding of spillover effects and co-movement between assets points to the development of regulatory and legal frameworks to monitor the digital currency business. Other than that, the Governments in these countries can utilize the data to set up their own central bank digital currencies.

Research on how health and political crises, especially the COVID-19 pandemic and the recent Ukraine-Russia war, may have an effect on asset allocation has only recently started to develop. More investigation should be directed at the determination of how the government put together a stimulus package to lessen the drawback effect of these abovementioned outbreaks on investment optimization. This paper only endeavors to analyze how Bitcoin acts as a diversifier or hedge for traditional equity indices. Future studies could expand to the comparison between emerging and developing market indices with the same objectives or include cryptocurrencies other than Bitcoin, fixed-income instruments, and other financial assets, e.g. gold and derivatives.

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# THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY APPLICATION DEVELOPMENT ON BANKING STABILITY IN VIETNAM

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**ABSTRACT**

The application of Information and Communication Technology (ICT) has long been adopted by banks worldwide, including in Vietnam, in their business operations. The implementation of these technologies is expected to bring high efficiency, reduce operational costs, improve system operations, mitigate risks, and ensure that banks operate more stably and securely. This study analyzes the impact of ICT development on banking stability in Vietnam, using data collected from 24 commercial banks in Vietnam between 2011 and 2023 through the FEM, FGLS, SGMM regression method. The study also proposes solutions to help stabilize the operations of commercial banks when applying ICT.

*Keywords:* "ICT", "banking stability", "Digital transformation", "operational efficiency"

## I. INTRODUCTION

### 1.1. Background of the study

Information technology infrastructure is one of the main pillars of the economy, supporting organizations, individuals, and governments in enhancing their competitiveness (Nustini, 2003). To strengthen the development of information technology infrastructure and seize opportunities in the 4.0 revolution, The State Bank of Vietnam has issued several directives to facilitate the development and application of technology in Vietnam's banking sector, specifically: Developing an action plan for the banking sector to implement the Prime Minister's Directive (2017) on strengthening the capacity to access the 4.0 technology revolution by 2020 and the orientation toward 2025. Decision No. 810/QD-NHNN on the Digital Transformation Plan for the banking sector by 2025, with a vision toward 2030. This is considered a significant milestone in the digital transformation process of the banking sector (Trang et al., 2022.). This reflects a strong commitment to investing in the banking sector's technological infrastructure. Information technology infrastructure can positively impact the stability of commercial banks, as using this infrastructure helps facilitate fast and secure electronic payments. Additionally, the application of electronic devices, cloud storage, blockchain technology, and fintech innovations enhances labor productivity, ensures smoother integration across various operational areas, reduces information asymmetry, and leads to more stable operations (Erumban & Das, 2016).

Financial stability is a concept discussed in many studies. According to the Bank of England, "Financial stability is identifying risks in the system and taking actions to mitigate these risks" (Kim & Mehrotra, 2017). According to Crockett (1997), a financial organization is stable when no risks emerge that could have severe consequences in the financial market. Duisenberge (2001) compared financial stability with monetary stability. While monetary stability reflects the overall sustainable price level, financial stability is much harder to define. In general, financial stability occurs when the components of the financial system function stably. Expanding this, financial stability in banking operations, or banking stability, refers to when the components within banking activities operate stably. The study uses the ZScore index to measure the risk of insolvency, an indicator widely used in literature Laeven & Levine (2009); Samet et al., (2018).

In the banking sector, there have been numerous studies focusing on the impact of information technology on the profitability and stability of banks, with varying results. The first viewpoint suggests that information technology helps reduce operational costs, expand distribution channels, and allows banks to operate more efficiently, with more transparent and stable information. Daud et al., (2022) studied the relationship between financial stability and technology adoption in several countries. The study indicated that technologies such as artificial intelligence and cloud computing help increase financial stability. According to Aduba, Asgari & Izawa, (2023), they also discovered the positive impact of technology on financial development in developing countries with modern financial markets. Elsayed

et al., (2024) stated that combining financial technology with blockchain technology can help identify and stabilize financial organizations in the rapidly changing financial environment of the United Arab Emirates (UAE). Puri et al.,(2023) in their study of the impact of digital transactions on banking stability in India from 2011 to 2020, also found a positive effect of information technology on banking stability. Specifically, the research showed that digital transactions, including mobile banking, national electronic funds transfer (NEFT), and real-time gross settlement (RTGS) systems, are very important in establishing stable banking operations in both the public and private sectors in India. Syed et al., (2022) found greater complexity in their study, which collected data from India and the United States from 2004 to 2018. The study pointed out that in India, in the short term, the expansion of digital financial services in the form of internet transactions and mobile money transactions has a negative and significant impact on banking stability. However, in the long run, digital financial services enhance the stability and efficiency of banks in India. In the United States, both in the short and long term, the expansion of digital financial services improves the efficiency and stability of banks.

On the opposite side, there is a viewpoint that the development of information technology may affect regulations that impact stability and trust in the financial system. DeYoung et al., (2007) researched the impact of digital financial technology in a sample of 55 developing countries between 2000 and 2020. The results showed that the use of digital financial technology through mobile phone registrations does not promote stability in the banking sector and creates instability. Furthermore, DeYoung (2005) studied the impact of the internet on banking services in the U.S. by comparing the performance of traditional banking with e-banking. The research results showed that e-banking increased commissions for deposit services but had no impact on credit operations. Additionally, banks incur significant costs, from operations to staff and management expenses, and this investment cannot replace the traditional branch and transaction office systems. (Li et al., 2020) conducted a study focused on the risk diffusion of technology to traditional financial institutions. The study showed that systemic risk can spread quickly during the development of information technology, especially in the traditional financial sector. Nguyen & Dang (2022) found that the development of information technology and financial technology could have a negative impact on financial stability in Vietnam when studying data from 37 Vietnamese commercial banks from 2010 to 2020. Thus, information technology infrastructure can have varying effects on the stability of commercial banks. Therefore, this research provides additional empirical evidence on the impact of the application of information and communication technology on banking stability in Vietnam.

### 1.2. Research Questions and Objectives

The objective of this research is to assess how ICT affects the stability of Vietnamese commercial banks from 2011 to 2023 and, from this, to provide management implications for the future stable operation of commercial banks in Vietnam as they apply ICT. To achieve the research objectives, the study raises the following specific research questions:

– How do ICT indicators affect the stability of commercial banks' operations in Vietnam?

– What policy implications can be proposed for banks to develop and apply appropriate ICT systems to ensure that commercial banks in Vietnam operate more stably in the era of the technology revolution?

## II. MATERIAL AND METHOD

### 2.1. Data in the Study

The research sample includes 24 joint-stock commercial banks in Vietnam with the most complete data from 2011 to 2023. As of September 30, 2024, the commercial banking system in Vietnam consists of 31 non-state joint-stock commercial banks, 4 state-owned banks, 9 100% foreign-owned banks, and 2 joint-venture banks. The study excludes state-owned banks, 100% foreign-owned banks, and joint-venture banks due to insufficient data. The independent variable on IT infrastructure is taken from secondary data sources, specifically the Report on the Readiness Index for the Development and Application of Information and Communication Technology by the Ministry of Information and Communications. The dependent variable for banking stability is calculated using the LnZ-score, and the control variables are collected and calculated from the audited financial statements of the commercial banks, gathered from the banks' websites. The list of 24 banks in the research sample is arranged with stock codes as shown in Table 1:

**Table 1. List of Banks in the Research Sample**

| List | Stock symbol | List | stock symbol | List | stock symbol | List | stock symbol | List | stock symbol | List | stock symbol |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ABB | 5 | BVB | 9 | KLB | 13 | OCB | 17 | STB | 21 | VBB |
| 2 | ACB | 6 | CTG | 10 | LPB | 14 | SEA | 18 | TCB | 22 | VCB |
| 3 | BAB | 7 | EIB | 11 | MBB | 15 | SGB | 19 | TPB | 23 | VIB |
| 4 | BID | 8 | HDB | 12 | NAB | 16 | SHB | 20 | VAB | 24 | VPB |

*Source: Author's compilation*

The research model is based on the model of Adusei (2015), and the author constructs the regression model as follows:

$$\text{LnZ-Score}_{it} = \alpha + \beta_1 ICT_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 LDR_{it} + \beta_5 CR_{it} + \beta_6 HHI_{it} + \beta_7 GDP_t + \beta_8 INF_t + \varepsilon_{it}$$

**Variables in the Model**

**Dependent Variable: LnZ-score**

$$LnZscore = \left( \frac{ROA + \frac{E}{A}}{\sigma(\text{ROA})} \right)$$

In which:

– ROA is the Return on Assets ratio, calculated as Profit / Total Assets.

– E/A (Equity-to-Assets ratio) is measured as Shareholder's Equity / Total Assets.

– The standard deviation of ROA is calculated for the period from 2011 to 2023.

– The independent variable ICT is the index taken from the report on the readiness for the development and application of Information and Communication Technology by the Ministry of Information and Communications.

Additionally, the study uses control variables, including:

– SIZE: Bank size is measured by the logarithm of total assets. It is expected that larger banks tend to be more stable in operations (Abuzayed et al., 2018; Lepetit et al.,2008).

– LEV: Financial leverage is calculated by Total Debt / Equity. Organizations with higher equity and lower leverage tend to operate more stably Lepetit et al., (2008); Abuzayed et al., (2018).

– LDR: Loan-to-deposit ratio, measured by the ratio of outstanding loans to total mobilized capital. Bourkhis & Nabi, (2013) found that the net lending ratio has an inverse relationship with the stability of banks.

– CR: Credit risk is calculated by the ratio of credit risk provision to total outstanding loans. High provisioning is a sign of credit risk and thus has an inverse relationship with banking stability.

– HHI: The index measuring income diversification. Income diversification indicates the extent to which income is derived from non-interest activities of commercial banks. Based on the research of (Abuzayed et al., 2018), this study uses the Constructing Index method with the Herfindahl Hirschman Index (HHI) to measure the income diversification level of Vietnamese commercial banks.

The HHI index is calculated using the formula:

$$HHI = \left( \frac{NON}{NOI} \right)^2 + \left( \frac{NII}{NOI} \right)^2$$

Where: **NON** is the non-interest income of commercial banks; **NII** is the net interest income from loans; **NOI** is the net operating income. This index ranges from 0.5 and above. When HHI = 0.5, it indicates that the bank has fully diversified its income, with non-interest income being approximately equal to interest income. The higher the HHI value, the lower the bank's income diversification.

Additionally, the study measures the impact of macroeconomic factors through the GDP growth rate index and the inflation index (INF) measured by the consumer price index. According to the research by Abuzayed et al., (2018);

Trung et al., (2021), GDP positively impacts banking stability, while the consumer price index, reflecting inflation, has a negative effect. The macroeconomic indicators are collected from the World Bank's data.

### 2.2 Research Methodology

The study uses the Fixed Effects Model (FEM) panel data regression method, followed by regression with the FGLS (Feasible Generalized Least Squares) model to address heteroscedasticity and autocorrelation issues in the FEM regression model. It then continues with regression using the SGMM (System Generalized Method of Moments) model on a panel dataset of 24 commercial banks in Vietnam from 2011 to 2023, resulting in 312 observations.

## III. RESULTS AND DISCUSSION

Table 2 presents the descriptive statistics of the variables in the regression model, showing the number of observations in the sample, the mean value, standard deviation, minimum value, and maximum value of the variables in the study. The highest ICT coefficient is 0.8114 for BIDV bank in 2015, while the lowest is 0, as some banks have not updated complete data for the year 2023.

**Table 2. Descriptive Statistics of Variables in the Study**

| Variable | Observation | Mean | Standard Error | Min | Max |
|---|---|---|---|---|---|
| LnZscore | 312 | 5.154361 | 0.801588 | 2.970675 | 6.512176 |
| ICT | 312 | 0.4721 | 0.1760 | 0 | 0.8114 |
| LEV | 312 | 11.4915 | 4.0351 | 3.1950 | 23.61981 |
| CR | 312 | 1.2727 | 0.4773 | 0 | 2.78 |
| LDR | 312 | 0.8048 | 0.1776 | 0 | 1.7703 |
| SIZE | 312 | 32.6223 | 1.1963 | 30 | 35.3721 |
| HHI | 312 | 0.724286 | 0.158479 | 0.503633 | 1.653516 |
| GDP | 312 | 5.748462 | 1.53052 | 2.6 | 8.1 |
| INF | 312 | 4.851692 | 4.481752 | 0.631 | 18.678 |

*Source: Author's calculations using Stata 17.1*

When analyzing the correlation between the variables in the model, the variable most strongly correlated with the LnZscore index is size, while the leverage ratio (LEV) has the weakest correlation with the LnZscore index. Upon examining the correlation between the variables, all correlation coefficients are less than 0.8. However, to assess whether the variables in the model are suitable and to determine if multicollinearity exists, a multicollinearity test needs to be conducted.

**Table 3. Correlation Matrix of Variables in the Model**

| | LnZscore | ICT | LEV | CR | LDR | size | HHI | GDP | INF |
|---|---|---|---|---|---|---|---|---|---|
| LnZscore | 1 | | | | | | | | |
| ICT | 0.1037 | 1 | | | | | | | |
| LEV | 0.0411 | 0.1639 | 1 | | | | | | |
| CR | 0.0485 | 0.0336 | -0.0648 | 1 | | | | | |
| LDR | 0.1642 | 0.0929 | 0.0467 | -0.0986 | 1 | | | | |
| SIZE | 0.4703 | 0.1123 | 0.4784 | 0.0434 | 0.1361 | 1 | | | |
| HHI | -0.1568 | -0.0268 | -0.0361 | 0.0129 | 0.1068 | -0.3193 | 1 | | |
| GDP | -0.0603 | 0.0345 | 0.0382 | -0.1036 | 0.0293 | -0.0556 | 0.0845 | 1 | |
| INF | 0.0906 | 0.0538 | -0.1904 | 0.0999 | 0.0636 | -0.2827 | 0.2478 | -0.0137 | 1 |

*Source: Author's calculations using Stata 17.1*

When testing for multicollinearity in Table 4, the results show that the VIF coefficient = 1.19 < 2, indicating that there is no multicollinearity between the variables in the model and that the variables used are appropriate.

**Table 4. Multicollinearity Test for the Variables in the Model**

| Variable | VIF | 1/VIF |
|---|---|---|

| | | |
|---|---|---|
| SIZE | 1.60 | 0.626813 |
| LEV | 1.38 | 0.724680 |
| HHI | 1.21 | 0.825186 |
| INF | 1.16 | 0.859499 |
| LDR | 1.08 | 0.926889 |
| CR | 1.05 | 0.950371 |
| ICT | 1.05 | 0.952571 |
| GDP | 1.02 | 0.975710 |
| Mean VIF | 1.19 | |

*Source: Author's calculations using Stata 17.1*

First, the author runs the fixed effects model (FEM) and random effects model (REM) sequentially. Then, the study uses the Hausman test to assess whether FEM or REM is the appropriate model for examining the impact of IT infrastructure on the stability of commercial banks' operations. The results show a Prob value of 0.00 < 0.05, indicating that FEM is the suitable model. Next, the study conducts tests for heteroscedasticity and autocorrelation, using the Wooldridge test and Wald test, both of which yield a Prob value of 0.000 < 0.05. Therefore, heteroscedasticity and autocorrelation exist, and the study proceeds with regression using the FGLS model to address these issues.

**Table 5. FGLS Regression Results for Factors Affecting Banking Stability**

| LnZscore | Coefficient | Std. err. | z | P>z |
|---|---|---|---|---|
| ICT | 0.168291 | 0.125163 | 1.34 | 0.179 |
| LEV | -0.04459 | 0.007405 | -6.02 | 0.000 |
| CR | -0.05598 | 0.053588 | -1.04 | 0.296 |
| LDR | 0.42997 | 0.140591 | 3.06 | 0.002 |
| SIZE | 0.437647 | 0.023451 | 18.66 | 0.000 |
| HHI | -0.27499 | 0.202488 | -1.36 | 0.174 |
| GDP | -0.00626 | 0.015234 | -0.41 | 0.681 |
| INF | 0.043224 | 0.0058 | 7.45 | 0.000 |
| _cons | -8.89403 | 0.81738 | -10.88 | 0 |

*Source: Author's calculations using Stata 17.1*

According to the results of the FGLS regression model, LEV has a negative impact on banking stability, while the variables LDR, SIZE, and INF have a positive impact on banking stability. The remaining variables, ICT, CR, HHI, and GDP, are not statistically significant. However, in regression models involving economic factors, endogeneity is an unavoidable issue. Therefore, the study uses the SGMM regression method to address this issue and provide more reliable results.

**Table 6. Results of the SGMM Regression Model on Factors Affecting Banking Stability**

| LnZscore | Coefficient | Std. err. | P>t |
|---|---|---|---|
| LnZscore L1 | 0.529762*** | 0.039653 | 0.000 |
| ICT | 0.476442*** | 0.083629 | 0.000 |
| LEV | 0.032969 | 0.031277 | 0.303 |
| CR | 0.098848 | 0.158944 | 0.540 |
| LDR | 1.262791* | 0.663656 | 0.070 |
| SIZE | 0.324151*** | 0.063239 | 0.000 |
| HHI | -1.18319** | 0.466798 | 0.019 |
| GDP | 0.014734* | 0.008329 | 0.090 |
| INF | 0.014492 | 0.013675 | 0.300 |
| _cons | -9.26973*** | 2.292833 | 0.001 |
| AR(1) p-value | | 0.001 | |

| | |
|---|---|
| AR(2) p-value | 0.191 |
| Sargan test | 0.786 |
| Number of groups | 24 |
| Number of instruments | 24 |
| Second stage F-test p-value | 0.000 |

*(***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.*

*Source: Author's calculations using Stata 17.1*

The research results satisfy the p-value condition for AR(1) which is 0.001 < 0.05, and the p-value for AR(2) is 0.191 > 0.05. This indicates that the model has first-order autocorrelation but no second-order autocorrelation of residuals, which meets the necessary condition. Additionally, the number of instrumental variables is 24, equal to the number of groups, which satisfies the condition that the number of instrumental variables is less than or equal to the number of groups. Furthermore, the Sargan Test result is 0.786, and the F test result is 0.001, indicating that the variables in the model are appropriate.

The research results show that the lag variable of lnZscore, LnZscore L1, ICT, LDR, SIZE, HHI, and GDP have statistical significance at different levels. The remaining variables, LEV, CR, and INF, are not statistically significant. Specifically, LnZscore L1, ICT, and SIZE have a significance level of 1%; HHI has a significance level of 5%; LDR and GDP have a significance level of 10%. Most of the variables have a positive impact on bank stability. LnZscore, ICT, LDR, SIZE, and GDP have positive effects, while HHI has a negative effect on bank stability. The variables with the strongest effects, in order, are LDR with a regression coefficient of 1.262791, HHI with a coefficient of -1.18319, LnZscore L1 with a coefficient of 0.529762, ICT with a coefficient of 0.476442, SIZE with a coefficient of 0.324151, and GDP with a coefficient of 0.014734.

## IV. CONCLUSION

The research results indicate that the application of information and communication technology (ICT) positively impacts bank stability. Indeed, the use of technology makes banking operations more transparent and efficient, reducing intermediary steps and operating costs, thus helping banks maintain greater stability. This finding is consistent with the research of Trang et al. (2022), Daud et al. (2022), Puri et al., (2023), Elsayed et al., (2024) and Aduba, Asgari & Izawa (2023).

Therefore, the study recommends that banks invest in technical infrastructure, such as increasing the internet bandwidth ratio to support Internet banking services, providing internal users with better access, and increasing the number of ATMs and POS machines. The network infrastructure must ensure high safety, security, and good transmission capacity. Additionally, with the rapid growth of the banking system and increasing data volume, central banks must invest in infrastructure, hardware, software, and management skills for monitoring and inspection. This will allow central banks to regularly monitor and check for quick and efficient resolution of issues (such as communication errors or the lack of customer information security.

At the same time, banks need to strengthen their workforce in the field of information technology with qualified and experienced personnel. This is crucial in the context of digital transformation today. Banks should have a strategy for managing high-quality human resources both in the short term and long term, in alignment with modern technologies, and increase cooperation with training institutions to help employees keep pace with new technological products and services.

Furthermore, banks should implement ICT systems such as core banking systems, internal software systems, online banking services, and electronic payments.

Moreover, the financial stability from the previous year, the credit-to-deposit ratio, and the size of the institution also positively impact bank stability. The study recommends that banks can benefit from increasing their scale and expanding credit activities in their operations. However, diversification has an inverse effect on bank stability, which goes against expectations, but reflects that diversification in recent banking operations has not been effective. When investing in non-interest activities, fixed costs rise, leading to an increase in overall leverage, making the bank riskier. This study emphasizes that banks still benefit from focusing on credit activities and should carefully consider

investment activities, avoiding spread investments or chasing trends.

Additionally, with regard to the macroeconomic factor, GDP has a positive impact, indicating that banks operate more stably during periods of economic growth, as expected and in line with the studies of Abuzayed et al., (2018); Trung et al., (2021).

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# DISCUSSING PROPERTY TAXES ON REAL ESTATE IN VIETNAM - SOME PROPOSALS FOR DEVELOPING AND IMPROVING LEGAL REGULATIONS

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**ABSTRACT**

In many countries around the world, property taxes have existed and play an important role in providing stable revenue for the state budget. They are also one of the effective tools for combating real estate speculation, thereby macro-managing the economy, and contributing to ensuring social equity. Observing the tax system in Vietnam, property taxes currently only include taxes on non-agricultural land use, agricultural land use, and income tax on real estate transfers. However, the role of these taxes remains limited, especially in terms of mobilizing resources for the state budget. This reflects a tax system and policies related to real estate that are still incomplete, inconsistent, and sometimes cause difficulties for individuals and organizations involved. In fact, property taxes have been discussed for many years. To date, property taxes are still under research and development, with the draft law still being refined. In early February 2023, in the Draft Law and Ordinance Building Program for 2024, with amendments for 2023, the Ministry of Justice solicited opinions on the proposal to issue a Real Estate Tax Law. At present, with the introduction of the 2023 Real Estate Business Law, the 2023 Housing Law, and the 2024 Land Law, addressing the construction and improvement of regulations on property taxes related to real estate in line with modern trends is an urgent issue.

*Keywords*: “property tax”, “real estate”, “land tax”

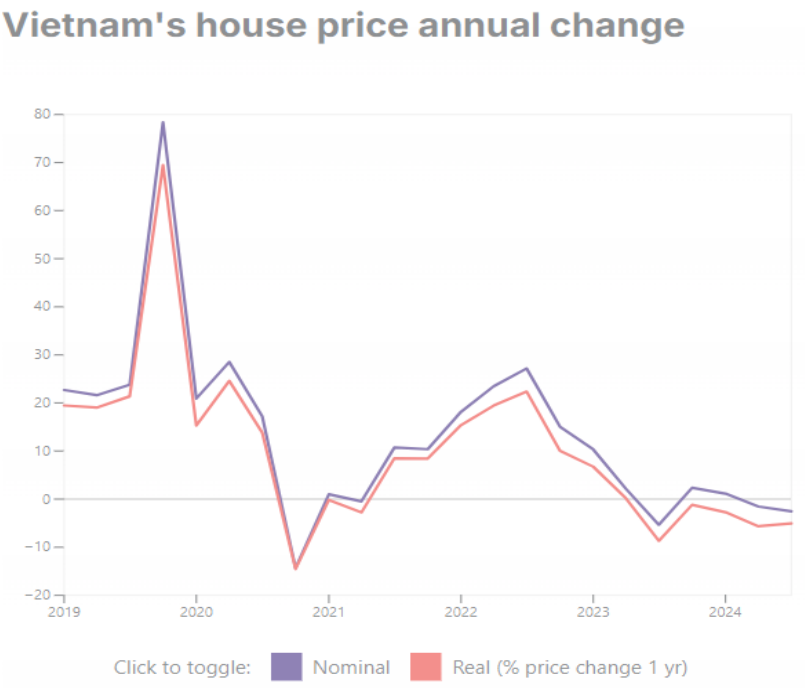
## I. INTRODUCTION

### 1.1 Background of the study

#### 1.1.1 The real estate market situation and property taxes related to real estate in Vietnam

The real estate market in Vietnam in recent years has undergone many challenges, especially during the recent pandemic, but has gradually recovered and made significant contributions to the national economy. However, alongside this recovery and development, the market still faces several unresolved negative issues that are not effectively managed, such as speculation and lack of transparency. One of the clearest signs of the volatility in the real estate market is the prices of properties over different periods. According to the chart showing housing prices below, it can be seen that housing prices in Vietnam have fluctuated significantly over the past 5 years (from 2019 to 2024). After experiencing crises due to the Covid-19 pandemic, the market has seen some recovery, but it has not been substantial, and there have even been significant downward fluctuations. This also indicates that the housing market in particular, and the real estate market in general in Vietnam, do not yet have a solid foundation to remain stable in the face of economic fluctuations.

One of the causes of these issues is related to the legal framework for property taxes on real estate. The current tax policy system related to real estate includes taxes on non-agricultural land use and taxes on agricultural land use. Essentially, the tax policies on non-agricultural and agricultural land have helped strengthen state management over land. However, due to the rapid fluctuations in global political economy as well as Vietnam's economy, the current real estate tax policies remain limited (such as not covering all sources of revenue, with low mobilization levels...). Therefore, the development and improvement of property taxes need to continue to be reviewed and refined to make more appropriate adjustments in each context.




*Source: globalpropertyguide.com*

### 1.1.2 The role of property taxes in the economy and the real estate market

Property taxes play an important role in regulating the economy and providing stable revenue for the state budget. Property taxes on real estate contribute significantly to stabilizing the real estate market. In a modern economy, property taxes can reduce speculation and increase fairness and transparency in wealth distribution. A comprehensive legal framework regulating property taxes related to real estate will encourage the rational and efficient use of assets, helping to minimize issues such as real estate bubbles. In reality, property tax laws, primarily concerning housing and land, directly affect the economic interests of entities within the economy. Property taxes linked to real estate are significant in the economy, impacting various economic, political, and social aspects. This is because real estate, which includes land—the most important asset of a country (manifested through factors such as area, natural advantages, mineral resources, and increasing value)—and buildings and structures tied to the land, are assets with considerable value in the total wealth of their owners. Land and buildings have their own market—the real estate market. The real estate market of a country is always interconnected with other key markets in the economy, such as the capital market and the labor market. Real estate policies also reflect the political views of a country, such as land use planning policies and real estate business policies.

### 1.1.3 International experience in developing property tax regulations related to real estate

Around the world, many countries have developed and implemented property tax regulations related to real estate as an important part of their tax systems. Most countries do not enact a separate property tax that covers all types of taxes related to assets, nor is there a unified model for property taxes. Each country has a different tax policy system for assets, depending on their policy objectives. However, the common taxable assets in most countries are houses and land. Developed countries such as the United States, the United Kingdom, Japan, and Singapore all have property tax regulations. The types of property taxes in these countries include real estate property taxes (such as taxes on land and buildings), taxes on real estate transactions, and taxes related to the use of land and other real estate assets, including homes and structures, etc

Some property tax systems in these countries are quite transparent and detailed for all real estate assets that are owned and used, including land and housing, with tax rates depending on the value of the assets. This not only helps the government attract revenue from the real estate market but also helps stabilize prices, curb speculation, and ensure fairness in the distribution of assets.

### 1.1.4 Current issues in developing property tax regulations related to real estate in Vietnam

Although Vietnam has regulations on property taxes related to real estate, this system still has many shortcomings and may no longer be suitable for the current fluctuations in the real estate market. The current regulations mainly focus on taxes related to real estate transfers. The taxes regulating the ownership and use of real estate assets primarily exist in the form of taxes on agricultural and non-agricultural land use. As a result, the level of oversight aimed at ensuring transparency and a healthy real estate market, as well as increasing revenue for the state budget from the tax authorities in the real estate sector, has not been very effective. The current application of property taxes on real estate also lacks fairness, especially for owners of large assets. Furthermore, Vietnam's tax legal system does not cover all types of assets subject to property taxes according to international practices.

Therefore, the law on property taxes, primarily those impacting real estate, needs to be developed and applied based on the principles of proper, adequate taxation, and balancing the interests of society, the economy, the state, and the taxpayers. In practice, the issue of developing and improving property taxes on real estate must address several legal issues, including: (i) how to establish property taxes on residential ownership to achieve the goal of preventing speculation and regulating the real estate market, while not eliminating the investment potential of market participants, (ii) criteria for determining property taxes on real estate to generate revenue for the state budget while ensuring fairness, (iii) the effectiveness of property tax laws arising from real estate transactions and the level of tax compliance. Additionally, the current trend of developing and enacting property taxes also leads to disputes over the identification of taxable subjects between personal income taxes and property taxes on real estate.

### 1.1.5 Significance of the Study

This research also contributes to clarifying the role and necessity of developing property tax regulations related to real estate in Vietnam. At the same time, the authors propose several recommendations for the development and improvement of property tax regulations related to real estate in Vietnam. Therefore, this study also serves as a reference for legislators, researchers, and policymakers in Vietnam to consider when building and refining property tax laws in the coming period (from 2025 onwards). Through this, the study aims to contribute to improving tax management effectiveness, combating speculation, and maintaining a healthy, transparent real estate market for sustainable development.

### 1.2 Research Questions and Objectives

To clarify the issues related to property taxes on real estate in Vietnam, this study has several main objectives:

- RO1: Assess the regulations related to property taxes on real estate in countries around the world.
- RO2: Examine the process of developing property tax regulations and determine the necessity of creating property tax laws related to real estate in Vietnam.
- RO3: Propose issues related to the development of property tax regulations on real estate in Vietnam.
- To achieve these objectives, the following key research questions will be addressed:
- RQ1: How do countries around the world regulate property taxes related to real estate?
- RQ2: What is the process of developing property tax regulations in Vietnam?
- RQ3: What is the necessity of creating property tax laws related to real estate in Vietnam today?
- RQ4: What proposals are needed to improve property tax regulations related to real estate in Vietnam?

## II. MATERIAL AND METHODOLOGY

### 2.1 Conceptual Foundation

According to the Cambridge Dictionary, property tax is a type of tax levied on buildings and land, based on their value. International research on taxes offers various perspectives on property taxes. Specifically, the Organisation for Economic Co-operation and Development (OECD) defines property tax as follows: "*A tax on property is defined as a periodic or non-periodic tax on the use, ownership, or transfer of property. This includes taxes on real estate or net wealth, taxes on changes in property ownership through inheritance or gifts, and taxes on financial and capital transactions*." (Tax on property, n.d.). Alternatively, *property tax is a type of tax levied on the ownership rights of assets. Simply owning property is the determining condition for the taxpayer to fulfill their legal obligation regarding*

*property tax."* (Holbert, 1980). Thus, property tax on real estate is often interpreted as a tax levied on assets, primarily real estate owned by individuals or organizations. This tax can also be understood as a financial obligation of individuals or organizations owning real estate to the state.

In general, property tax is a type of tax imposed on ownership rights, mainly on real estate, including houses, land, land use rights, buildings, and other assets attached to the land. Typically, governments in various countries set relatively high tax rates on real estate, based on the area or value of the property. In principle, the taxpayer is the entity that owns or has the right to use the real estate. Additionally, some countries further differentiate tax rates based on the purpose of the property (for residential use or business investment, etc.) or based on the number of properties owned (there may be differences between tax rates on the first property and subsequent ones).

### 2.2 Research method

The study is based on the following methods:

**Analytical method**: This method is used to study and evaluate property tax regulations related to real estate in countries around the world, including taxable subjects, taxpayers, tax rates, etc. The analytical and synthetic methods are also applied to examine the property tax regulations in the Draft Property Tax Law in Vietnam, clarifying the necessity of enacting regulations on property taxes related to real estate. Proposals for improving property tax regulations in Vietnam are also clarified through this method.

**Comparative method**: This method is used to compare property tax regulations related to real estate between countries worldwide and Vietnam. Through this, the authors are able to evaluate and draw lessons from other countries in developing and refining property tax laws, which play an important role in regulating markets, ensuring social equity by balancing the income of different population groups, and reducing income inequality. The comparative method is also applied to learn from the experiences of other countries in developing and refining property taxes, which allows the authors to conclude that property tax is an effective tool to curb speculation in real estate and contribute to stabilizing, developing, and ensuring the sustainability and health of the real estate market.

**Synthesis method**: Based on the evaluation of property tax regulations related to real estate in countries around the world and in the Draft Property Tax Law in Vietnam, this research applies the synthesis method to systematize the limitations of the regulations compared to practical realities. From there, the study synthesizes recommendations for improving legal regulations related to taxable subjects, taxpayers, tax rates, and property tax management for real estate, contributing to improving the general tax legal system in Vietnam.

## III. RESULT AND DISCUSSION

### 3.1 Property tax laws in some countries around the world

Currently, over 90% of countries worldwide impose property taxes under various names. According to statistics from the Ministry of Finance, property taxes account for 3-4% of the total tax revenue in developed countries, with some places, such as Japan, reaching as high as 8%. (Loan, 2018) It can be seen that property tax on real estate not only plays a role in ensuring government revenue, regulating the macroeconomy, and serving as an effective tool to combat land speculation, but also creates opportunities for many people to access land and housing, contributing to social equity. The common taxable subjects in most countries are houses and land. A brief overview of property tax regulations in some countries is as follows:

In the United States, property taxes are heavily levied on house sales and second homes. When taxing house sales, the U.S. Internal Revenue Service (IRS) clearly distinguishes between homes for personal use and homes for investment. For property tax, which is levied once when purchasing a house, the tax rate varies from state to state but does not exceed 2.35% of the property's value. However, for a primary residence, state governments in the U.S. will levy very low taxes, or even exempt tax on properties valued under $250,000 for individual ownership, or under $500,000 for household ownership. The Housing Assistance Act of 2008 in the U.S. also ended tax exemptions for second homes, as these properties are primarily for profit-driven investment. According to U.S. property tax laws, taxable property includes land, buildings, houses, parking lots, parks, gardens, etc. Property tax is based on the net value of the property and its market value, with the taxable value of the property, tax rate, and progressive tax rate serving as the bases for calculation. (Dung, 2023).

In the United Kingdom, property tax, or Stamp Duty Land Tax (SDLT), is divided into two categories: tax for first homes and tax for second homes and beyond. For first homes, the current tax rate in the UK is progressive with 5 levels based on the property value, ranging from 2% to 12% for properties valued from £125,001 and above. The UK government announced that, starting from April 1, 2016, anyone purchasing a second home or land that is not a first home will be required to pay a 3% tax rate. The aim is to increase the availability of housing for first-time buyers by reducing competition from landlords. (Kath Scanlon, Christine Whitehead, Fanny Blanc)

In Sweden, taxable property is defined by the country's laws as personal property and real estate. The form of taxation and the basis for taxing real estate is based on the value of the house and land, where the tax is proportional to the value, with no starting threshold like in some other countries. Thus, real estate (houses and land) is taxed twice: first, through property tax (if the net value of the property is 800,000 SEK or more), and second, when tax is levied on the house and land itself.

In Germany, property tax was first introduced in 1893. However, since 1997, Germany has not imposed property taxes. The tax rate in 1997 was based on the value of the property minus unpaid debts, with an exemption of 120,000 DM (at that time, before the Euro was introduced) for one family member, and a tax rate of 1% for individuals and 0.6% for legal entities. In Germany, property tax on second homes is aimed at covering local government expenses related to the property (according to Article 105 of the German Constitution, tax is levied on individuals who register their second home, whether rented or owned). The tax rate varies by location, ranging from 5% to 23% per year, with the most common rate being 10% of the property's value. (Theoretical and practical basis for property tax construction in Vietnam, 2019)

In Asian countries, similar property tax regulations are also applied. For example, South Korea implements a tax rate that varies according to the type of real estate. Specifically, the tax rate for residential properties ranges from 0.1% to 0.4%, for buildings it ranges from 0.25% to 0.5%, excluding buildings in golf clubs or luxury recreational facilities, and for land, the tax rate ranges from 0.2% to 0.5%. (Applicable Taxes, n.d.)

In Singapore, the country has been very successful in implementing a tax on second properties, and this tax is even levied at a very high rate. The additional property tax, which has been in effect since 2013, applies to second properties at a rate of up to 7% of the purchase price, and 10% for the third property, starting from 2013. (Property Tax on Residential Property, 2023) . In China, buyers of a second home are subject to a tax rate of 1.2% on the value of the property. China has also proposed a draft law for a property tax that would apply to industrial, commercial properties, and individual residences, based on the assessed value of the property. (Xinhua, 2024)

In Thailand, on November 16, 2018, the Thai Parliament passed the Land and Building Tax Act, which came into effect on January 1, 2020. The purpose of this reform was to promote more efficient land use and the construction of buildings on land, as well as to allocate tax revenue to local governments. Previously, land development tax in Thailand was based on a progressive tax rate according to land area. Now, Thailand has enacted the Land and Building Tax Law, which applies a progressive tax rate based on the assessed value of the property and categorizes properties based on their intended use, such as agricultural land, residential properties, commercial properties, and unused properties, etc. (Pham Thi Thu Hong, Nguyen Thi Hoa, 2020)

Overall, it can be observed that property taxes in some countries mainly focus on real estate, including houses, land, and structures on land. These types of properties are subject to relatively high tax rates. Many countries tend to apply an additional tax rate for owners of a second or subsequent property, with the clear goal of preventing land and housing speculation, regulating the real estate market, and providing greater access to housing for a larger group of people in society. The regulations regarding property taxes on real estate in countries around the world can be summarized as follows:

Taxable property: The commonly taxed property is real estate, including houses, buildings on land, and land itself. For each type of property, it is generally subdivided into categories based on its intended use. These are assets that are closely regulated through registration procedures and oversight by various government agencies. Typically, owners prove their ownership or usage rights through documentation issued by the relevant authority.

Taxpayer: The taxpayer for property taxes is generally the owner of the property. However, in some countries, the tax liability extends to those who have the right to use the property (for example, in cases where land is publicly owned

and managed by the state, such as in Vietnam). In cases where ownership is unclear, the person directly using the property is required to pay the tax (as seen with Taiwan's land tax) according to provisions outlined in Article 4 of Taiwan's Housing Tax Act.

Tax basis: The tax base for property taxes is typically based on the market value of the property at the time of taxation. In cases where determining the market value is difficult, a tax value set by the government is applied, adjusted periodically according to the economic and social development phase.

**3.2 Overview of the formation and development of property tax law in Vietnam**

In Vietnam, property taxes have been in place for a long time and are regulated by laws such as the Agricultural Land Use Tax Law and the Non-Agricultural Land Use Tax Law. However, over time, alongside changes in national policies and the market economy, these property taxes have not seen significant changes. This has sometimes led to outdated regulations that no longer align with the current realities. The amount of tax collected from property use only accounts for about 0.036% of GDP (while the property tax/GDP ratio in developing countries in the Asia region is around 2% of GDP), meaning that this figure is hundreds of times lower than that of other countries in the region. (Trung, 2018)

Recognizing the importance of establishing a Property Tax Law, especially for real estate, over the past years, many drafts of the Property Tax Law in Vietnam have been introduced. However, the approach has not been unified, and many aspects still need to be reviewed and refined. Therefore, the enactment of the Property Tax Law in Vietnam has not yet been realized. Specifically, since 2008, the Ministry of Finance has drafted the Property Tax Law, but it was unable to present it to the National Assembly due to receiving many conflicting opinions. At the end of 2009, the Ministry of Finance introduced the Land and Housing Tax Law draft for public opinion with the expectation that the government would review and discuss it in the August 2009 meeting. If passed by the National Assembly, the law would have taken effect from January 1, 2011. However, for various reasons, the land and housing tax law project was not enacted. (Minh, 2022)

Following that trajectory, at the beginning of 2018, the Ministry of Finance once again announced a proposal for the Property Tax Law draft. However, this draft was once again left unresolved. Experts argue that the issue with the 2018 Property Tax Law draft was not related to its complexity, sensitivity, or difficulty, but rather to some of the provisions being inappropriate. Moreover, the proposed tax rates in the draft were significantly higher than the existing laws at the time. According to Article 8 of the draft Property Tax Law, for non-agricultural business production land and non-agricultural land used for business purposes, the draft presents two options: First, non-agricultural business production land used for restaurant construction would have a tax rate of 0.52%; other non-agricultural business production land would have a tax rate of 0.3%. Second, non-agricultural business production land and non-agricultural land used for business purposes would be taxed at a rate of 0.3%. Meanwhile, the current law applies a tax rate of 0.03% for non-agricultural business production land and non-agricultural land used for business purposes, as stipulated in Article 2 of Circular 153/2011/TT-BTC. Therefore, increasing the tax rate to such a high level immediately without a clear roadmap would be difficult to implement in practice, particularly as it would be hard to gain societal consensus on the new regulation. This is an issue that the legislative body must thoroughly research and assess to find a suitable figure that balances the interests of the state and taxpayers. Additionally, the draft Program for Law and Ordinance Development for 2024, adjusted in 2023 by the Ministry of Justice, includes a proposal for the enactment of a Real Estate Tax Law. As of now, property taxes are still under research and development, and the draft law is still being refined.

Thus, Vietnam has also begun developing regulations on property taxes related to real estate, similar to other countries around the world. However, to date, the regulations still face some obstacles and have not yet been fully implemented. Overall, the proposed property tax rates for real estate are nearly equivalent to the tax rates applied in many countries worldwide, meeting the integration requirements. Other issues, such as determining taxable entities and taxpayers, are also relatively compatible with current tax laws and the regulations of other countries. Regarding property values for tax assessment, Vietnam uses market prices and the size of the property, which is similar to most countries worldwide. However, a difference compared to many countries is that Vietnam does not distinguish between

taxes on first-time properties and subsequent properties.

Overall, the draft laws regarding property taxes for real estate have initially recognized the correct direction for taxing the necessary real estate. Factors such as the legal basis for the law and taxable entities have been studied and developed based on many theoretical grounds. However, in practice, these drafts face challenges in being passed because they have not yet clarified the purpose, the appropriate regulatory approach, or laid out a specific roadmap for increasing tax rates. Therefore, these drafts have remained at the research and commentary stage for a prolonged period without being passed or implemented. Meanwhile, the enactment of the Property Tax Law is becoming increasingly urgent.

### 3.3 Assessment and recommendations on the development of the Law on Property Tax on real estate in Vietnam

#### 3.3.1 The necessity of establishing property tax laws related to real estate

Currently, property taxes on real estate are common in most countries around the world and are an important part of the tax legal system in each country. This is linked to the role of property taxes in generating stable revenue for the state budget, regulating the market, and ensuring social fairness, especially in contributing to the fight against property speculation. In Vietnam, researchers and policymakers argue that a property tax law should be developed soon to address socio-economic issues. Specifically:

*Firstly, the regulation of property taxes on real estate helps improve the national tax system, aligning it with international standards in the field of taxation.* The establishment of a Property Tax Law for real estate would not only meet the requirements of management and social regulation but also help harmonize with tax laws in most countries around the world. As of 2018, 174 out of 193 countries worldwide apply this form of tax, with different names, including: Property Tax (in 65 countries such as India, South Korea, Japan, Serbia, Slovenia, Canada, Puerto Rico, France, the United States, Switzerland, etc.); Real Estate Tax (51 countries); Land Tax (30 countries); Land Use Tax; House and Land Tax... and these are usually levies applied during the land use process. (Theory, practice of countries on property tax and policy orientation for Vietnam, 2018)

*Secondly, property taxes contribute to increasing revenue for the state budget*. In many countries around the world, property taxes play an important role in the structure of public revenue. This is a stable source of income, and the monitoring and control of revenue are easier compared to other types of taxes. Property taxes related to real estate do not require competition or are limited by international agreements, making it easier for regulatory agencies to plan the projected budget revenue. Therefore, the establishment and application of property taxes should also be considered and recognized in Vietnam. Additionally, due to its stability, this type of tax helps fill gaps in other tax structures, such as import and export taxes. This is because import and export taxes in each country are currently dependent on many objective factors, such as the regional and global market economy, cooperation among parties, and membership in global economic organizations.

*Thirdly, property taxes on real estate contribute to regulating the real estate market.* The urgency of applying property taxes becomes clearer when the gap between the wealthy and the middle- and low-income groups in society continues to widen. Currently, some individuals with substantial resources are accumulating property, particularly land and houses, which increases real estate prices and makes it harder for the poor to access housing. The reality of low tax rates leads to economic consequences such as: (1) people are inclined to save money by investing in real estate, leading to increased land speculation and higher property prices, which both weakens the economy's competitiveness and makes it difficult to solve housing problems for low-income individuals. An unstable real estate market, coupled with an economy unable to channel funds into productive investment, occurs because people prefer to store savings for speculation. However, considering the impact of taxes on land and housing prices, in the short term, when other factors remain unchanged, taxing will increase property prices. In the long term, theoretically, when speculators exit the real estate sector, the supply of property for those with genuine needs will increase, and prices will decrease. In reality, however, property prices may not decrease significantly and may even rise in some countries that have implemented high property tax rates. Nevertheless, property taxes have a stabilizing effect and help limit excessive increases in land and housing prices. (Poghosyan, 2016) In addition, if a high tax rate is applied to vacant properties, it will also help bring these properties into use and reduce resource wastage.

*Finally, property taxes contribute to ensuring social equity*. This is both a role and a goal of property tax laws, aiming to ensure fairness among organizations and individuals regarding the right to own and use property. Fairness is reflected in the fact that taxpayers will pay the same tax rate for the same type of property, regardless of the quantity or intended use of the property. This includes considering and calculating the circumstances and conditions of the taxpayer, especially during times of economic hardship and a heated real estate market, as is the case today. Property taxes ensure social equity by redistributing income across different social classes, thus reducing income inequality.

**3.3.2 Some proposals for developing property tax laws on real estate**

Based on the analysis, evaluations, and references to the experiences of other countries in developing and applying property tax laws, the authors propose the following content regarding property taxes on real estate:

*First, regarding the taxable objects*

As identified, the taxable objects under the property tax law on real estate will mainly include houses, land, and buildings for commercial purposes. Countries can choose to tax land and houses as a unified asset or as two separate assets; they may tax all land and buildings or only tax the second house or property, as a pilot example in China. Some countries tax only land, not houses, such as Jamaica, Kenya, and New Zealand, or conversely, tax only houses, not land, as seen in Tanzania, Ghana, and Haiti. (Kelly, Roy; White, Roland; Anand, Aanchal, 2020)

In addition, property tax policies should clearly define which objects are exempt or not subject to tax. Most countries exempt properties used for public purposes, such as land for national defense, religion, education, healthcare, transportation infrastructure, cemeteries, etc. To support economic sectors, some countries also exempt agricultural or tourism-related properties from tax.

The basis for calculating property tax is typically based on the area and/or value of the property. When setting the tax threshold, countries can choose area, for example, taxing land with an area of 60m² or more, or value, such as taxing houses with a value of 1 billion VND or more. The property tax calculation can also combine both area and value, meaning it is based on the land size and adjusted according to factors like location, characteristics of the property, and its intended use to determine the tax amount. Although this method is simple, very few countries tax purely based on area. This is because taxing based on area equates the value of the asset and does not ensure fairness (Lan, 2022).

In Vietnam, the current trend in the development of property tax is to determine the tax payable based on the area and the purpose of using the real estate, with consideration given to separately assessing taxes for houses, land, and construction works. From the authors' perspective, this approach is reasonable given the current real estate market situation and the economic-social conditions in Vietnam. However, the determination of taxable and exempted entities should be based on one of two methods: (1) clearly specifying a list of types of houses and land not subject to tax, or (2) setting a tax exemption threshold, which should consider other exempted entities, such as religious heritage. Regulations on this issue need to reference the new provisions in the 2023 Housing Law, the 2023 Real Estate Business Law, and the 2024 Land Law to ensure consistency. The 2018 Property Tax Bill already provides a fairly complete list of taxable entities in the direction mentioned above. However, the bill needs to consider a new category of construction works with mixed-use functions serving multiple purposes (as per Clause 2, Article 5 of the 2023 Real Estate Business Law). In this case, the determination of taxable and exempted entities should clarify whether the tax should be based on the general purpose of the entire structure or separately for each section of the structure.

In general, the key issue in determining taxable entities is clarifying which entities are subject to property tax and which are exempt. The draft law should define the tax base based on the purpose or area of the real estate and whether to impose taxes separately on each entity, such as houses, land, and construction works, or treat them as a unified entity. This issue is crucial for property tax. It helps avoid overlapping tax responsibilities and enhances the effectiveness of the tax when applied in practice.

*Second, regarding the taxpayer*

Countries around the world generally define the taxpayer for property tax on real estate as the owner, user, or the person entrusted with the use or benefits of the property. However, the 2018 Draft Property Tax Law does not clearly define the entrusted party as a taxpayer. It is suggested that lawmakers consider adding this category to the group of taxpayers to align more closely with international practices. This provision would also cover cases where someone

bears the burden of the property tax.

In addition, in item b, clause 3, Article 4 of the 2018 Draft Property Tax Law, it is stated that if there is an agreement, the tenant may be the taxpayer. This provision is inherited from the tax regulations on non-agricultural land use. However, there is a flaw in this approach. The taxpayer may exploit the tax threshold provisions to avoid tax. Specifically, if the value of the property exceeds the taxable threshold, the property owner could rent to multiple tenants, and each tenant's rental value would not exceed the taxable threshold. This method is easily applicable to properties that can be divided, such as houses with many rooms or floors. This leads to unfairness in the property tax regulation system. (Nam, 2018). Thus, the draft law needs to consider adding provisions to address this issue, contributing to the effective application of the regulation in practice.

*Third, regarding the tax valuation*

Most countries today apply market value, rental value, or a value set by the government for tax purposes. According to the 2018 Draft Property Tax Law, Vietnam applies the land price table issued by the provincial People's Committees at the time of tax calculation. With the change in the land price table cycle under the 2024 Land Law from a five-year schedule to an annual schedule, it will better reflect market prices in accordance with economic conditions over time. Additionally, the inclusion of new methods for determining land value in the 2024 Land Law may play an important role in perfecting the tax valuation for the Property Tax Law related to land. For houses and buildings, the draft law determines the tax valuation based on the grade and type of the property. However, given the practical realities and characteristics of real estate, the draft law should also consider other factors, such as land structure and the materials used in construction, to better align the valuation with the actual value of the property. (Phan Phuong Nam, Tran Minh Hiep, 2018)

*Fourth, about tax rates*

The determination of the tax rate must ensure a balance between the need to mobilize resources for the state budget, the tax-paying ability of different groups, and the overall development of the economy. Additionally, lawmakers may choose to adopt a progressive tax rate system based on the value of the property, applying higher tax rates to vacant or unused properties in order to optimize the actual use of real estate. (Tuan, 2018) To prevent speculation and ease the tax burden on low-income groups, different tax rates could be considered for various regions across the country, with tax policies targeting properties starting from the second house or those exceeding a certain value. For regions experiencing high property speculation or prolonged housing price inflation, the draft law may include specific provisions that apply higher tax rates in these areas when certain pre-identified conditions are met. Thus, criteria for real estate speculation behavior should be defined in order to apply taxes that prevent speculation, such as: owning multiple properties, holding properties for less than five years, owning vacant properties, or owning properties by high-income individuals. Additionally, the tax policy should consider introducing a capital gains tax on real estate transactions. Individuals who generate significant profits from real estate transactions would be subject to higher capital gains taxes. (Son, 2022) The draft law proposes a 1% tax rate on unused land and houses (combined with land used for improper purposes). However, this rate should be aligned with international standards to foster social consensus and effectively limit speculation. Furthermore, for houses and buildings, the implementation of property tax should be gradual, as immediately imposing a high tax rate could destabilize the economy and society. A more suitable approach would be to start with a lower tax rate on houses and buildings, with a progressive tax rate based on the value or area of the property or building. This would help regulate the market and ensure social equity while promoting economic growth.

*Fifth, regarding tax collection management*

Property tax is a type of tax that requires coordinated efforts in the construction and management of data information. Identifying taxable assets and their owners (or other individuals responsible for paying taxes) is often linked to the land registration system. Furthermore, to apply property tax, the infrastructure related to real estate data must be thoroughly prepared; there must also be an effective coordination mechanism between relevant agencies in collecting, updating, and sharing information about houses and land. A current challenge for many countries, particularly developing ones, including Vietnam, is that information about houses and land is often stored and managed

by different agencies. Additionally, the system for storing information related to asset transfers is incomplete and not standardized.

Moreover, to enhance tax management efficiency, mechanisms to encourage and facilitate voluntary tax compliance should be strengthened through raising awareness among taxpayers. This requires tax authorities to clarify the connection between the tax obligations that taxpayers must fulfill. Improvements in infrastructure and public services funded by this revenue should also be implemented in parallel. (Tuan, 2018)

## IV. CONCLUSION

In conclusion, property taxes on real estate play a significant and necessary role in generating government revenue, regulating the real estate market, and ensuring social balance. Therefore, Vietnam can refer to the legal experiences of property taxes in countries worldwide, while considering the economic and social context, to develop and apply the Property Tax Law on real estate. Based on evaluations and observations of the actual situation regarding the development and implementation of property taxes on real estate in Vietnam, as well as property tax regulations in various countries, the authors propose several suggestions for improving the legal framework of property taxes on real estate.

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# ENHANCING FINANCIAL TRANSPARENCY TOWARDS SUSTAINABLE DEVELOPMENT GOALS: THE ROLE OF DIGITAL ACCOUNTING WITH SUPPORT FROM LEADERS

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**ABSTRACT**

This study aims to examine the relationship among leadership support, digital accounting, and financial transparency, thereby testing how these factors contribute to sustainable development. A total of 200 small and medium enterprises (SMEs) in Ho Chi Minh City, Vietnam were selected as the sample for the study. Structural equation model is applied to test the research relationships. The research findings indicate that leadership support has a positive effect on the level of digital accounting adoption and financial transparency. While the level of digital accounting adoption has a positive effect on sustainable development and financial transparency and financial transparency has a positive effect on sustainable development. Findings from this research are expected to provide valuable insights for organizations seeking to leverage digital accounting for improved financial transparency and sustainable development.

*Keywords*: “Digital Accounting”, “Financial Transparency”, “Leadership Support”, “Sustainable development”.

## I. INTRODUCTION

Small and medium-sized enterprises (SMEs) are the backbone of Vietnam's economy, playing a vital role in job creation, fostering innovation, and contributing significantly to the nation's GDP. However, in today's competitive landscape, financial transparency is paramount for sustainable growth. This is where digital accounting emerges as a game-changer for SMEs in Vietnam. By embracing digital tools, SMEs can automate processes, minimize errors, and gain real-time access to financial data. This enhanced transparency strengthens trust with stakeholders, improves resource allocation, and facilitates informed decision-making (Troshani, I et al, 2019). Ultimately, digital accounting empowers Vietnamese SMEs to navigate the market effectively, achieve their financial goals, and contribute to a more sustainable future, aligning with Vietnam's overall development trajectory (Pham, Q. H., & Vu, K. P, 2022).

Financial transparency is a cornerstone for sustainable growth of SMEs in Vietnam. This transparency fosters trust with stakeholders, including investors, creditors, and customers. When stakeholders have clear and reliable financial information, they are more likely to invest in the SME, offer favorable credit terms, and choose the SME's products or services. This translates into increased access to capital, improved financial stability, and ultimately, a stronger foundation for long-term growth (Jaffar, N et al, 2012) . Additionally, financial transparency allows SMEs to identify areas for improvement in resource allocation and cost management (Francis J et al, 2004). By making data-driven decisions based on accurate financial information, SMEs can optimize their operations, reduce waste, and ultimately achieve more sustainable growth (Je zovita, A., 2015). In essence, financial transparency empowers Vietnamese SMEs to not only expand their businesses but also do so in a responsible and efficient manner, contributing to a more sustainable future for themselves and the Vietnamese economy.

Leadership support plays a pivotal role in driving the adoption and successful implementation of digital accounting for sustainable growth. Strong leadership commitment fosters a culture of innovation and creates the necessary buy-in from all levels of the organization. Leaders who champion digital transformation empower their teams to embrace new technologies and processes (Northouse PG, 2010). This includes allocating resources for training, infrastructure, and software. Additionally, leadership support ensures clear communication and strategic alignment between digital accounting initiatives and overall sustainability goals (Breuer, S et al, 2019). By demonstrating strong leadership and a commitment to both digitalization and sustainability, organizations can position themselves for long-term success and contribute meaningfully to a more responsible and environmentally conscious future (Yuki G, 2006).

To further clarify the influence of factors such as leadership support on the level of digital accounting application

and the effect of this result on financial transparency and sustainable development, the following sections of this study will clarify the research theory, research methods and research results achieved along with discussions related to the research results.

## II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This study employs a multi-theoretical approach to explain the relationship of factors in research model. The Resource-Based View (RBV) can provide a deeper understanding of how digital accounting capabilities can contribute to sustainable competitive advantage. By examining digital accounting as a strategic resource, we can analyze its role in enhancing organizational performance and creating value. RBV allows us to explore how firms can leverage their digital accounting capabilities to differentiate themselves from competitors and achieve sustainable development. Agency theory is incorporated to explore the potential conflicts of interest between management and shareholders, and how digital accounting can mitigate these issues. Finally, institutional theory is employed to analyze the external pressures and industry norms that shape the adoption and implementation of digital accounting practices.

### 2.1 Leadership support in relationship with Digital accounting and Financial transparency

Leadership support is a critical factor influencing on digital accounting and sustainable development. Strong leadership is essential in driving the adoption and effective implementation of digital accounting systems. By championing digital transformation and allocating necessary resources, leaders can create an organizational culture that embraces innovation and efficiency. Moreover, effective leadership ensures that digital accounting initiatives are aligned with overall sustainability goals. Conversely, a lack of leadership support can hinder the adoption and utilization of digital accounting technologies, limiting their potential effect on financial (House, R et al, 2004).

- H1: Leadership support has a positive effect on Digital accounting
- H2: Leadership support has a positive effect on Financial transparency

### 2.2 Digital Accounting in relationship with transparency and Sustainable development

Digital accounting has emerged as a powerful tool for enhancing financial transparency within organizations. By automating manual processes, improving data accuracy, and providing real-time insights, digital accounting systems enable organizations to generate more comprehensive and reliable financial information. This increased transparency is facilitated through features such as automated data capture, robust reporting capabilities, and advanced analysis. Moreover, digital accounting systems often employ robust internal controls and audit trails, reducing the risk of errors and fraud, thereby further bolstering financial transparency (Troshani, I et al, 2019). Consequently, stakeholders, including investors, creditors, and regulators, can access and analyze financial data more efficiently, fostering trust and confidence in the organization's financial health (Amanamah, R. B et al, 2016). Digital accounting also plays a pivotal role in achieving sustainable growth by providing organizations with the data and insights necessary to make informed decisions. By automating financial processes and generating real-time reports, digital accounting systems enable organizations to identify areas for efficiency improvements, reduce waste, and optimize resource allocation (Shan, 2021).

- H3: Digital accounting has a positive effect on Financial transparency
- H4: Digital accounting has a positive effect on Sustainable development

### 2.3 Financial transparency in relationship with Sustainable development

Financial transparency is important for sustainable growth by fostering trust, accountability, and informed decision-making (Shuraki, M. G et al, 2021). When organizations openly disclose their financial performance, including environmental and social effects, they build credibility with stakeholders, including investors, customers, and communities. This trust can lead to increased investment, stronger partnerships, and a positive reputation (Nguyen, T. H et al, 2020). Furthermore, financial transparency enables organizations to identify areas for improvement, allocate resources effectively, and mitigate risks. By providing a clear picture of the company's financial health, transparency empowers organizations to make strategic decisions that align with long-term sustainability goals (Shaughnessy & Goulding, 2021)

- H5: Financial transparency has a positive effect on sustainability development.

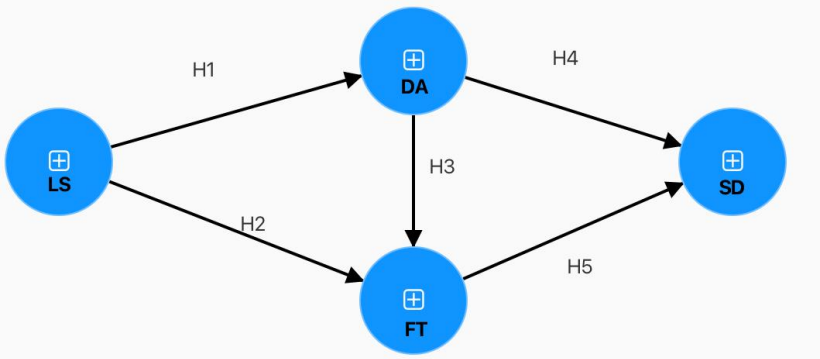



**Fig1. Research Model**

## III. RESEARCH METHODS

### 3.1. Sample and Data Collection Procedure

This research focused on SMEs in Ho Chi Minh City, Vietnam. The participants who responded to the survey including: accounting staff, chief accountants and managers at all levels related to the use of accounting information to make decisions. A total of 200 questionnaires were distributed, resulting in 165 usable responses, yielding an effective response rate of approximately 82,5%. This response rate is considered satisfactory (Hilali, W. E et al, 2020).

### 3.2. Measurement

To measure the research variables, a 5-point likert scale was used for latent variables such as: leadership support, financial transparency and sustainable development. For digital accounting variable, it is measured by scoring in the following order: Score 1 if the company only uses Excel for accounting; Score 2 if the company uses separate accounting software; score 3 if the company uses cloud accounting; Score 4 if the company uses enterprise resource management software (ERP) and score 5 if the company uses AI in accounting processing. Leadership support was evaluated through a six-item scale that examined the support of leadership for using digital accounting. Financial transparency was evaluated through a five-item scale to examine characteristics related to financial transparency such as full disclosure, ease of access, objectivity, honesty and auditing. Sustainable development was evaluated through a six-item scale that examined factors related to sustainable development such as: increasing sales, reducing operating costs, improving compliance, increasing investor's trusting, easy access to capital in society and improve the effectiveness of decisions.

### 3.3. Data Analysis

Data analysis for this study employed Partial Least Squares Structural Equation Modeling (PLS-SEM), conducted using SmartPLS 4.0 software. PLS-SEM was selected due to its suitability for examining complex relationships between latent variables, which are represented by multiple indicators. This method is particularly advantageous when dealing with models involving exogenous, moderating, and endogenous variables (Hair et al., 2017; Nitzl, 2016).

## IV. RESULTS AND DISCUSSION

### 4.1 Measurement Model analysis

The initial step in the PLS-SEM process involves assessing the measurement model to confirm its reliability and validity (Hair et al., 2017; Kock, 2020). As indicated in Table 1, outer loading Matrix require indicators in each latent variable should be higher than 0.7 (Hair et al., 2017). The results show that variable FT2 has an outer loading index less than 0.7, so this variable will be removed and ask the diagram to run again a second time.

**Table 1. Outer loading Matrix**

| | DA | FT | LS | SD |
|---|---|---|---|---|
| **DA** | 1 | | | |
| **FT1** | | 0.900 | | |
| **FT2** | | 0.499 | | |
| **FT3** | | 0.903 | | |

| | | | |
|---|---|---|---|
| **FT4** | 0.900 | | |
| **FT5** | 0.788 | | |
| **LS1** | | 0.871 | |
| **LS2** | | 0.852 | |
| **LS3** | | 0.906 | |
| **LS4** | | 0.806 | |
| **LS5** | | 0.836 | |
| **LS6** | | 0.736 | |
| **SD1** | | | 0.820 |
| **SD2** | | | 0.836 |
| **SD3** | | | 0.788 |
| **SD4** | | | 0.845 |
| **SD5** | | | 0.810 |
| **SD6** | | | 0.841 |

After removing the FT2 variable, the next step will be to test the reliability and discrimination values of the scales. As indicated in table 2 and table 3, the model demonstrates satisfactory reliability, with both composite reliability and Cronbach's alpha exceeding the recommended threshold of 0.70 (Hair et al., 2017; Kock, 2020). Convergent validity is also established, as all item loading surpass 0.70 and are statistically significant ($p < 0.01$). Furthermore, the Average Variance Extracted (AVE) values for all constructs exceed the 0.50 criterion, providing additional evidence of convergent validity.

**Table 2: Reliability and validity test results**

| | Cronbach's alpha | Composite reliability (rho_a) | Composite reliability (rho_c) | Average variance extracted (AVE) |
|---|---|---|---|---|
| **FT** | 0.919 | 0.939 | 0.943 | 0.806 |
| **LS** | 0.914 | 0.922 | 0.933 | 0.699 |
| **SD** | 0.905 | 0.908 | 0.927 | 0.678 |

**Table 3: Discriminant Validity - Fornell Larcker Criterion**

| | DA | FT | LS | SD |
|---|---|---|---|---|
| **DA** | 1 | | | |
| **FT** | 0.228 | 0.898 | | |
| **LS** | 0.816 | 0.430 | 0.836 | |
| **SD** | 0.402 | 0.533 | 0.603 | 0.824 |

To check whether observed variables have multicollinearity or not, the VIF coefficient test is used (Hair et al., 2017), if the observed variable has VIF>= 5, multicollinearity will occur. Accordingly, it needs to be eliminated before continuing to test the structural model. According to the results shown in table 4, there are two variables LS1 and LS2 with VIF index is higher than 5, so these two variables will continue to be eliminated from the research model.

**Table 4: Multicollinearity statistics (VIF)**

| | VIF |
|---|---|
| **DA** | 1 |
| **FT1** | 4.286 |
| **FT3** | 4.684 |
| **FT4** | 3.573 |
| **FT5** | 2.050 |
| **LS1** | 5.502 |
| **LS2** | 5.036 |

| | |
|---|---|
| **LS3** | 4.236 |
| **LS4** | 2.932 |
| **LS5** | 4.516 |
| **LS6** | 2.532 |
| **SD1** | 3.679 |
| **SD2** | 3.608 |
| **SD3** | 2.170 |
| **SD4** | 2.859 |
| **SD5** | 2.657 |
| **SD6** | 3.077 |

### 4.2 Structural model analysis

After FT2; LS1; LS2 variables was removed from the research model due to insufficient standards for scale quality. The remaining variables will be tested in the structural model to test hypotheses. Table 5 below shows the results that all 5 hypotheses are accepted (Pvalues <0.05) which means that leadership support has a positive effect on the level of digital accounting and financial transparency, at the same time digital accounting has a positive influence on sustainable development and financial transparency, finally financial transparency positively affects the sustainable development of small businesses and medium in Ho Chi Minh City, Vietnam.

This result is consistent with the theory of RBV and stakeholder theory, because if businesses know how to take advantage of resources to improve technology in accounting processing, they will create a competitive advantage in the future through information transparency, thereby contributing to increasing the trust of stakeholders and helping businesses access capital more easily and help businesses develop more sustainably (Al-Dmour, A.H, 2018).

**Table 5. Path coefficients and P-value results**

| | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | Conclusion |
|---|---|---|---|---|---|---|
| **DA -> FT** | 0.209 | 0.215 | 0.088 | 2.371 | 0.0180 | H4 Supported |
| **DA -> SD** | 0.297 | 0.301 | 0.075 | 3.95 | 0.0000 | H3 Supported |
| **FT -> SD** | 0.465 | 0.457 | 0.076 | 6.09 | 0.0000 | H5 Supported |
| **LS -> DA** | 0.686 | 0.691 | 0.055 | 12.588 | 0.0000 | H1 Supported |

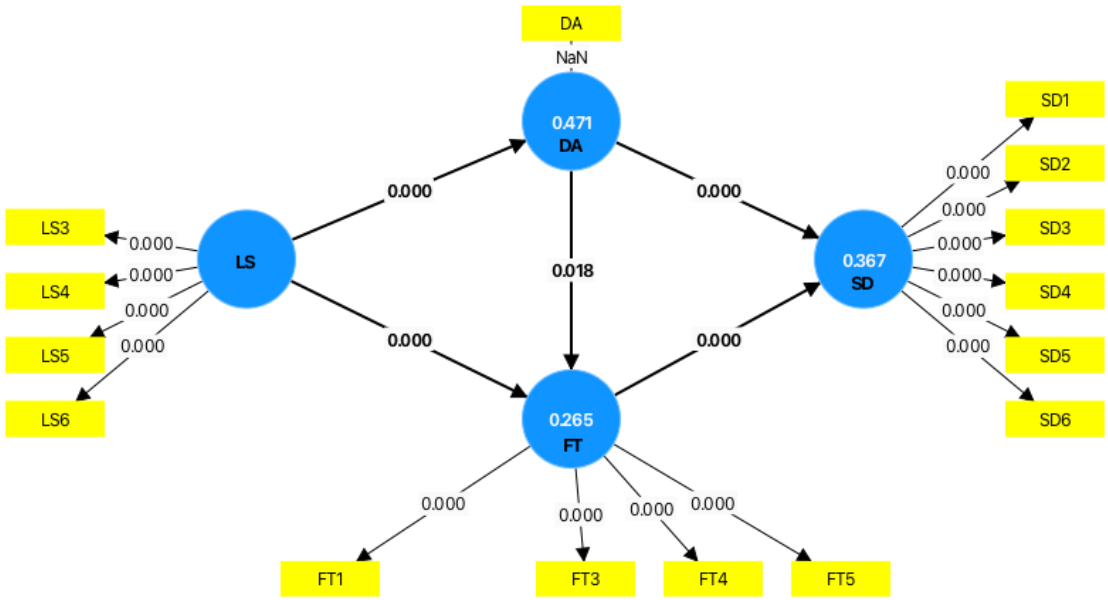



**Fig2. Structural model result**

## IV. CONCLUSION

This study has demonstrated a clear and positive relationship between leadership support, digital accounting, financial transparency, and sustainable development. The findings underscore the critical role of managerial backing in driving the adoption of digital accounting systems. Furthermore, the study reveals that digital accounting significantly contributes to both financial transparency and sustainable development. Importantly, enhanced financial transparency is shown to positively effect sustainable development outcomes. Improve their financial performance and contribute to a more sustainable future. By investing in leadership development, fostering a supportive environment for digital accounting, and prioritizing financial transparency, organizations can unlock the full potential of these interconnected factors.

Future research could explore the moderating effects of organizational size, industry, and geographical context on the relationships examined in this study. Additionally, investigating the long-term effects of these factors on sustainability performance would provide valuable insights for policymakers and practitioners.

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# SESSION 5: TOURISM AND ENVIRONMENTAL MANAGEMENT

# VALUING THE CARBON STORAGE CAPACITY OF MANGROVES IN KIM SON DISTRICT, NINH BINH PROVINCE

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## ABSTRACT

Based on the value transfer method, the study applies the carbon accumulation results for Trang trees (Kandelia obovata); the carbon accumulation results for Ban trees (Sonneratia caseolaris). For the carbon storage capacity in mangrove sediments, the study applies the carbon sequestration coefficient in global mangrove sediments through the study of MacKenzie et al., 2016. Combining the market price method, the study estimates the $CO_2$ reduction value of Kim Son mangrove forest at 99 thousand USD/ha/year. In Kim Son mangrove forest, through this study, there have been quantitative calculations for carbon sequestration services, so it is recommended that localities continue to study and calculate more closely to meet the needs of fair exchange as a basis for applying the payment mechanism for mangrove environmental services.

*Keywords*: "carbon sequestration", "carbon storage", "mangrove forest", "Kim Son district"

## I. INTRODUCTION

### 1.1. Background of the study

Mangroves are highly productive tropical and subtropical ecosystems characterized by the important ecosystem services and functions they provide, central to the welfare of many coastal communities (McNally et al., 2011). Mangroves are also regarded as disproportionately important to global carbon sequestration and storage, given the small area they cover 147.000 $km^2$ and account for a majority of carbon stored in estuarine ecosystems (McLeod et al., 2011). Their role as carbon storers has been further highlighted by studies stating that mangroves should be an integral part of policy initiatives that seek to reduce carbon emissions through reductions from forest emissions.

It found that between 1996-2020, global mangrove coverage decreased by 3.4 per cent – or 5,245 km2 – however, encouragingly in recent years mangrove decline has stabilised, with gains around many of the world's large rivers, estuaries and deltas offsetting further losses (Understanding how mangrove loss threatens biodiversity - UNEP-WCMC). In Vietnam, mangrove forests decreased rapidly in the period 1943-2000 from 450,000 ha to 155,290 ha, mainly due to war, conversion of forest land to agricultural production, aquaculture and urbanization (Sam et al., 2005).

The decline in both quantity and quality of mangrove forests is due to causes such as industrialization, urbanization, conversion of land use purposes, exploitation of timber and charcoal, especially large-scale aquaculture development (Balsco, 2001).

The Kim Son coastal mangrove forest has an area of 719 hectares (Kim Son District Statistical Yearbook, 2023) and is a green wall to protect the environment, break waves to protect sea dykes, stabilize coastal mud, increase nutrients for marine animals, a habitat for many migratory birds, and provide seafood for humans, etc. In particular, the Kim Son coastal area with a diverse ecosystem is an important part of the buffer zone and transition zone of the Red River Delta Interprovincial Coastal Wetland World Biosphere Reserve. The mangrove forest area decreased the most in the period 2000-2015 (decreased by 438.48 hectares, equivalent to 47.9%) due to conversion to aquaculture (Nguyen Thi Thu Ha, 2024).

According to a field survey, in 2024, when the mangrove forest area decreased significantly, people in the coastal area of Kim Son district were always worried every time the rainy season began. At that time, high tides submerged many areas of crops, ponds raising aquatic products, and some households had to evacuate... Currently, mangrove forests are of interest to the state, many domestic and international organizations have supported localities to plant mangrove and parrot trees to prevent waves and sea winds, so people can live and produce with peace of mind.

The loss of this valuable ecosystem largely arises from both market and policy failures, the non-market nature of the public benefits provided by mangrove forests (Bann, 1998). To solve this problem, it is necessary to understand the values of different types of resources. Economic valuation of resources is an effective solution to "monetize" the value of resources, which is an important basis for policy makers, authorities, and managers to choose the optimal solution for sustainable use of resources in the relationship between protection, exploitation, and use.

This paper initially studies the carbon accumulation potential in mangrove forests of Kim Son district using the value transfer method. In the mangrove forest area of Kim Son district, there is a study by Tran Duc Tuan and colleagues (2022) studying the accumulated carbon stock based on experimental methods (arranging survey lines, establishing standard plots, and analyzing in the laboratory). Experimental methods have the advantage of high accuracy, but are difficult to implement in limited conditions of time and budget. Beside that, there is also a study by Nguyen Thi Thu Ha, 2023 determining the $CO_2$ absorption value by the value transfer method applying carbon storage coefficients in the mangrove and Sonneratia trees from the documents of Nguyen Viet Thanh et al (2018) in Xuan Thuy mangrove forest, Nam Dinh, but there has not been a transfer according to the actual conditions of Kim Son mangrove forest. The present study applied carbon accumulation coefficients for K. obovata and Sonneratia caseolaris according to the documents of Nguyen Hong Hanh, 2015 with some similarities in the physiological characteristics of plants in Kim Son mangrove forest. In addition, this study also estimated the carbon storage capacity of mangrove sediments per year per unit area through the research results of Daniel M. Alongi, 2012 (based on data from 139 research sites worldwide). The research results of the article serve as a basis for effective management and use of mangrove resources in Kim Son district.

### 1.2. Research Questions

This study addresses 02 research questions:

- RQ1- What is the estimated (monetary) value of carbon sequestration by plants in Kim Son mangrove forest ?
- RQ2 - What is the estimated (monetary) value of carbon sequestration by soil in Kim Son mangrove forest ?

## II. MATERIAL AND METHOD

The forest type selected for research is pure Kandelia obovata and pure Sonneratia caseolaris.

The research object is the amount of carbon accumulated in 3 reservoirs: Carbon in plant biomass (stems, branches, leaves, roots) and the amount of carbon accumulated in the soil of the mangrove forest Kandelia obovata coastal planting in Kim Trung commune, forest Sonneratia caseolaris in Kim Hai commune, Kim Son district.

**Method of analysis and synthesis of documents**

The main method used in the topic is the method of collecting and processing information, studying secondary documents. The documents used in the study include studies on mangrove valuation in the world and in Vietnam, documents on Kim Son mangrove forests provided by the locality, Statistical Yearbook of Kim Son district in the years 2000, 2010, 2020, 2023.

**Value transfer method**

The value transfer method is a shortened method for estimating economic or monetary values based on the use of results from studies conducted elsewhere. This method can be applied to estimate all ecosystem services, but the use of this method depends on the location of the research site and the objective of the valuation.

The strength of this method is generally lower cost than primary data collection evaluation studies, is conducted relatively quickly and can be used as a rapid assessment technique before considering conducting larger-scale studies. The limitation of this method is that it depends heavily on the results of existing studies that are suitable or similar to the research site. To overcome this limitation, the study considered coefficients in areas with similar natural conditions and geographical proximity to Kim Son, Ninh Binh.

Carbon accumulation in mangrove biomass depends on tree type, tree age and trunk diameter (Nguyen Thi Hong Hanh, 2015, 2017, Tran Duc Tuan, 2022), so the study applied the calculation results of Nguyen Thi Hong Hanh, 2015, the amount of carbon accumulated in the biomass of mangrove trees and Sonneratia trees according to similar ages.

Assess the carbon accumulation rate of mangrove forests according to IPCC (2006), based on surveys to determine carbon reserves in reservoirs, calculate the average increase and decrease of carbon content according to the formula (1):

$$\Delta B = \frac{\Delta t2 - \Delta t1}{t2 - t1} \quad (1)$$

In which

ΔB: Carbon accumulation rate

Δt1: Carbon stock studied at study time t1

Δt2: Carbon stock studied at study time t2

Calculate the average amount of carbon dioxide (CO2) absorbed by the mangrove forest in a year using the formula (2) based on the study of IPCC (2006):

Total amount of CO2 absorbed (ton/ha) = Total accumulated carbon (ton/ha) x 3.67 (2)

In which: 3.67 is the conversion factor calculated for all forest types.

## III. RESULT AND DISCUSSION

### 3.1. Overview of Kim Son mangrove forest

The coastal mangrove forest of Kim Son district was formed in the delta of the Day and Can rivers. This place and the entire land south of the 20th parallel of Ninh Binh were honored to be recognized by UNESCO as the buffer zone and transition zone of the Red River Delta Biosphere Reserve. Kim Son mangrove forest was planted by the Vietnamese government, Japan and the Ninh Binh Forest Protection Management Board since 1995. It is mainly planted on coastal alluvial plains. The total forest area according to the Statistical Yearbook of Kim Son district in 2023 is 719 hectares. The entire area is currently contracted by forest owners to protect with contracted households according to the provisions of Decree 168/2016/ND-CP of the Government regulating the contracting of forests, orchards and water surface areas in special-use forest management boards, protection forests and State-owned agricultural and forestry single-member limited liability companies.

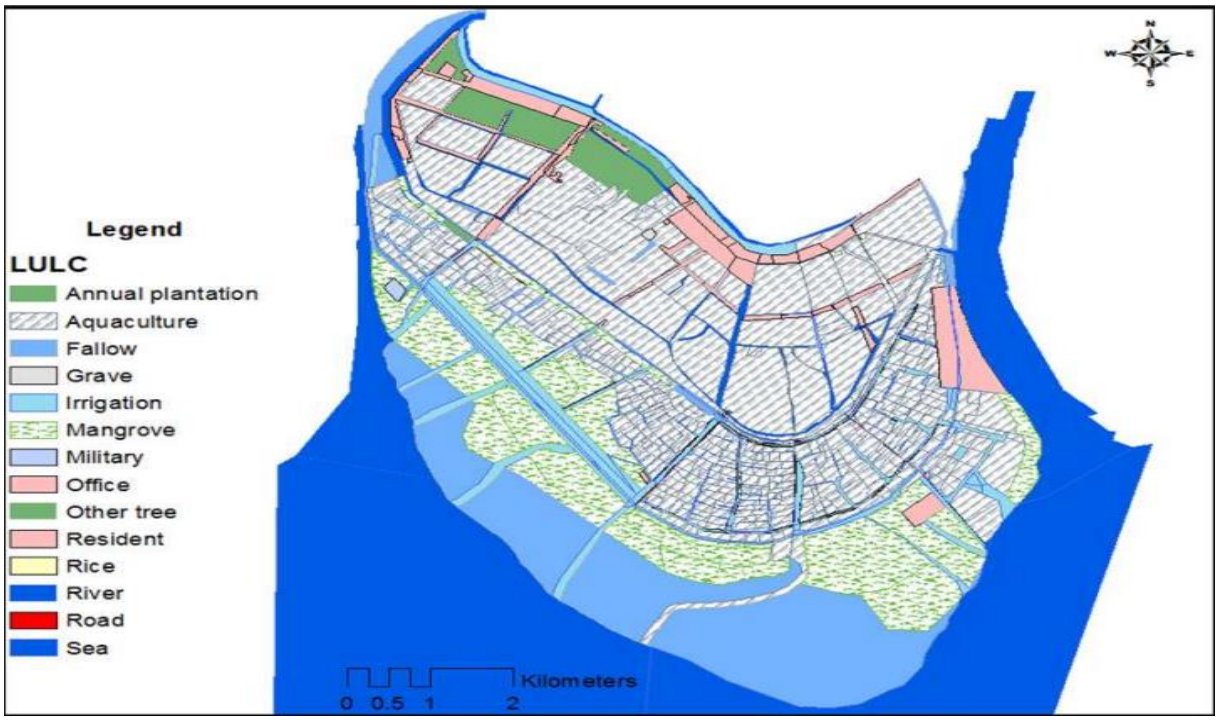



**Fig 1. Map of mangroves in Kim Son district, Ninh Binh province (Hong quang nguyen et al., 2019)**

The Kim Son coastal alluvial plain is a new land, and economic activities often take place, so the composition of mangrove species is not diverse. On the other hand, when the mangrove forest matures, the alluvial plain has encroached far into the sea and the sea encroachment activities have occurred. Therefore, the mangrove vegetation has

not changed much in terms of ecological succession in the community. That is the reason why the composition of mangrove species in Kim Son is lower than in neighboring areas and compared to the whole country. Sonneratia and Acanthopanax are considered suitable plants for the site conditions of the Kim Son coastal alluvial plain. Acanthopanax is grown a lot on the Can River side and reeds are concentrated on the Day River side.

Economically significant species in Kim Son mangrove forest include goby, cobia, halibut, nymph fish, wind crab, crab, shrimp, tiger prawn, clam, octopus, don, seaweed, curtain crab... used as food and water birds with biodiversity value. The rich food source for aquatic species is organic matter in the form of granular plants, which is the product of the decomposition process of plant matter, including: leaves, branches, buds, roots, flowers, fruits... of mangrove trees. Fallen branches, leaves, flowers, and fruits are used by many species, including crabs, which play an important role in decomposing leaves by tearing them into pieces so that the leaves decompose faster under the influence of fungi and bacteria (Nguyen Thi Thu Ha, 2023).

The Kim Son coastal mangrove forest has attracted a large number of people from coastal communes to exploit natural aquatic products and dig ponds for hire to make a living in different ways such as catching crabs, clams, crabs, and clams by hand, and setting up nets to catch small shrimp and fish. However, this form of destructive exploitation is a threat to the development and growth of newly planted forest areas (Nguyen Thi Thu Ha, 2023).

### 3.2. Determining the carbon storage capacity of mangrove forests in Kim Son district

Based on the IPCC guidelines (2006), assessing the carbon storage capacity of forests through 3 reservoirs: (1) carbon storage in above-ground biomass; (2) carbon storage in below-ground biomass; (3) carbon storage in soil is equivalent to (i) determining the carbon storage capacity of mangrove plants and (ii) determining the carbon storage capacity in mangrove sediments.

#### 3.2.1. Determining the carbon storage capacity of mangrove plants

To determine the carbon storage capacity of mangrove plants, it is necessary to first calculate the carbon storage capacity of mangrove trees. Kim Son mangrove forest has 02 main dominant communities, which are the Kandelia obovata and Sonneratia caseolaris communities.

In the coastal mangrove forests of Kim Son district, according to data analysis from the Statistical Yearbook of the years 2000, 2005, 2010, 2015, 2020, 2023, it was found that the most mangrove forests were planted in the periods 1995-2000 (1,686 ha of concentrated trees, 538,000 scattered trees), 2001-2005 (716 ha of concentrated trees, 295,000 scattered trees) and 2006-2010 (664 ha of concentrated trees, 311,000 scattered trees).

**Table 1. Results of coastal afforestation in Kim Son district through stages**

| | 1995-2000 | 2001-2005 | 2006-2010 | 2011-2015 | 2016 - 2020 | 2021-2023 |
|---|---|---|---|---|---|---|
| Concentrated new forest planting (ha) | 1.686 | 716 | 664 | 0 | 110 | 123 |
| Scattered tree planting (1000 trees) | 538 | 295 | 311 | 230 | 332 | 354 |

*Source. Statistical yearbook of Kim Son district for the years 2000, 2010, 2020, 2023*

Assuming that Kim Son mangrove forest was completely planted in 2010, the average age of the forest by 2023 is 13 years old. According to Tran Duc Tuan et al., 2022 in the study of accumulated carbon stocks of coastal mangrove forests planted in Kim Son district, Ninh Binh province, the parameters of mangrove trees in the standard plots of forest age 12 are as follows:

Applying the calculation results of Nguyen Thi Hong Hanh, 2015, the amount of carbon accumulated in the biomass of mangrove and mangrove trees according to the ages and carbon accumulation rates for these two types of trees (apply formula (1)) is as table 2:

**Table 2. Result of carbon accumulation rate in plant biomass from research Nguyen Thi Hong Hanh, 2015**

| | 10 year | 13 year | Carbon accumulation rate |
|---|---|---|---|

| | | | by tree type |
|---|---|---|---|
| Kandelia obovata | 1.60 kg/tree | 2.39 kg/tree | 0.263/kg/tree/year |
| Sonneratia caseolaris | 23.22 kg/tree | 37.23 kg/tree | 4.67/kg/tree/year |

*Source: Nguyen Thi Hong Hanh, 2015 and caculated by author*

According to the research results of (Tran Duc Tuan et al., 2022), the tree density in the pure mangrove and pure mangrove forests planted in 2010 (13 years old in 2023) is 7067 trees/ha and 2067 trees/ha, respectively. Carbon accumulation in mangrove biomass depends on the type of tree, tree age and trunk diameter (Nguyen Thi Hong Hanh et al.,2017; Tran Duc Tuan et al., 2022).

**Table 3. Average carbon accumulation rate per hectare and per year**

| | Density | Carbon accumulation rate per hectare and per year | Average carbon accumulation rate per hectare and per year in both biomes |
|---|---|---|---|
| Community Kandelia obovata | 7,067 tree/ha | 1.86 tons/ha/year | 5.76 tons/ha/year |
| Community Sonneratia caseolaris | 2,067 tree/ha | 9.65 tons/ha/year | |

*Source: Tran Duc Tuan et al, 2022 and caculated by author*

This result is lower than the research results of Tran Duc Tuan et al., 2022. In the study of Tran Duc Tuan et al., the carbon accumulation capacity of pure mangrove plantations is 14.80 - 15.38 tons/ha/year, the carbon accumulation capacity of pure mangrove plantations is highest at 28.87 - 51.56 tons/ha/year. This may be because the plant biomass in the study of Nguyen Thi Hong Hanh, 2015 is smaller than the plant biomass in the study of Tran Duc Tuan et al. 2022. Therefore, when inheriting the carbon accumulation coefficient of Nguyen Thi Hong Hanh, 2015, the carbon accumulation value of the current study is lower than the carbon accumulation value of Tran Duc Tuan et al. 2022 (the same research object is Kim Son mangrove forest).

**3.2.2. Determining the carbon storage capacity in mangrove sediments**

Through an overview of domestic and foreign documents, the value of carbon sequestration rate in mangrove soil is shown in the following table (Table 4).

**Table 4. Carbon sequestration rate in mangrove soil in some studies**

| Research location | Mangrove carbon accumulation rate (gram C/m2/year) | Reference |
|---|---|---|
| Mangroves in Vietnam (8 mangrove locations in Vietnam) | 121.0 ±6,1 – 602.7 ± 30.3 | (MacKenzie et al., 2016) |
| Mangrove forest in Hau Loc, Thanh Hoa, Vietnam | 632 - 994 | (Nguyen Thi Hong Hanh, Tran Hoang Anh Ngoc, 2017) |
| Mangroves in the world (139 locations in the world) | 174 | (Daniel M. Alongi, 2012) |
| Mangroves of the World (205 locations in the world) | 179.6 | Daniel M. Alongi, 2020 |

Through the above table, it can be seen that the carbon accumulation rate in mangrove soil in the study of MacKenzie et al., 2016 is the smallest (lower limit is 121 g $C/m^2$/year). The study applied the result of 121.0 g $C/m^2$/year to Kim Son mangrove soil, equivalent to 1.21 tons/ha/year.

**3.2.3. Estimation of carbon accumulation value in mangrove forests of Kim Son district**

The total amount of carbon stored in Kim Son mangrove forest (in soil and in plant biomass) per hectare is:

5.76 tons/ha/year + 1.74 tons/ha/year = 7.50 tons/ha/year

Calculate the average amount of carbon dioxide (CO2) absorbed by the mangrove forest in a year using the formula (2) based on the study of IPCC (2006). The $CO_2$ reduction of 1 ha the mangrove ecosystem of Kim Son district:

7.50 tons C/ha/year * 3.67 = 27.50 tons $CO_2$/ha/year

$CO_2$ reduction of the mangrove ecosystem of Kim Son district (719 ha):

27.50 tons $CO_2$/ha/year * 719 ha = 19,772 tons $CO_2$/year.

The price of 1 carbon credit as 5 USD ((Hai Hoa Nguyen et al., 2021), the value of carbon accumulation in the mangrove forest of Kim Son district in 1 year is: 98,862 USD/year equivalent to 99 thousand USD/year.

This study initially estimated the carbon accumulation value of mangrove forests in Kim Son district using the value transfer method. The research results can be used as a reference in decisions related to resource management. However, due to time and budget constraints, the study only considered vegetation at the age of 13 and did not take into account all factors affecting carbon accumulation in soil and in plant biomass. These issues are expected to be clarified in subsequent studies.

### 3.3. Some policy recommendations

Firstly, through the overview of the study, it is known that the carbon accumulation capacity of mangrove forests depends on the type of tree, age of the forest, tree density, and tree biomass, so it is necessary to study the design of mangrove belts so that the tree planting capacity is suitable for the site conditions of the study area.

Secondly, in Kim Son mangrove forest, through this study, there have been quantitative calculations for carbon sequestration services. Localities need to continue to study and calculate more closely to meet the needs of fair exchange as a basis for applying the payment mechanism for mangrove environmental services. Especially in the current context, Vietnam has a legal basis for implementing payment for environmental services (PES), which are the Law on Forest Protection and Development (2016) and the Law on Biodiversity (2018). PES has been widely recognized as a successful policy tool for natural resource management in more than 60 countries. These schemes have been applied to various ecosystem services internationally, including biodiversity conservation, river basin services, carbon sequestration and landscape beauty. In addition, a carbon payment mechanism is being piloted in Vietnam under Decree 156 and its extension to mangroves would make a positive contribution to the completion of a PFES policy for carbon. Furthermore, the carbon market and interest in carbon credits have been established for a long time, so potential buyers have a clear knowledge base and interest.

## IV. CONCLUSION

Mangrove forests are distributed in tropical and subtropical coastal estuaries, are one of the ecosystems with high biodiversity, they play an important role in coastal ecosystems, especially in low-lying coastal areas of developing economies. Regulating services of wetland ecosystem services are identified as maintaining air quality, regulating climate, filtering water and treating waste; regulating erosion, minimizing damage caused by storms, floods and sea level rise in coastal areas; carbon fixation.

Based on value transfer methods, combining the replacement value method and market price, the task of estimating the $CO_2$ reduction value of Kim Son mangrove forest is 99 thousand USD/ha/year. Currently, the payment for forest environmental services for mangrove forests in Vietnam is initially applied to 3 types of services: Maintaining landscapes for ecotourism business; providing spawning grounds, food sources, and seeds for aquaculture; carbon sequestration. In Kim Son mangrove forest, through this study, there have been quantitative calculations for carbon sequestration services, so it is recommended that localities continue to study and calculate more closely to meet the needs of fair exchange as a basis for applying the payment mechanism for mangrove environmental services.

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# EVALUATE THE CURRENT SITUATION AND ISSUES OF THE EMERGING TREND OF CRUISE TOURISM IN HO CHI MINH CITY

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**ABSTRACT**

This article delves into the current situation of cruise tourism in Ho Chi Minh City (HCMC), Vietnam, offering a comprehensive SWOT analysis to identify its strengths, weaknesses, opportunities, and threats. It evaluates the potential of boat tourism, examining the infrastructure and the government's role in fostering the growth of this industry. By synthesizing official statistical data and survey results from a small-scale study involving 50 participants from various countries, the article analyzes the current situation, highlighting certain shortcomings in the development policies related to cruise tourism in HCMC. Furthermore, the article provides recommendations aimed at enhancing the industry's capabilities, leveraging its strengths, and improving the quality of cruise tourism services in HCMC.

*Key words*: cruise tourism, cultural and historical places

## I. INTRODUCTION:

### 1.1 Background of the study

As highlighted by Sun et al. (2019), cruise tourism holds a pivotal position in the worldwide tourism sector, with notable expansion observed in Asia. This form of tourism also constitutes a substantial component of the global leisure passenger transportation industry, involving journeys by sea with scheduled stops at multiple ports, as per the definition provided by the Collins English Dictionary (2018).

Historically, cruising has been perceived as customarily designed for individuals in their retirement years and those with substantial wealth. Nowadays, an increasing number of travelers are seeking new routes that involve exploring exotic oriental cultures, attractive destinations, native wildlife, abundant tourism resources, and geographical proximity to neighboring nations with similar climates, all of which are available in the Asia region. In HCMC, various waterway travel companies have developed numerous tours, such as paddleboarding on the Saigon River, traversing the brackish mangrove forest in Can Gio, enjoying sunset views on the Saigon River, experiencing night river bus tours, and more. However, there are still limitations in terms of the diversity of waterway tourism products. With its geographical advantages, infrastructure, as well as distinctive cultural and historical features, HCMC holds significant potential to capitalize on the strengths of the boat industry and river tourism. This presents an opportunity to showcase the city's image to both domestic and international tourists. As HCMC positions itself on the global cruise tourism stage, understanding its internal dynamics is paramount.

This article is divided into 5 sections. Section 1 introduces cruise tourism. Following that, Section 2 presents the potential of cruise tourism in HCMC with an analysis of infrastructure and a SWOT analysis. Then, it analyzes the supporting role of government policies in developing cruise tourism. Section 4 specifically addresses issues related to river tourism in HCMC through a survey of a small group of participants. Finally, Section 5 presents conclusions and recommendations to leverage strengths and address current weaknesses.

### 1.2 Research Questions and objectives

Cruise tourism is increasingly recognized as a significant component of the global tourism industry, particularly in Asia, where demand for river and boat tourism is rising. HCMC with its extensive river network and strategic location, presents considerable potential for developing a thriving boat tourism sector. However, despite its advantages, the sector faces several challenges that hinder its growth and competitiveness.

This study aims to achieve the following research objectives:

– To evaluate the current status and development potential of boat tourism in HCMC.

– To identify key issues affecting the growth and sustainability of river tourism in the city.

– To analyze tourists' perceptions and preferences regarding boat tourism in HCMC.

– To propose practical and managerial recommendations to enhance the quality and efficiency of boat tourism services.

By addressing these objectives, the research seeks to contribute to a deeper understanding of the boat tourism industry in HCMC and offer insights into strategies that can optimize its development.

## 2. TOURISM POTENTIAL OF BOAT TOURISM IN HO CHI MINH CITY (TPHCM)

### 2.1 Infrastructure

With a total area of over 2,095 km2, the city is divided into 19 districts and 5 districts, comprising 322 wards and communes. As the focal point of Southeast Asia, HCMC serves as a crucial transportation hub, encompassing significant road, waterway, and air routes. Thanks to this strategic position, the city has effectively connected provinces within the region, establishing itself as an extremely vital international gateway. HCMC holds the advantage of connecting the largest economic center in the south with the provinces of the Southeastern region. Its extensive river system allows the city to develop robust waterway transportation, establishing trade and cargo terminals, and facilitating convenient tourism exploitation with 251 ports, including 73 ports and terminals catering to passenger and tourist transport. The city benefits from four major rivers - Saigon, Dong Nai, Long Tau, and Soai Rap - forming an interconnected waterway network linking neighboring provinces such as Binh Duong, Tay Ninh, Dong Nai, Long An, Tien Giang, Ba Ria - Vung Tau, and particularly the Mekong Delta region. Consequently, Ho Chi Minh City can leverage both waterway transportation and the potential for various types of domestic water tourism. The Saigon River, in particular, holds a strategically significant position within the city's transportation network, featuring 101 routes with a total length of 913 km and approximately 135 resources serving water tourism. This presents numerous opportunities and values for commercial exploitation, logistics services, tourism, and other related services. In terms of economic development along the riverbanks, there are various historical and cultural landmarks along the Saigon River, including the Nhà Rồng Wharf, the ancient area of Chợ Lớn (Chinatown), the Thủ Ngữ Flagpole (Saigon River), and Bình Đông Wharf. Some modern structures have also become new symbols of Ho Chi Minh City, such as Bạch Đằng Park, Ba Son Bridge (Thủ Thiêm 2 Bridge), the 68-story Bitexco Tower, the 81-story Landmark 81 Tower, and more. According to Lau & Yip (2020), Vietnam encounters a hurdle in establishing itself as an outstanding destination for cruise vacations, primarily due to inadequate infrastructure. The absence of dedicated cruise ports capable of accommodating large vessels has led numerous tour operators to exclude Vietnam from their cruise itineraries. Additionally, the limited availability of city tours with considerable distances between cruise ports and shopping/entertainment venues obstructs Vietnam's potential as a home port for cruises in the Southeast Asian region. The fact remains that Vietnam is considering streamlining immigration policies, enhancing port infrastructure, championing environmental management, and introducing innovative tourism services. The feasibility of Vietnam emerging as a cruise home port remains a subject of uncertainty.

### 2.2 SWOT analysis

| Strengths | Weaknesses |
|---|---|
| **Cultural Riches**: HCMC boasts a wealth of cultural heritage, providing a unique and authentic experience for cruise tourists.<br>**Diverse Culinary Scene**: The city's diverse and flavorful cuisine is a significant strength, catering to the growing demand for culinary tourism.<br>**Infrastructure Development**: Ongoing investments in infrastructure, including modern terminals, showcase the city's commitment to facilitating smooth cruise operations. | **Environmental Impact**: The rapid growth of cruise tourism poses environmental challenges, requiring sustainable practices to mitigate its impact.<br>**Infrastructure Gaps**: Despite progress, certain infrastructure aspects, such as transportation networks, need further development to accommodate increasing cruise traffic.<br>**Seasonal Dependency**: The city's cruise tourism is currently reliant on specific seasons, potentially leading to fluctuating visitor numbers. |

| | |
|---|---|
| | **Operations**: In the context of boat tours, travelers have to purchase tickets directly at the pier, which means they cannot manage their time efficiently if the tickets are sold out. There is a lack of utilization of information technology in the operation process. |
| **Opportunities** | **Threats** |
| **Economic Boost**: Cruise tourism presents a substantial opportunity for economic growth, fostering job creation and contributing to the local economy.<br>**Cultural Exchange:** The city's cultural richness provides a platform for meaningful cultural exchange, enhancing its global reputation as a tourist destination.<br>**Emerging Markets**: Tapping into emerging cruise markets and establishing partnerships with cruise liners can further amplify tourism. | **Environmental Concerns**: Failure to address environmental concerns could result in reputational damage and potential restrictions on cruise operations.<br>Competition from Neighboring **Destinations**: Nearby destinations may pose competition, emphasizing the need for unique selling propositions to distinguish HCMC. |

**III. THE ROLE OF THE GOVERNMENT/CITY IN THE DEVELOPMENT OF BOAT TOURISM.**

HCMC has implemented the project "Developing Riverbank and Riverside Economy and Services in HCMC from 2023 to 2024" with the goal of efficiently and intelligently exploiting the commercial, service, transportation, and tourism values of the Saigon River while still preserving its robust historical and natural values. Specifically:

– Reviewing construction planning and land use planning within the protective corridor along the Saigon River.

– Proposing planning ideas for the Saigon River corridor in the direction of developing green infrastructure, effectively exploiting land values along the riverbanks.

– Implementing policies to support investors prioritizing the development of public works, commercial and service projects, and parks.

– International cooperation to research planning strategies and development management, proposing green infrastructure models for the corridor along the Saigon River.

HCMC has issued a plan for developing water tourism products for the 2023-2025 period. In the 2023-2024 phase:

– Improving and enhancing the quality of existing water tourism products, including short-range tourism products (within a radius of less than 10 km):

+ Tourism route to Binh Quoi (from Bach Dang Wharf - Saigon River - Thanh Da Canal - Thanh Da Wharf, Binh Quoi... and vice versa).

+ Inner-city tourism route Nhiêu Lộc - Thị Nghè (from Thị Nghè Wharf upstream to Candaransi Pagoda on Nhiêu Lộc - Thị Nghè Canal and vice versa).

+ Medium-range tourism products (radius from 10 km to less than 60 km):

+ Tourism route to Cu Chi (from Bach Dang Wharf - Saigon River - Thanh Da Canal - Saigon River - Đình Wharf, Dược Wharf in the Cu Chi Tunnels Historical Site).

+ Tourism route to Can Gio (from Bach Dang Wharf - Saigon River - Nhà Bè River - Lòng Tàu River - Dinh Ba River - Lò Rèn River - Vàm Sat River - Soài Rạp River).

– Building a standard presentation about water tourism routes to provide additional information about the history, culture, and characteristics of the river systems, channels, and ditches associated with water tourism routes in HCMC.

– Introducing existing water tourism products in the city.

– Developing maps of water tourism routes and destinations using GIS technology.

In the 2024-2025 phase:

– Investing in the construction and development of new water tourism products.

– Short-range tourism products (radius of less than 10 km):

+ Tourism route to District 7 (from Cau Mong Wharf/Bach Dang Wharf - Saigon River - Te Canal - Ong Lon Ditch - Dia Ditch).

+ Domestic wharves on the route: Cù Lao Nguyễn Kiệu Wharf, Tôn Đức Thắng University Wharf, Trung Son Residential Area Wharf, Him Lam Park Wharf...

– Developing new tour programs on the route:

+ Starting point: Bach Dang Wharf (District 1)/Cau Mong Wharf (District 4) - Endpoint: Ngoi Sao Viet Wharf (District 7).

+ Tourism route to District 1, 4, 5, 6, and 8 (from Bach Dang Wharf/Cau Mong Wharf - Saigon River - Te Canal - Ben Nghe Canal - Tau Hu Canal to Binh Dong Wharf or continuing along Doi Canal - Binh Dong Market).

– Medium-range tourism products (radius from 10 km to less than 60 km): Tourism route to Thu Duc City (from Bach Dang Wharf - Saigon River - Chiếc Ditch - Trau Trau Ditch - Ong Nhiêu Ditch - Tac River - Dong Nai River - Hoi Son Pagoda Wharf).

– Long-range tourism products (from Ho Chi Minh City to provinces in the region):

+ Water routes originating from the central area of the city, such as Saigon Port, Bach Dang Wharf, Cau Mong Wharf... to provinces like Ba Ria - Vung Tau, Binh Duong, Dong Nai, Tien Giang, Ben Tre, Vinh Long, Can Tho, and the Chau Doc - An Giang route connecting through Cambodia.

In the 2024-2025 phase:

– Continuing to leverage the attractions of the Cu Chi Tunnels Historical Site, Can Gio Mangrove Biosphere Reserve for international tourists, developing tours related to sources, cultural history combined with enjoying the Saigon River, visiting craft villages, gardens, and ecological areas, attracting various domestic tourist groups.

– Strengthening riverside tourism services and diversifying entertainment services on water vehicles.

– Planning specialized routes for exploitation in the 2025-2030 period:

+ History-themed route from Bach Dang Wharf - Đình Bình Nhan/Đình Hanh Phu - Đền Ben Duoc/Revolutionary Tradition Zone Saigon - Cholon - Gia Dinh.

+ Culture-themed route from Bach Dang Wharf - Ky Quang 2 Pagoda, Khanh Anh Monastery - (Thủ Dầu Một Ferry - Bà Bình Duong Pagoda) or Phu Chau Floating Temple (Gò Vấp).

+ Urban development-themed route from Bach Dang Wharf – Ba Son Bridge – Landmark 81 – Van Phuc Urban Area...

## IV. SOME ISSUES RELATED TO THE BOAT TOURISM SITUATION IN HCMC.

### 4.1 Research Methodology

This study employs a qualitative research approach to examine the challenges associated with boat tourism in HCMC. The primary data were collected through a structured survey involving 50 participants from various nationalities, selected based on their experience with river tourism in the city. The questionnaire comprised both closed-ended and open-ended questions, allowing for a comprehensive analysis of tourists' perceptions, preferences, and concerns.The data analysis process followed a thematic coding approach to identify recurring themes in participant responses. The coding process involved three stages:

Open Coding: Responses were categorized into broad themes, such as infrastructure, service quality, environmental concerns, and cultural engagement.

Axial Coding: Relationships between themes were analyzed to determine underlying issues affecting boat tourism in HCMC.

Selective Coding: The final themes were synthesized to form key insights, which informed the recommendations presented in Section 5.

**Table 1: Coding structure for qualitative data analysis**

| Main Themes | Sub-Themes | Example Participant Responses |
|---|---|---|
| **Infrastructure & Accessibility** | Poor docking facilities | "The piers are not well maintained, and it's hard to board the boats safely." (N4) |
| | Lack of transportation links | "Does not have complete ecosystem links tour, people, accomodation." (N34) |
| **Service Quality** | Tour guide professionalism | "Tour guide capacity: boatman should be trained to act as an ambassador to introduce to tourists" (N21) |
| | Pricing concerns | "The tours are expensive compared to the service provided." (N22) " It is usually boring on tour with expensive prices without many nice views for sightseeing" (N11) |
| **Tourism Experience** | Lack of entertainment | "Poor activities for tourist. The tour gets boring after some time; there should be more activities on the boat." (N8) |
| | Limited cultural engagement | "Not many cultural activities in the city, should include more cultural performances or storytelling." (N11) |
| **Environmental Issues** | Water pollution | "The river is dirty, and it affects the experience." (N12, N13, N50) |
| | Lack of eco-friendly initiatives | "They have not been able to balance between mass tourism and ecotourism, leading to the incorporation between local authority and local communities." (N2) |
| **Marketing & Information Accessibility** | Lack of online booking options | "I could not find a reliable source on the internet" (N38) |
| | Limited promotional efforts | "Many tourists don't even know that HCMC has river tours." (N43) |
| **Safety & Regulation** | Unclear safety guidelines | "Not safety and clean enough. Sometimes there many rip off venders" (N13) |
| | Need for better regulations | "There should be stricter policies to maintain boat quality, service standards and supports" (N45) |

*Source: Autor collected*

**4.2 Results**

**Table 2: Information about the age group of survey participants.**

| Age (n; percentage %) |
|---|
| 18-26 (18; 36%) |
| 27-46 (23;46%) |
| 47 and above (9; 18%) |

**Table 3: Information about the nationalities of the survey participants**

| Nationality (n; percentage %) |
|---|
| Vietnamese (37;74%) |
| Ugandan (1;2%) |
| British (4; 8%) |
| Swiss (1; 2%) |
| Hongkong (1;2%) |
| Korean (1;2%) |
| Singaporean (2; 4%) |
| Laos (1; 2%) |
| Indonesian (1; 2%) |
| Australian (1;2%) |

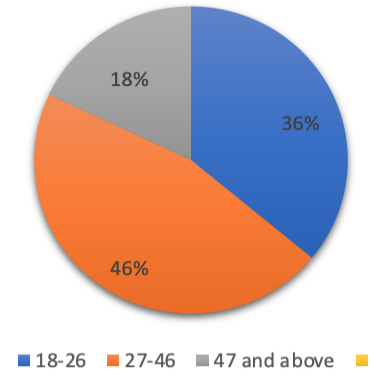



**Figure 1: Age group of participants**

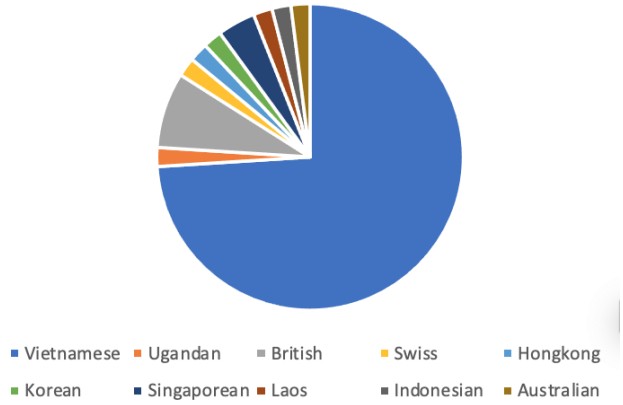
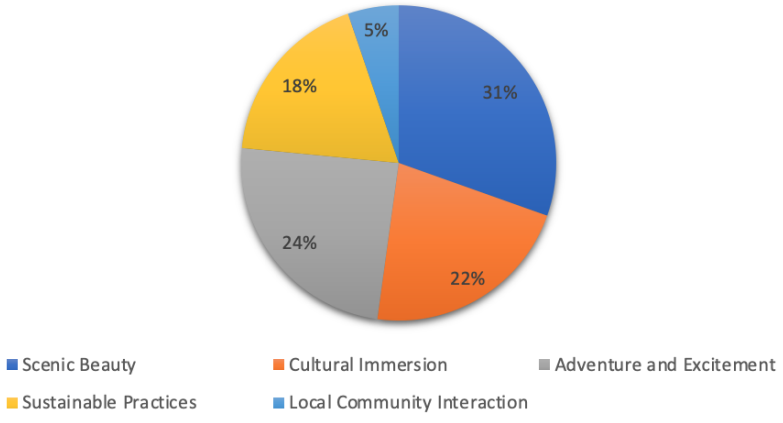



**Figure 2: The nationalities of participants**

When asked about the types of river tourism activities they were most interested in (*What types of river tourism activities are you most interested in? (e.g., river cruises, water sports, cultural tours*), (question number 5), a significant 30% responded that they were interested in Natural Exploration. Additionally, 28% of survey participants expressed interest in River Cruises, while Water Sports (e.g., kayaking, rafting) and Cultural Tours along rivers garnered respective percentages of 20% and 22%. According to Người Lao Động (2023), it is observed that when comparing river tourism products with other parts of the world such as France, Italy, China, and Thailand, HCMC appears to have not invested significantly in the landscape along both sides of the river. There is a lack of beautiful architectural structures, attractive entertainment points, and more. Notably, in Thailand, which attracts billions of dollars annually through vigorous exploitation of entertainment activities for tourists, such as enjoying cuisine on boats along the Chao Phraya River in Bangkok or participating in the Songkran water festival. Furthermore, in recent times, HCMC has engaged in various promotional activities for river tourism, such as the HCMC Water Festival and organizing survey teams to introduce waterway tourism, which have gained considerable interest from tourists, especially programs featuring artistic performances. Many travel companies have been deploying a series of river tourism products to welcome visitors. However, compared to other product categories, the city's river tourism has not fully tapped into its potential. HCMC has welcomed over 2.3 million international tourists, primarily from the South Korean, Chinese, and American markets, in the first half of 2023. Currently, the city organizes around 10 major tourism events each year, with an average of one event per month, serving both residents and tourists to stimulate tourism demand.

The most crucial factors influencing participants to choose a river tourism experience in Vietnam are Scenic Beauty, constituting 30.4%, followed by Adventure and Excitement at 24.35%, Cultural Immersion at nearly 22%, and Sustainable Practices at 18.26%. However, the factor of Local Community Interaction is relatively low, accounting for 5.21%. This represents an area for improvement to diversify tourism products in the future. Furthermore, over 70% of participants seek information from friends or family, while 60% have visited travel websites and social media platforms.

**Figure 3: The important factors when choosing a river tourism experience in Vietnam**



Based on the survey information with question “From your perspective, what challenges do you think river tourism operators face in Vietnam?”,, the majority of survey participants responded that water quality, pollution, and environmental issues are the challenges faced by river tourism operators in Vietnam. Specifically, participant N21 mentioned, "Tour guide capacity: boatmen should be trained to act as ambassadors to introduce tourists." Participant N11 expressed, "Not many cultural activities in the city; it is usually boring on tour with expensive prices without many nice views for sightseeing." Meanwhile, participant N34 raised concerns about, "Does not have a complete ecosystem linking tours, people, accommodation."

**Table 4: Importance of Incorporating Sustainable Practices in River Tourism**

| | |
|---|---|
| Very important | 30; 60% |
| Somewhat important | 14; 28% |
| Neutral | 5; 10% |
| Not important | 1;2% |

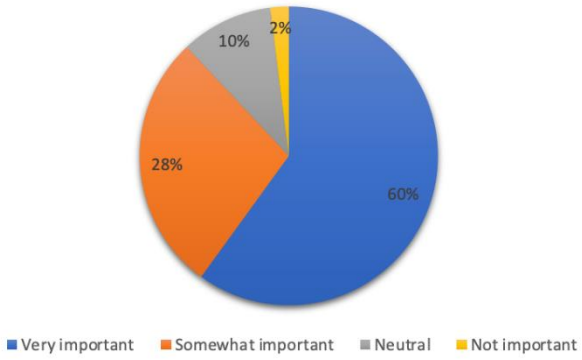



**Figure 4: Importance of Incorporating sustainable Practices in River Tourism**

When asked about previous challenging experiences when participating in river tours in Vietnam, survey participant N1 mentioned, *"Maybe just to get the local community more involved in the sustainable practice of river tourism."* Participant N4 suggested, *"Create more activities during the time tourists are on the boat, make it more interesting and worth the price, improve services and English skills for staff."* On the other hand, participant N15 expressed a desire for an official website where they could easily find information and make payments. Additionally, some participants mentioned that the experience was good but emphasized the need for more promotion and marketing efforts.

## V. CONCLUSION AND RECOMMENDATIONS

Ho Chi Minh City's journey into cruise tourism can be steered towards success by leveraging its strengths, addressing weaknesses, and capitalizing on opportunities while mitigating threats. A strategic marketing approach that focuses on sustainable practices, unique experiences, and collaborative partnerships will not only attract cruise tourists but also ensure the long-term prosperity of this burgeoning industry in Vietnam's vibrant southern metropolis. To enhance the effectiveness of the recommendations, this section distinguishes between practical implications for tourism operators and managerial implications for policymakers and regulatory authorities.

### 5.1 Practical Implications (For tourism operators and local businesses)

*Diversification of tourism products*: Expanding the range of river tourism activities, such as themed cultural cruises, dining experiences, and eco-tourism packages, to attract a broader audience.

*Improvement of service quality*: Enhancing staff training programs, particularly in hospitality and language skills, to improve the overall customer experience.

*Integration of digital technologies*: Developing an official online platform for booking river tours, providing detailed tour descriptions, real-time availability, and secure payment options.

*Sustainability initiatives*: Implementing eco-friendly measures, such as reducing plastic waste on boats and

improving waste management systems along the riverbanks.

**5.2 Managerial Implications (For government authorities and tourism policymakers)**

*Infrastructure enhancement*: Investing in the modernization of river ports, docking facilities, and transportation links to improve accessibility and efficiency.

*Policy support for sustainable tourism*: Establishing regulations to minimize environmental degradation while promoting sustainable business practices among tourism operators.

*Strengthening promotional efforts*: Launching international marketing campaigns and forming strategic partnerships with global cruise operators to position HCMC as a premier boat tourism destination.

*Community involvement*: Encouraging local engagement in tourism development through community-based tourism initiatives, ensuring that economic benefits are distributed equitably.

By addressing these practical and managerial aspects, HCMC can leverage its geographical advantages and cultural heritage to develop a competitive and sustainable boat tourism industry. Indeed, community-based tourism is considered a form of tourism that brings many benefits for sustainable economic development for local residents. This form not only helps people protect ecological resources but also preserves and promotes the unique cultural aspects of the locality, especially in HCMC, which has strengths in natural landscapes, historical values, indigenous cultures, customs and lifestyles, rich culinary culture, etc. In the current digital age, integrating information technology into business activities is essential. We aim to make it easier for people to look up information about the timing of tours/routes, make online payments safely, and apply communication promotion if needed. Tourists are also very concerned about the environment and sustainability.

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# SUSTAINABLE FASHION: RETHINHKING MATERIALS FOR A GREENER FUTURE

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**ABSTRACT**

Textile production involves numerous steps, from spinning raw fibers into yarn, then weaving or knitting the yarn into fabric, and finally finishing processes such as dyeing, printing, and finishing. Traditionally, these manufacturing processes have violated the principles of environmental sustainability. Coupled with the ever-increasing demand for clothing, manufacturers have paid less attention to environmentally friendly and sustainable production methods. Moreover, the rapid changes in fashion trends and the shortening of fashion cycles have contributed to disrupting the ecological balance. Currently, the growing green consciousness of consumers demands a change in the textile supply chain. Numerous studies on the materials used in the fashion industry have been conducted, focusing on eco-friendly and sustainable options that cause minimal harm to the environment. Furthermore, sustainability in the textile industry encompasses not only environmentally friendly supply chains but also the creation of a cost-effective and socially responsible production setup. This article will delve into the negative impacts of materials traditionally used in the fashion industry and explore the trend towards using green, environmentally friendly materials. Based on pressing real-world issues, the author proposes several recommendations for fashion businesses seeking to achieve greater sustainability in the future.

*Key words:* “Fashion materials”, ” Green transition”, “Sustainable fashion”, “Sustainable living”.

## I. INTRODUCTION AND THEORETICAL FRAMEWORK

Along with the development of the economy and society, environmental pollution has become a serious issue not only in urban areas but also in rural regions. According to the Ministry of Natural Resources and Environment, Vietnam generates 23 million tons of household waste, over 7 million tons of industrial solid waste, and over 630,000 tons of hazardous waste annually. Meanwhile, waste treatment faces many difficulties, severely impacting people's lives (Gazzola et al., 2020).

Today, businesses worldwide are under growing pressure to reconcile environmental stewardship with economic expansion. This challenge is particularly acute for the manufacturing and fashion sectors. The fashion industry, while influential in shaping trends and culture, also exerts a substantial impact on our planet (Lee & Huang, 2021).

Driven by the growing consumer preference for sustainable living, the fashion industry has been undergoing a transformation. By adopting eco-friendly practices in production and commerce, the industry is working towards minimizing its ecological footprint and conserving resources. This shift is a testament to the power of consumer consciousness in shaping the future of fashion.

Sustainable living is a way of living that minimizes negative human impacts on the environment by using resources wisely, reducing waste, and prioritizing nature-friendly choices (Cairns, et. al., 2022). Environmental Stewardship refers to the protection of natural resources and the maintenance of ecological balance for the benefit of present and future generations (AMSilk, 2022).

Some theories related to sustainability and environmental economics in textile production include:

The first is the theory of sustainable development. Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In the textile industry, this concept involves balancing three factors: economic, environmental, and social. Sustainable textile businesses need to find ways to maximize profits while minimizing negative impacts on the environment and improving working conditions for workers (Lee & Huang, 2021). This requires the adoption of green technology, the use of recycled materials, reduced water and energy consumption, and ensuring fairness in the supply chain.

The second is the circular economy theory. The circular economy is a model that aims to reduce waste and maximize resources by extending the product life cycle through recycling, reuse, and remanufacturing. In the fashion industry, the application of the circular economy includes the use of recycled materials (such as organic fibers or polyester from plastic bottles), designing products that are easy to recycle, and implementing a business model that is "rent instead of buy" (Shu Zhong et al., 2023). In addition, sustainable fashion brands also apply the "cradle to cradle" model to ensure that products can return to the production cycle without harming the environment.

Third, environmental economics theory focuses on assessing and pricing the environmental impacts of production activities, thereby developing policies to minimize negative impacts. In the textile industry, this theory emphasizes the application of environmental taxes, emission licensing systems, and mechanisms to encourage businesses to reduce pollution. For example, taxing wastewater and $CO_2$ emissions from textile factories can encourage businesses to switch to cleaner technologies (Thompson and Roberts, 2022). In addition, incorporating environmental costs into product prices also helps raise awareness of sustainable consumption, thereby reducing waste in the fashion industry.

The fourth is the theory of sustainable supply chains. Sustainable supply chains emphasize optimizing production and distribution processes to reduce negative impacts on the environment and society. For the textile industry, this includes using transparently sourced materials, ensuring fair working conditions in factories, and minimizing waste during transportation. The application of digital technologies, such as artificial intelligence (AI) and blockchain, can help track and monitor the supply chain, ensuring that fashion brands adhere to sustainability standards from production to the moment the product reaches the consumer (Neumann, et. al., 2021).

The fifth is the theory of sustainable consumption. In addition to corporate responsibility, consumers also play an important role in promoting sustainable development in the textile industry. The theory of sustainable consumption refers to changing shopping behavior towards more responsible, such as prioritizing eco-certified products, limiting unnecessary purchases and supporting brands committed to environmental protection. Models such as "slow fashion" encourage consumers to buy less but choose high-quality products with a long lifespan, thereby reducing negative impacts on the environment (Shu Zhong et al., 2023).

In sum, applying sustainability and environmental economics theories to the textile industry not only helps to minimize negative impacts on the environment but also creates new business opportunities, promoting the development of a green economy.

In the field of fast fashion, many domestic and foreign studies have focused on the use of different materials, aiming to assess environmental impacts and find sustainable solutions.

In the study by Jones et al. (2018), the article "Recycling in Fast Fashion" published in the Fashion and Sustainability Journal, the authors investigated the development of recycled materials such as recycled PET fabrics and bio-based fibers. The aim of the study was to promote the use of recycled materials to reduce textile waste. They found that although some types of recycled materials are gradually being used in the fast fashion industry, the main problems remain the cost and complexity of the production process.

A typical study is "The global environmental injustice of fast fashion" (2018) by Rachel Bick et al., published in the journal Environmental Health. This study analyzes the negative impacts of the fast fashion supply chain on the environment and society, especially the use of materials such as polyester and cotton. The purpose of the study is to highlight the global environmental injustice caused by fast fashion and call for measures to reduce it.

A study by Smith et al. (2019) in their article "Sustainable Textiles in Fast Fashion" published in the Journal of Fashion Technology & Textile Engineering focused on analyzing synthetic fabrics such as polyester and nylon, two materials commonly used in the fast fashion industry. Their study found that although these materials are cheap and can be mass produced quickly, they have a major negative impact on the environment when not recycled effectively.

Nguyen Thi Lan Anh (2020) in her book New Materials in the Fast Fashion Industry studied natural and synthetic fibers, especially the development of recycled cotton and recycled polyester. The aim of the study was to find material options that could minimize environmental impact while still maintaining properties that fit the needs of the fast fashion industry. She emphasized that the use of recycled materials can reduce the amount of waste from the fashion industry.

Research by Hong Que (2021) in the article Characteristics of Materials in Fast Fashion: Challenges and Solutions

published in the Vietnam Textile and Garment Industry Journal has shown that materials such as polyamide and spandex are dominating the fast fashion industry thanks to their elasticity and wrinkle resistance. However, the study also shows that the production and processing of these materials consume a lot of energy and water, creating significant environmental impacts.

Another study by Thompson and Roberts (2022) in the article “Sustainable Materials in Fast Fashion” published in Sustainable Fashion Journal focused on examining the use of biomaterials such as fabrics from mushrooms and algae in the fast fashion industry. This study highlighted the potential of these materials to replace synthetic materials, to reduce negative environmental impacts and save natural resources.

In Vietnam, the article "Fast Fashion and its Environmental Hazards" in the Environment Magazine (2022) pointed out that global clothing production has doubled in the past 15 years, with the average garment being worn less and discarded faster than ever. The article highlighted the use of toxic chemicals in the dyeing process, causing serious water pollution.

Research by Hoang Minh Tam (2023) in the article “The Development of Fast Fashion Materials and Environmental Impact” published in the Journal of Textile Science and Technology has shown that the fast fashion industry is gradually shifting towards the use of ecological materials such as linen and fabrics from natural fibers. The aim of the research is to find out how to apply these materials in fast fashion production to minimize the negative impact on the environment during the production and consumption process.

Additionally, the study “Fast Fashion and Its Environmental Impact in 2025” published on Earth.Org (2025) also mentioned that fast fashion consumes large amounts of water and is responsible for about 10% of global CO2 emissions. This study focused on materials such as polyester and nylon, emphasizing their negative impact on the environment.

All in all, the above studies all show that, although fast fashion materials such as polyester, nylon, or spandex can meet the needs of fast and cost-effective production, finding and applying sustainable and recycled materials is essential to minimize negative impacts on the environment. However, up to now, no research has been conducted on this content. Therefore, the author's research is a highly urgent research.

## II. METHODOLOGY, CURRENT SITUATION AND SCIENTIFIC RESULTS

### 2.1. Methodology

In order to accomplish the stated research goals, this study relies on secondary data such as documents and articles pertaining to the effects of fast fashion. Data collection, synthesis, analysis, and statistical techniques were employed to analyze the secondary data.

### 2.2. Current situation

#### 2.2.1. The negative impacts of materials used in fast fashion on the current environment

The fashion industry, especially fast fashion, is really hurting our planet. Can you believe that in just one year, it's responsible for 10% of the world's carbon emissions, uses up a whopping 93 billion cubic meters of water, and creates a mountain of 92 million tons of waste (Su et al., 2019)? And get this: it takes us a whole 12 years to even try to recycle all the stuff the fashion industry produces in a single day! For example:

– Air pollution: The production of synthetic fibers is a major contributor to greenhouse gas emissions, releasing significant amounts of carbon dioxide into the atmosphere. The fashion industry is responsible for 8-10% of global carbon emissions (Chen et al., 2021).

– Water pollution: The textile dyeing industry is a significant contributor to water pollution due to its extensive use of water and hazardous chemicals (Chen et, al., 2021). The direct discharge of these substances into water bodies contaminates water sources, harms aquatic life, and poses risks to human health (Watchravesringkan, Zhou & Gil, 2019).

– Fashion waste: The fast fashion industry promotes frequent consumer purchases, resulting in a significant amount of clothing being thrown away after a short time. Synthetic materials such as polyester and nylon are highly resistant to decomposition, leading to pollution of soil and marine environments (Lundblad & Davies, 2016).

– Resource wastage: The fashion industry is the second largest consumer of water among all industries. The processes of manufacturing, dyeing, transportation, and garment processing consume a significant amount of energy, primarily from fossil fuels.

– Biodiversity impact: Cotton cultivation requires large tracts of land, leading to deforestation, reduced biodiversity, and soil erosion. Chemical substances released from production and dyeing processes pollute the habitats of animals and plants.

**2.2.2. The growing trend of using sustainable materials in the fashion industry**

In recent times, there has been a lot of research done on the materials used in fast fashion. Specifically as follows:

**Table 2.1. Summary of studies on materials used in fast fashion**

| Author | Article | Year | Materials used |
|---|---|---|---|
| Senelisile Moyo et al. | Use of bacterial isolates in the treatment of textile dye wastewater: A review | 2022 | Using bacteria to treat textile dyeing wastewater |
| Shu Zhong et al. | TextileNet: A Material Taxonomy-based Fashion Textile Dataset | 2023 | Classification of textile materials in fashion |
| Nguyen Hoang An et al. | Nghiên cứu các yếu tố ảnh hưởng đến quyết định chọn mua sản phẩm thời trang được sản xuất bằng nguyên vật liệu tái chế tại khu vực Thành phố Hồ Chí Minh | 2024 | Fashion products from recycled materials |
| AMSilk AMSilk | Develops Spidersilk, a Biocompatible Material for Use in Cosmetic Formulations | 2022 | Synthetic spider silk |
| Clara Rodríguez Fernández | Watch Strap Made of Recombinant Spider Silk Launches in Europe | 2019 | Recombinant spider silk |
| Huw Hughes | H&M x Good News launch sneaker collection made with Bananatex | 2021 | Bananatex |
| Clara Rodríguez Fernández | These Spider Silk Sneakers from Adidas Are Biodegradable | 2016 | Biosteel fibers from spider silk |
| Amy Feldman | Spider Silk In Airplanes? Germany's AMSilk Inks Deal With Airbus To Develop A New High-Performance Material | 2018 | Spider silk materials for the aviation industry |
| Simon Glover | Biotech pioneers to partner on protein fibres | 2023 | Bio-protein fibers |
| Roxana Gheorghita Puscaselu et al. | Alginate: From Food Industry to Biomedical Applications and Management of Metabolic Disorders | 2020 | Alginate from brown algae |

Source: Author's summary

In 2023, the fashion industry witnessed significant changes, especially in the post-COVID-19 era, with consumers increasingly gravitating towards sustainable fashion. In response to this demand, many fashion businesses have stepped up their production of apparel made from natural, environmentally friendly materials. Popular green materials include: (1) Natural materials such as organic cotton, linen, silk, bamboo, and hemp, which are grown and produced using methods that minimize the use of chemicals, protecting the environment and human health. (2) Recycled materials: Fabrics made from recycled PET bottles, textile scraps, and old clothing help reduce waste and conserve energy. (3) Bio-based materials: Materials produced from biomass sources such as seaweed, fungi, and fruit peels are emerging as innovative and promising options (Kang, Liu & Kim, 2013).

According to a recent report by Coherent Market Insights, the global sustainable fashion market is currently valued at $7.8 billion in 2023 and is growing rapidly, projected to surge to $33.05 billion by 2030 (Chen et al., 2021). A notable trend within this market is circular fashion, which promotes the reuse and recycling of clothing to reduce waste and minimize environmental impact.

A report on the Global Sustainable Fashion Market published by The Business of Fashion predicts a compound

annual growth rate (CAGR) of 22.9% from 2023 to 2030 due to increasing consumer demand and a growing preference for environmentally friendly fabrics (Polajnar Horvat & Šrimpf Vendramin, 2021).

Since then, more and more designs have emerged using eco-friendly materials like organic cotton and recycled polyester to meet the growing demand for sustainable fashion. A British biotechnology company has recently developed a sustainable material from bacterial fermentation, aiming to create a lower-carbon fabric alternative to traditional ones.

In Japan, printing company Seiko Epson plans to establish a clothing recycling business based on the company's paper recycling technology next year, when the European Union's (EU) ban on the destruction of unsold clothing comes into effect. Traditional clothing recycling involves using rotary blade cutters to separate fibers and requires a large amount of fresh cotton to maintain durability. This technology achieves a fiber recovery rate of around 10%. Seiko Epson's new method is said to be able to recover more than 50% of fibers, but the company aims to eventually recover 100% (Park & Lin, 2020).

The green shift in materials is also a trend pursued by high-end fashion brands. Dior and Burberry have said no to deforestation to reduce emissions, while Prada offers its iconic Hobo bag in recycled nylon, and Versace has banned the use of fur.

Regardless of pricing strategies, sustainability has also reached fast fashion brands. Zara has pledged to use recycled or more sustainable materials such as cotton, linen, and polyester, aiming for 100% of its garments to be made from these fabrics by 2025.

Primark has also adopted a similar approach in their latest campaign titled "Time for Change. A Better Future," introducing a wide range of products made from sustainable materials. Uniqlo has decided to create a capsule collection called "Dry-Ex," which is produced by recycling plastic bottles and allows for the use of innovative washing techniques that reduce water usage by up to 99%.

In addition, the secondhand market signals a new cycle for fashion products. Globally, according to data from Statista, the used clothing market is projected to reach a value of $351 billion by 2027, nearly double the $177 billion recorded last year (Cairns, Ritch & Bereziat, 2022).

In Vietnam, the sustainable fashion trend is gradually emerging, especially against the backdrop of the still prevalent fast fashion. Creating and choosing sustainable clothing has become an integral part of the fashion industry. Sustainable fashion in Vietnam is also being promoted, and more and more brands are following this trend (Neumann, Martinez & Martinez, 2021).

### 2.3. Recommendations for fashion businesses in the future

The green transformation in production is an inevitable trend. In the future, a macro-level change in the fashion industry is urgently needed, namely:

– To choose sustainable materials: Prioritizing the use of natural fibers such as organic cotton, wool, silk, jute, hemp, etc., as they are biodegradable and minimize environmental impact. Prioritizing the use of new bio-based materials or recycled fabrics with clear traceability.

– To apply clean production process: Implementing advanced technologies such as natural dyeing, efficient wastewater treatment, and minimizing energy consumption during production. Reducing long-distance transportation by producing closer to the point of consumption, thereby minimizing carbon emissions. Building partnerships with suppliers and manufacturers committed to social and environmental responsibility.

– To apply sustainable design: Designing products that can be easily repaired, recycled, or upgraded to extend their lifespan. Optimizing cutting and sewing processes to minimize fabric waste and overproduction. Designing products that can be combined with various other outfits, increasing their versatility and reducing the need for new purchases.

– To carry out marketing and education: Providing detailed information on the origin of materials, production processes, and the environmental impact of products. Organizing events and workshops to raise consumer awareness of sustainable fashion. Collaborating with non-governmental organizations and participating in community projects to create positive change in the fashion industry.

– To boost investment in research and development: Investing in research and development of new technologies to create more sustainable fashion products. Searching for and developing new types of biodegradable and recyclable materials. Building new business models such as clothing rental and buying back old clothes to reduce waste.

## III. CONCLUSION AND MANAGEMENT IMPLICATIONS

In the context of climate change and a growing environmental consciousness, the trend of using green materials in the fashion industry is becoming a significant factor. The shift towards eco-friendly fabrics not only minimizes negative impacts on the planet but also meets the increasing demand of consumers for sustainable products.

As a producer, designer, distributor, or consumer, using sustainable materials is not only a collective action to protect the environment and conserve Earth's resources but also has long-lasting significance for future generations. Although there are still many challenges to overcome, sustainable fashion has truly become an inevitable trend of the future. Sustainable fashion has awakened the global garment industry. And it has also awakened the "responsibility of consumers".

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# INTEGRATING SUSTAINABLE TOURISM INDICATORS INTO URBAN PLANNING AND PLACEMAKING IN VIETNAM

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**ABSTRACT**

Tourism has significantly contributed to Vietnam's economy, but rapid development has also posed social, environmental, and cultural challenges. In response to global issues like climate change, heritage conservation, and urbanization, the concept of sustainable tourism has emerged as a solution to balance economic growth, environmental protection, and social equity. This study explores how urban planning and placemaking can integrate sustainable tourism indicators to address these challenges effectively. By examining Vietnam's current urban planning system and successful placemaking case studies, the research identifies strategies for aligning tourism development with sustainability goals. It highlights the need for collaboration among governments, consultants, and stakeholders to create resilient tourism infrastructure, enhance local identity, and achieve net-zero emissions. The proposed framework aims to provide actionable solutions for integrating sustainability into urban development, supporting long-term tourism growth while preserving Vietnam's cultural heritage and natural resources.

*Key words:* Sustainable tourism, Urban planning, Place-making, Net-zero emissions, Vietnam

## I. INTRODUCTION

Vietnam's economy witnessed a significant contribution from the tourism industry sector in the country's development. The tourism industry is known as the smokeless industry because this is an industry that exploits available natural resources to attract tourists to visit. However, in the modern world, Tourism development has characteristics of interdisciplinary and comprehensive, as it has close connections with many other fields and professions: transportation, environment, entertainment, and real estate. That requires the contributions of various stakeholders among the development process, in order to balance the targets of multiple aspects (financial, environmental, social development) and maintain the sustainable development capability.

Urban planning and place-making are two effective tools for the government to manage the development of urban complexion (physical wealth), demography, destination soul, marketing, and cultural recognition, these factors influence the development of the tourism industry (Camilleri, 2017) and the ability to pursue sustainability concepts in tourism (Grabara K. Janusza, Paula Bajdora, 2013). Firstly, urban planning (Kennedy, 2011) covers all tourism indicators that are related to infrastructure, environment, facilities, public space, population, and socioeconomic aspects. Additionally, place-making (Wyckoff, 2014) takes over creating and operation processing, bringing a sense of local culture to international tourists. From a marketing perspective (Nguyen Hoang Tien, Ho Tien Dung, Nguyen Van Tien, 2020), place-making is considered the branding process and helps local destinations retain their own attraction for the long run. It requires more cooperation between consultant agencies, tourism enterprises, and the local community than government regulations. Based on certain levels and phases in the urban planning and placemaking process such as region planning, master planning, and landscape design, sustainable tourism criteria groups could be filled or considered as the main priority. Following the framework of sustainable tourism (Grabara K. Janusza, Paula Bajdora, 2013), multiple benchmarks to evaluate sustainable tourism, Vietnam's urban planning regulations, existing issues as well as case studies of sustainable tourism destinations, and activities in Vietnamese tourism cities. The study has 5 parts including reviewing the concept of sustainable tourism, urban planning, place-making, current planning systems in Vietnam, the proposed framework of applying sustainable tourism indicators into VN urban planning phrases, the concept of place-making and its effect on sustainable tourism in the context of some successful case studies in Vietnam, and conclusion at the end.

## II. LITERATURE REVIEW

### 2.1. Sustainable Tourism in Vietnam

According to Vietnam tourism development strategy to 2030 of Prime Minister, tourism development is a spearhead economic sector playing a vital role in modern economic structure. Sustainable tourism development bases on green growth platform and maximizes tourism contribution on United Nation sustainable development objective. Furthermore, culture tourism growth, attaching tourism to conservation, heritage value and ethnic culture enhancement is significantly concentrated as a main point in sustainable tourism development. Besides that, professional tourism with 4.0 industrial renovation application is highly promoted (Vietnam.gov.vn).

Objectives in sustainable tourism program base on three main pillars: economy, environment and society with twelve supportive points (Handbook on sustainable tourism development, Science Council – Tourism Department, 2005). In economic aspect, guaranteeing economy efficiency for tourism entrepreneurs having profit and growing for long terms plays a crucial role and be a foundation for local development through tourists' expenditure as well as creating jobs and raising income levels. Additionally, socioeconomic equity by sufficient allocating economic benefits among society which are profited from tourism activities is a vital goal in balancing between economic and social elements of sustainable tourism development. Furthermore, tourists' satisfaction and tourism organizations' enhancement are also a closely interactive couple and one of the most important strategies in tourism promotion. Moreover, developing tourism industry must be associated with social security to maintain the neatness and attractiveness of community in tourist destinations. No less important, cultural value conservation is one of four main sustainable tourism development strategies to 2030 of Prime Minister to create unique and indigenous attractiveness especially to foreigner tourists. Last but not least, environment pillar is always a fundamental factor of sustainable development in general. Natural protection along with efficient use of resources in reducing precious and non-renewable resource usage rate for tourism activities are the key objectives in environment goal besides environmental protection during tourism development periods.

In order to get basic aims on sustainable tourism development, several straightforward principles regarding environment, socio-economy, community relations, and education. Firstly, rational resource use and exploitation, and reducing natural resource overconsumption are intensely essential to ensure long-term growth as well as maintain, and conserve natural diversity. Secondly, socio-economy principles involve tourism development in overall socio-economy plan and local economy support. Tourism growth tactic should be appropriate to local area and plan together with backing related local businesses, leading to support local economic statement. Moreover, community relation principles in sustainable tourism development include engaging local communities and getting opinions from citizens and relevant organizations to consult and impose policies ensuring balance advantages during implementation. Finally, educational principles in sustainable tourism development relating to human resource training and scientific research need to be considered as an effective solution for not only enhancing economic benefits but also exalting tourism quality.

**Case Study: Hoi An, Vietnam**

Hoi An stands as a prominent example of successfully integrating sustainable tourism indicators into urban planning and placemaking. The city's UNESCO-recognized Old Town has maintained its cultural integrity through strict heritage conservation policies, pedestrianized streets, and eco-friendly tourism initiatives (Long et al., 2021). Infrastructure improvements, such as underground electrical wiring and waste management systems, have enhanced environmental sustainability. Moreover, community-based tourism programs have empowered local artisans and small businesses, ensuring equitable economic distribution. Hoi An's green tourism initiatives, including bicycle-friendly streets and eco-tourism villages, demonstrate a holistic approach to sustainable tourism development.

### 2.2. The international framework of Sustainable tourism

The Sustainable tourism framework is generated to ensure the balance between three main pillars and play as a guideline for not only tourism agencies, and local governments but also local communities, and stakeholders in the whole stages to achieve the main goals of sustainable tourism (Grabara K. Janusza, Paula Bajdora, 2013). All the following basic core indicators of sustainable tourism also are determined based on three important dimensions the environmental, Social, and Economic (Francisco Javier Blancas, Macarena Lozano Oyola, Mercedes González, Rafael,

2017). Dynamic sustainable tourism evaluation system helps participating objects measure sustainability in a certain tourist destination and improve solutions and change to adapt to the existing conditions in the planning and operating process.

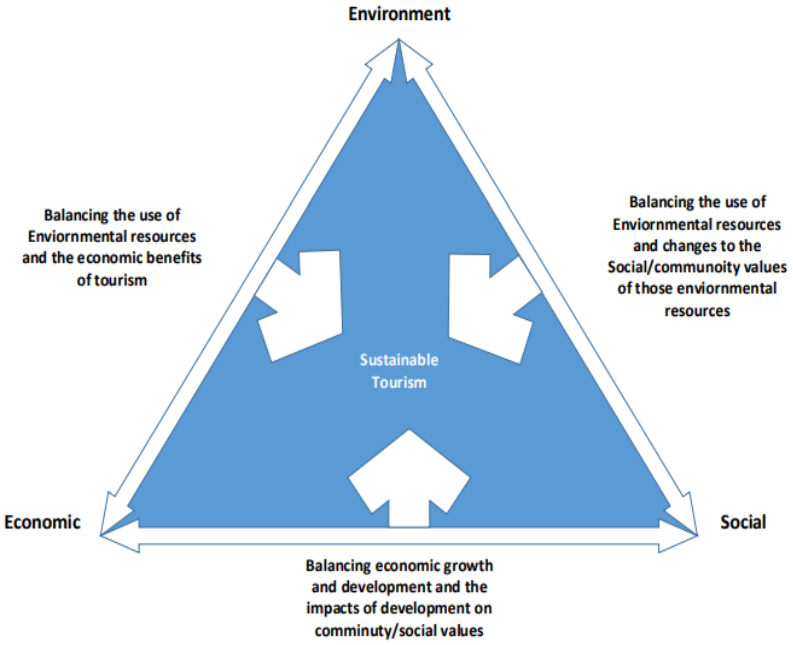



**Figure 1. Dimensions of Sustainable Tourism**

*Source: www.sustainabletourismonline*

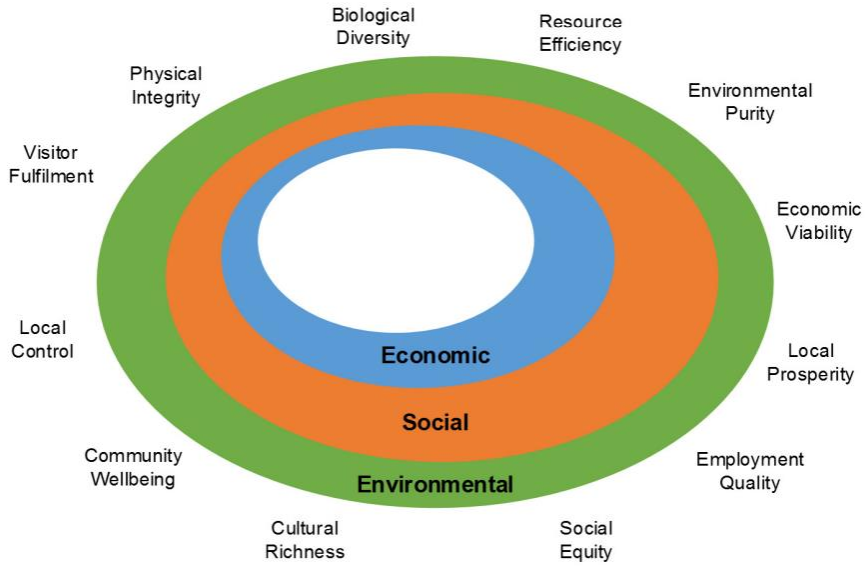



**Figure 2. Framework for Sustainable Tourism**

*Source: www.tourismlandscapes.wordpress.com*

ASEAN framework on sustainable tourism development bases on the balance between three factors: environment, economy and socio culture with five key pillars including sustainable economic growth; social inclusiveness employment and poverty reduction; resource efficiency, environmental protection, and climate change; cultural values diversity, and heritage; mutual understanding and peace, health, safety, and security (ASEAN, 2023)

World Tourism Organization (UNWTO) and its work with a wide range of partner agencies and governments of six countries during and following the preparation of the document, namely Kenya, India, Vietnam, Senegal, Botswana and Timor-Leste to present five key pillars of sustainable tourism in developing countries: Tourism policy and governance;

trade, investment, data, and Competitiveness; employment, docent work and capacity building; poverty reduction and social inclusion (UNWTO, 2013)

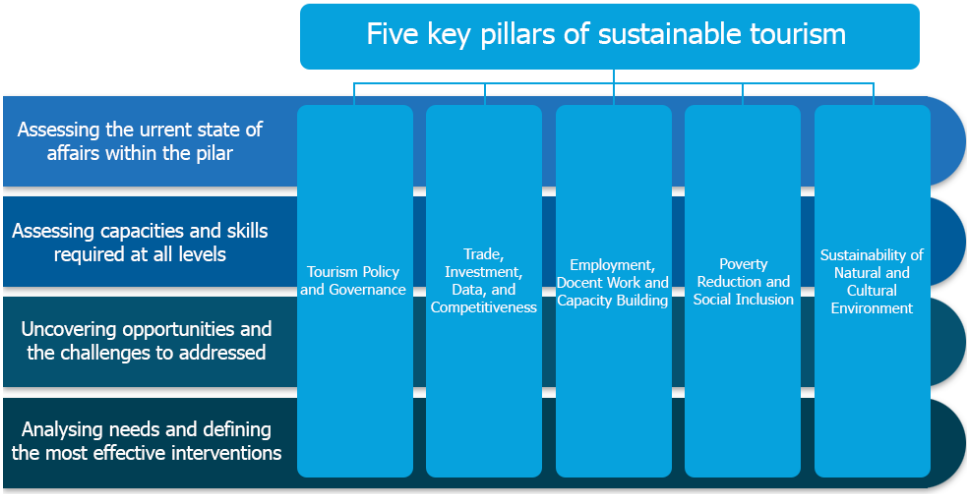



**Figure 3. Key pillars of Sustainable tourism**

*Source: www.unwto.org*




**Figure 4. Pacific Sustainable Tourism Policy Framework**

*Source: www.southpacificislands.travel*

Case Study: Copenhagen, Denmark

Copenhagen provides a leading example of sustainable urban tourism planning. The city has implemented carbon-neutral strategies, green transportation networks, and sustainable architectural designs that align tourism with broader urban planning goals (Gehl, 2016). Smart city initiatives, including data-driven tourism management and congestion control, have optimized visitor experience while minimizing environmental impact. Copenhagen's commitment to sustainable hospitality—such as energy-efficient hotels and local food sourcing—has made it a global benchmark for integrating sustainability into tourism.

Case studies from the Pacific region also provide valuable insights. Republic of Fiji, an island country in Melanesia, is famous for one of the best marine life in the world and its tourism industry. Fiji national sustainable tourism framework 2024 to 2033 shares the vision and goals of the Fijian tourism industry with four priorities derived

from the Pacific Sustainable Tourism Policy Framework (PSTPF): prosperous visitor economy, thriving and inclusive communities, visible and valued cultures, healthy islands and oceans (MTCA, The Fiji Ministry of Tourism and Civil Aviation, 2023)

### 2.3. Urban Planning and Placemaking

Vietnam belongs top 10 most vulnerable countries affected by climate change in the long run ( David Eckstein, Vera Künzel, Laura Schäfer, Maik Winges , 2019). Currently, many tourist destinations are suffering natural disasters (rising sea levels, typhoons, flooding) and problems in tourism operations. Urban development strategies and place-making practices are expected to solve existing issues of physical wealth and tourism destination branding. Furthermore, Urban planning and Place-making determine new solutions to improve infrastructure facilities, and policies to bring satisfying experiences, and profits for both international tourists and residents, ensuring the ability to create an adaptable city (David Drakakis-Smith and Chris Dixon, 1997).

Urban planning systems (Van Phuc Ma, Trung Vinh Tran, 2018) in Vietnam are managed by the Ministry of Planning and Investment, the Ministry of Construction, the Ministry of Natural Resources and Environment, and Others, and Political Systems through the legal, and regulation systems.

**Table 1: Planning System in Vietnam - Alteration of Vietnam's Urban Planning System by the Law of Urban Planning**

| ORGANIZATIONS | Regional Level | Urban Level | Zoning Level | Detailed level |
|---|---|---|---|---|
| **Ministry of Natural Resources and Environment and Others** | Land-use and specialized planning | | | |
| **Ministry of Planning and Investment** | Overall Planning of socio-economic development | Planning of socio-economic development | | |
| **Ministry of Construction** | Regional planning | Master planning | Zoning planning | Detailed planning |
| **Context** | - Analysis and evaluation of existing context<br>- Development framework (demographic and socio-economic framework for over the next 5 years)<br>- Direction of urban development directions (land use, urban cores, development control area, etc)<br>- Large-scale infrastructure plans (ground height, transportation, water supply, drainage, sewerage, electricity, etc)<br>- Environmental impacts assessment<br>- Urban design | | - Analysis and evaluation of existing situations<br>- Attributes and functions of planned area<br>- Land use plans and planning criteria<br>- Infrastructure plans (transportation, water supply, drainage, electricity, solid waste management, etc)<br>- Environmental impact assessment<br>- Urban design | |

*Sources: (Van Phuc Ma, Trung Vinh Tran, 2018)(Shigehisa MATSUMURA, Nguyen Trong Hoa, Truong Trung Kien, 2017)*

Place-making: The theory of Placemaking is formed in the urban design process, as it brings questions for urban planners, governments, and citizens about how a place can be described and make this destination become unique with another one, and create a strong sense of place (Quality places) (Wyckoff, 2014). That kind of requirement is more difficult in the modern world, when urbanization is happening fast, then creating mass construction, the same urban structure, and loss of identity (culture, landscape, history monument). More seriously the extent and rate of global environmental changes affect human behavior, urban ecology (green space, forest, water) (Grimmond, 2016).

Placemaking process has strong connection with the destination context, environment resources (Carlos Smaniotto Coasta, Mastourech Fathi and Juan A. Garcia-Esparza). Especially for hictoric cities, placemaking have to based on the

context of historical sites, cultural heritages, which dircectly linked to the tourism development. But the conflicts of benefits and strategies between two side of tourism development and historical preservation create challenges (Marija, 2010), that require placemaking approach to determine the balance solutions, and identify the significant role of heritage in local identity.

Case Study: Singapore's Marina Bay

Singapore's Marina Bay exemplifies the integration of sustainable tourism within urban planning. Through strategic master planning, Marina Bay incorporates green spaces, water-sensitive urban design, and sustainable transport systems. The district hosts iconic eco-friendly developments such as Gardens by the Bay, which combines urban biodiversity with tourism appeal (Chang, 2019). The integration of smart technology for energy conservation and waste management further cements its role as a model for sustainable tourism and placemaking.

Case Study: Da Nang, Vietnam

Da Nang is another example of a successful integration of urban planning with sustainable tourism. As Vietnam's most livable city, Da Nang has implemented coastal management programs, green city initiatives, and infrastructure investments to support sustainable tourism growth. Efforts such as renewable energy adoption, public transportation improvements, and sustainable beach tourism management contribute to its growing reputation as a model city for urban sustainability (Anh Vu Mai et al., 2020).

Besides that, many destinations lack management and investment from the government, local people, and stakeholders in all aspects of tourism development to solve multible challenges in tourism development (Anh Vu Mai, Kim Chi Nguyen Thi, Thanh Nga Nguyen Thi, Truong Le, 2020) waste their locally available resources (landscape, atmosphere, traditional villages). As a result, these problems make tourism destinations become less attractive for tourists and less prefer to return.

## III. RESEARCH METHODOLOGY

The study employs a multi-phase approach to investigate how sustainable tourism indicators can be integrated into urban planning and placemaking within the Vietnamese context. The first phase involves a comprehensive review of Vietnam's existing urban planning system. This analysis examines current structures, policies, and practices that influence tourism development. National and regional planning documents are analyzed to identify key elements that could support the integration of sustainable tourism concepts.

The second phase focuses on a case study analysis of successful placemaking and sustainable tourism initiatives in Vietnam and internationally. By examining these case studies, the research identifies best practices and strategies that can be adapted to Vietnam's unique socio-economic and cultural conditions. This comparative analysis helps uncover effective methods for balancing tourism development with environmental protection, cultural heritage preservation, and social equity.

In the third phase, the study identifies and evaluates key sustainable tourism indicators, such as environmental conservation, cultural heritage preservation, net-zero emissions, and community engagement. These indicators are assessed for their feasibility in the Vietnamese context based on criteria such as policy compatibility, financial viability, stakeholder support, and infrastructure readiness. This evaluation ensures that the proposed indicators can be realistically integrated into urban planning and placemaking practices.

Finally, the feasibility of integrating these indicators is thoroughly assessed. The study considers factors such as existing infrastructure, resource availability, and alignment with current urban planning frameworks. This multi-faceted assessment aims to provide actionable insights and practical recommendations for integrating sustainable tourism indicators into urban development. By doing so, the research supports Vietnam's goal of fostering resilient, culturally rich, and environmentally sustainable tourism infrastructure.

## IV. RESULTS AND DISCUSSION

### 4.1. Current urban planning systems in Vietnam

Vietnam's urban planning system is undergoing significant transformations to address the challenges posed by rapid urbanization, economic expansion, and climate change. Governed by the Law on Urban Planning (2009), the

system operates across multiple levels: national, regional, urban, zoning, and detailed planning. Key instruments guiding this process include the National Urban Development Master Plan, regional plans, urban master plans, and zoning frameworks.

Despite improvements, Vietnam's urban planning system faces several challenges, including fragmented governance, inconsistent policy implementation, and limited integration of climate resilience strategies. Enhancing coordination among government agencies, leveraging technology for data-driven decision-making, and fostering participatory planning are critical for a more adaptive and inclusive urban development framework. Additionally, sustainable urban design principles must be embedded in planning strategies to strengthen resilience against climate change and ensure long-term environmental sustainability

### 4.2. Place-making and sustainable tourism

Placemaking and sustainable tourism are interconnected approaches aimed at creating dynamic, resilient, and culturally rich destinations while maintaining environmental and social sustainability. Placemaking in tourism focuses on designing spaces that reflect the distinct character of a destination, enhance visitor experiences, and improve the well-being of local communities. This approach prioritizes public space enhancement, cultural authenticity, and active community involvement.

Sustainable tourism development seeks to mitigate the adverse effects of tourism while optimizing its social and economic benefits. Its core principles include environmental conservation, economic viability, cultural heritage preservation, and equitable community engagement. However, challenges such as overtourism, inadequate regulatory enforcement, and short-term economic priorities often undermine sustainability efforts.

Integrating placemaking with sustainable tourism requires participatory planning, where local communities, businesses, and policymakers collaborate to ensure tourism initiatives align with sustainability goals. Eco-cultural tourism, which emphasizes both natural and cultural heritage, supports authenticity and environmental stewardship. Smart technologies can be employed to manage visitor flows, track environmental impacts, and optimize tourism infrastructure. Capacity-building initiatives can also empower local stakeholders to actively engage in sustainable tourism management. Strong governance frameworks and policy enforcement are essential to balance development with conservation efforts.

### 4.3. Proposed Model for Integrating Sustainable Tourism Indicators

Based on the existing planning system of Vietnam with the participation of individuals and expertise organizations. The proposed Model for Integrating Sustainable Tourism Indicators is generated to analyze, identify, and achieve targets in each planning stage. Following these principles, not only urban planners but also policy makers, tourism organizations, and communities can understand and actively take part in the place-making process. This model facilitates a structured and inclusive approach to sustainable tourism development by embedding key indicators at multiple planning levels. The incorporation of participatory governance, environmental safeguards, and smart urban solutions ensures that tourism contributes positively to urban resilience, cultural vibrancy, and economic stability.

**Table 2. Integrating Sustainable Tourism indicators in the Urban Planning Process**

| | **Regional Planning** | | | |
|---|---|---|---|---|
| **Principles** | **National development strategy** | **Determination of tourism key factors** | **Connection** | **Participated objects: national government, policy makers, planning agencies, international institutions,** |
| **Indicators** | + Sustainable economic growth | + Heritage Conservation | + Transportation | |
| | + Jobs creation | + Natural-based tourism | + Logistic | |
| | + International Cooperation and Research | + Environment Protection site | | |
| | + Cultural protection | | | |

| | | | | | |
|---|---|---|---|---|---|
| | + Biodiversity Protection | | | | **and experts** |
| **Master planning** | | | | | |
| **Principles** | **Land use** | **Environment approach** | **Community** | **Connection** | |
| **Indicators** | + Tourism center | + Effective energy use | + Labor market | + Public transportation | **Participated objects: Government, Consultant agencies, international institutions, Conservation organizations.** |
| | + Infrastructure | + Waste management | + Service quality | + Eco vehicles approach | |
| | + Heritage and historic sites | + Natural protection sites | + Economic structure | + Transit system | |
| | + Agriculture areas | | + Living condition | | |
| | + Open space | | + Community wellbeing | | |
| | + Traditional villages | | | | |
| | + Urban green space | | | | |
| **Zonning planning** | | | | | |
| **Principles** | **Land use** | **Environment approach** | **Population** | **Connection** | **Participated objects; government, consultant agencies, stakeholders, urban planning agencies** |
| **Indicators** | + Tourism center | + Effective energy use | + Living condition | + Public transportation system | |
| | + Tourism facilities | + Waste management | + Public building | + Foot pathway | |
| | + Urban green space | + Sanitation facilities | + Facilities | | |
| | + Heritage and historic sites | | + Job creation | | |
| | + Traditional villages | | | | |
| **Detailed planning** | | | | | |
| **Principles** | **Land use** | **Environment approach** | **Local Approach** | **Connection** | **Participated objects: Government, planning agencies, tourism investors, stakeholders, local community.** |
| **Indicators** | + Accommodations | + Renewable energy system | + Traditional villages | + Foot pathway | |
| | + Amenities | + Native-based plants | + Services | + Pavement system design | |
| | + Natural-based landscape design | + Eco materials | + Qualified labor | | |
| | + Green parks | + Garbage collection | + Communities-based design | | |
| | + Traditional villages | + Landscape design | + Services and local products | | |
| | + Religion building | | | | |

*Source: Authors*

## V. CONCLUSION

In this new phase of development, significant challenges require an innovative approach to tourism development strategies through urban planning and placemaking perspectives. These strategies not only enhance physical infrastructure and foundational elements but also preserve existing cultural values and explore future potential, contributing to the national tourism branding process. Vietnam's tourism development strategy has established a

sustainable criteria framework that aligns with international standards. The case studies presented demonstrate global best practices and their feasible adaptation to the Vietnamese context.

Urban planning plays a crucial role in managing spatial factors such as infrastructure, land use, landscape, policy, and regulation. Based on Vietnam's planning system, sustainable tourism principles and indicators can be systematically integrated into different planning phases with the active participation of relevant organizations, communities, and stakeholders. Meanwhile, placemaking has a strong influence on community engagement, tourism marketing, and cultural identity by fostering a sense of place, preserving cultural values, promoting environmental responsibility, and encouraging collaborative design approaches.

The integration of urban planning and placemaking not only accelerates tourism industry development but also fosters cross-sector collaboration among domestic institutions and international conferences. This interdisciplinary approach—encompassing economics, scientific research, energy, and education—ensures that sustainable tourism development aligns with national sustainability goals, including Vietnam's commitment to achieving net-zero emissions.

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# SOME ISSUES OF FESTIVAL MANAGEMENTASSOCIATED WITH CULTURAL ECONOMIC DEVELOPMENT IN HO CHI MINH CITY IN THE DIGITAL TRANSFORMATION PHASE

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**ABSTRACT**

In recent years, Ho Chi Minh City (HCMC) has emerged as a dynamic cultural festival center, contributing significantly to the development of the cultural economy. However, with the strong impact of digital transformation, festival management within the framework of cultural economic development and sustainable growth in HCMC remains a major challenge. This article explores the intersection of festival management and cultural economics, analyzing their roles, functions, and relationships in the digital transformation era. It aims to propose solutions for festival management aligned with cultural economic development. The research findings will offer new perspectives for cultural policymakers, stakeholders, and efforts to promote sustainable initiatives in the current context.

*Keywords:* **"**cultural economics", "digital transformation", "festival management", "cultural economic development"

## I. INTRODUCTION

### 1.1. Background of the study

On Ho Chi Minh City's bustling streets, the Tet Festival's vibrant colors and rhythms unite generations. Yet behind the spectacle lies a transformation—centuries-old traditions reshaped by digital innovation. As technology reshapes festival management, its role grows both crucial and complex. Digital transformation is reshaping HCMC's festivals, proving that technology and culture can coexist. Virtual reality, live streaming, and digital ticketing now enhance traditions, yet some cultural legacies risk fading amid this rapid change.

At the heart of this shift lies a mystery—how can the city manage the delicate balance between honoring its cultural past and embracing digital innovation without sacrificing the authenticity that defines these festivals? This study examines HCMC's festival management to uncover challenges and opportunities, showing how digital transformation can shape cultural celebrations while preserving their traditional essence.

As Vietnam's leading cultural and economic hub, HCMC blends heritage with modernity, drawing strength from its history, diverse population, and rich network of cultural institutions. Furthermore, The city's cultural economy thrives on creative industries like arts, fashion, and entertainment, driving both local and national economic growth.

Firstly, HCMC is home to a rich tapestry of cultural heritage, including museums, theaters, and traditional festivals. The city also serves as a conduit for global cultural exchange, hosting international art exhibitions, music festivals, and fashion events. This reinforces the city's role in connecting Vietnam's heritage to a global audience, making it a key player in the international cultural arena.

In addition to its historical significance, the cultural industries in HCMC play a critical role in Vietnam's broader cultural economy. These industries contribute to job creation, tourism revenue, and urban development. As a result, the city's creative sectors account for a substantial share of its GDP, reflecting the growing importance of cultural assets in economic strategies.

Recently, HCMC has also embraced digital tools to modernize its cultural infrastructure. Online platforms and virtual events have expanded access to cultural experiences, fostering greater inclusivity and international reach. This development aligns with global trends in cultural economics, where digital transformation plays a pivotal role in enhancing cultural production and consumption.

Moreover, festivals in HCMC play a critical role in shaping cultural tourism, reinforcing local identity, and driving

economic growth. Notably, festivals such as the Tet Festival and the Ao Dai Festival not only celebrate traditions but also attract international tourists, contributing significantly to the local economy. Cultural festivals serve as a magnet for tourism, offering unique experiences that showcase the region's heritage.

As Richards (2018) notes, "Cultural festivals act as a magnet for tourism, creating an immersive environment where visitors can engage with local traditions and lifestyles" (p. 12). This highlights how these festivals become platforms for storytelling, allowing communities to present their culture authentically to a global audience.

In the context of local identity, festivals also reinforce communal bonds and foster pride. According to Quinn (2009), festivals are "mechanisms of cultural expression that enable communities to define and celebrate their identity" (p. 176). In HCMC, this is evident in how both traditional and contemporary elements are blended during major events, showcasing the city's dynamic character and fostering a sense of belonging among residents and visitors alike.

Economically, festivals stimulate growth through increased spending on accommodation, dining, and transportation. They also generate employment and support local businesses. As reported by Getz and Page (2016), "Festivals contribute to economic vitality by attracting tourists, encouraging local spending, and boosting regional branding efforts" (p. 227). This highlights the broader economic impact festivals have in the city, influencing various sectors and contributing to a more robust local economy.

This digital integration aligns with the observation by V. Grover et al. (2022) that Digitalization has fundamentally changed organizational structures and processes and affects how people interact with each other, thereby impacting organizational culture.

The second Ho Chi Minh (HCM) City River Festival in 2024 was a great success with impressive numbers, said the city Department of Tourism on June 12. From May 31 to June 9, the southern city attracted more than 1.3 million visitor arrivals, including 121,000 international visitors and 1.18 million domestic visitors. Tourism and service revenue reached 4.25 trillion VND. The average room capacity at accommodation establishments in District 1 increased by 20% compared to normal. (BAT, 2024).

In conclusion, the cultural and economic contributions of festivals in HCMC are clear. By blending tradition with innovation, they offer a platform for cultural expression, drive tourism, and support economic growth.

**1.2. Research Questions and Objectives**

This study aims to explore the multifaceted role of festival management in Ho Chi Minh City, focusing on its impact on cultural economic development, heritage preservation, business growth, and digital transformation In light of these considerations, the following research questions have been identified, including:

– How does festival management contribute to the cultural economic development of Ho Chi Minh City?

– How do festivals in Ho Chi Minh City contribute to the preservation and promotion of cultural heritage?

– How does digital transformation impact festival management in Ho Chi Minh City in terms of organization, audience engagement, and economic outcomes?

*Research Objectives*

The research aims to explore the complexities of festival management in HCMC, particularly in the context of **C**ultural **E**conomic **D**evelopment (CED)[1] during the digital transformation phase. This research seeks to fill the gaps in the literature by: (1). *Analyze the Role of Festivals in CED:* Investigate how festivals contribute to HCMC's cultural economy through tourism, community engagement, and heritage promotion. Assess the economic impact of festivals on local businesses, creative industries, and employment. (2). *Examine the Challenges of Festival Management in the Digital Transformation Era:* Identify the technological, logistical, and cultural challenges faced by festival organizers during the digital shift. Explore the implications of digital tools on festival planning, promotion, and execution. (3). *Evaluate the Impact of Digital Tools on Festival Operations:* Assess how digital tools enhance the efficiency of festival operations, including logistics, ticketing, and crowd management. Investigate the role of digital technologies in improving coordination among stakeholders, including organizers, performers, and vendors. (4). *Develop Strategic Recommendations for Enhancing Festival Management*: Propose innovative approaches to festival management that leverage digital transformation for improved cultural and economic outcomes. Suggest strategies for balancing cultural

authenticity with modern technological advancements.

## II. METHODOLOGY

### 2.1. Conceptual Theoretical Framework of The research

*Cultural Economics Theory*: Cultural Economics Theory explores the intersection of culture and economics, focusing on how cultural values, goods, and activities influence economic behavior and outcomes. It recognizes that cultural goods are unique because they carry both economic value (measurable in monetary terms) and cultural value (symbolic, aesthetic, or social significance).

Pierre Bourdieu, in his influential work Distinction: A Social Critique of the Judgement of Taste (1984), introduced the concept of cultural capital, which refers to the non-economic social assets, such as education, knowledge, and cultural awareness, that individuals use to gain social mobility. Cultural goods and services, according to Bourdieu, are not just economic commodities but also represent the social status of individuals and groups. The consumption of cultural products (like art, literature, and performances) is often linked to class distinctions, making cultural participation an avenue for signaling taste, identity, and social belonging. Bourdieu argued that alongside economic and social capital, cultural capital plays a crucial role in determining a person's social position and access to opportunities. "Cultural capital is convertible, on certain conditions, into economic capital and may be institutionalized in the form of educational qualifications" (Bourdieu, 1986, p. 243).

Bourdieu's theory emphasizes that the appreciation of cultural goods is highly influenced by societal norms and class dynamics, suggesting that culture is a tool for social distinction. However, it may overlook how broader shifts in global society—such as digital access and democratization of cultural content—are reshaping how people value and consume culture.

The Two-Sector Model of cultural economics, developed by David Throsby, divides the cultural economy into two key sectors: the commercial sector and the non-market sector. The commercial sector includes cultural products and services that are traded in the market, such as concerts, films, or cultural tourism. The non-market sector encompasses cultural goods and services that are funded by public or private philanthropic support, such as public museums, educational programs, or community arts initiatives. David Throsby (2001) emphasized this dual nature: "Cultural goods are valued not only for their economic significance but also for their cultural and symbolic meanings." and "Cultural value derives from the symbolic, aesthetic, and spiritual attributes of cultural goods, whereas economic value is measured by the market price or other monetary indicators." (Throsby, 2001, p. 44). However, this model might underplay the increasingly blurred lines between commercial and non-commercial cultural activities, especially in the context of digital transformation where many cultural products now straddle both sectors (e.g., online streaming platforms).

### 2.2 Research method

This study adopts qualitative methodologies to explore the cultural and economic dimensions of festival management in HCMC. Specifically, a case study analysis is conducted on prominent festivals, such as the Tet Festival, Ao Dai Festival, and HOZO music Festival, to examine their management strategies and cultural significance. Additionally, thematic analysis is employed to identify recurring themes from interviews and focus groups with key stakeholders, including organizers, policymakers, and attendees. To further contextualize the strategic integration of culture and economics, document analysis is carried out, reviewing cultural policies, festival reports, and promotional materials. Collectively, these approaches provide in-depth insights into the role of festivals in shaping cultural identity and driving economic development, especially in the context of a rapidly modernizing city. Finally, Data is gathered through interviews, participant observation, and archival research, ensuring a comprehensive and nuanced understanding of the local festival landscape.

## III. RESEARCH RESULTS

### 3.1. Role of Cultural Festivals in CED

Festivals play a significant role in CED by acting as catalysts for cultural preservation, community engagement, and economic stimulation. In addition, they contribute to the creative economy by promoting cultural products,

enhancing tourism, and supporting local industries.

Festival economics refers to the study of the economic impact and financial dynamics of festivals, including their role in stimulating local economies, creating employment opportunities, and promoting cultural tourism. Specifically, this field examines the monetary benefits festivals generate, such as direct spending on tickets, food, and merchandise, as well as indirect effects like increased demand for accommodations and transportation. For example, Throsby (2001, p. 56) argues that "festivals are crucial in CED as they create opportunities for cultural expression, generate economic value, and contribute to the sustainability of cultural industries." Similarly, Getz (2010, p. 45) emphasizes that "festivals serve as platforms for cultural tourism, attracting visitors and creating economic benefits for host communities. Building on this, Frey (1994) defines festival economics as the study of how festivals influence economic activity, emphasizing expenditure patterns, revenue generation, and their broader impact on host communities.

This definition underscores the dual role of festivals in delivering immediate financial benefits and fostering long-term economic growth and community well-being. Similarly, Getz (2007) expands this perspective, describing festival economics as "a subfield of event studies that investigates the economic dimensions of festivals, encompassing cost-benefit analyses, funding strategies, and the return on investment for stakeholders." This highlights the importance of strategic financial planning and sustainability in festival management.

Moreover, Gibson and Connell (2012, p. 79) argue that "festivals serve as significant drivers of cultural economies, acting as platforms for showcasing local heritage, creativity, and cultural products while stimulating local businesses and tourism industries. This dual impact, involving cultural enrichment and economic growth, further underscores the essential role of festivals in supporting both local heritage and economic activity. Likewise, Getz (2010) emphasizes the dual benefits by stating, "By attracting tourists and fostering local participation, cultural festivals contribute to economic growth, create employment opportunities, and enhance the cultural identity of host communities."

In developing economies, Richards (2007) highlights the transformative power of festivals, asserting that "festivals are a powerful tool for the cultural economy as they provide a space for cultural exchange and commercialization of cultural goods, creating direct and indirect economic benefits" (p. 11).

In summary, festivals are not only celebratory events but also vital mechanisms for driving cultural, social, and economic progress. Through strategic planning and an emphasis on sustainability, festivals can become even more impactful in shaping cultural economies and fostering community development.

*Key Contributions to CED:*

Festivals play a pivotal role in driving tourism and economic revenue, creative industries growth, and community development, making them key contributors to cultural and economic sustainability. For instance, festivals attract both domestic and international visitors, significantly boosting spending on accommodation, food, and transportation. According to the HCMC Department of Tourism, the River Festival (May 31 - June 9) welcomed a total of 1,301,000 visitors, including 121,000 international guests and 1,180,000 domestic attendees. As a result, tourism and service revenue reached VND 4,250 billion, with the average room occupancy rate in District 1 increasing by 20% compared to normal.

In addition to economic benefits, festivals also stimulate the growth of creative industries by providing a vibrant platform for artists, artisans, and performers to showcase their work. This not only enhances the cultural vibrancy of a region but also fosters local creative economies.

Moreover, festivals contribute significantly to community development. They strengthen social cohesion by bringing people together, while also offering opportunities for skill development and volunteering. In this way, festivals serve as multifaceted tools for economic growth, cultural preservation, and community empowerment.

**3.2. Festival management and CED in HCMC**

Ho Chi Minh City, a bustling metropolis with a rich tapestry of Cultural festival resources, boasts immense potential in festival management. As Vietnam's economic and cultural hub, the city is home to a diverse range of festivals, from traditional celebrations like Tet Nguyen Dan (Lunar New Year) to contemporary events such as international music and art festivals. Its abundant resources, including vibrant cultural institutions, skilled artisans, and

dynamic creative industries, provide a strong foundation for organizing world-class festivals. These events not only preserve and promote local traditions but also serve as significant drivers of tourism and economic growth, positioning the city as a leading cultural destination.

Ho Chi Minh City hosts a wide variety of festivals, including traditional Vietnamese festivals, international cultural events, and music festivals. For example, key events such as the Tet Nguyen Dan (Lunar New Year), Mid-Autumn Festival, HCMC Tourism Festival, and the Festival of International Music, among others, cater to both local and international audiences. As a result, these festivals promote the city's cultural vibrancy and contribute to its economic growth. In line with this, the viewpoints and policies of the Party Committee and the Government of HCMC regarding the organization of festivals, cultural, and sports events are outlined in the Project "Organizing typical festivals, cultural, and sports events in HCMC, period 2020 - 2030." This project is associated with the goal of comprehensive development for the city.

Moreover, festivals stimulate local economies by increasing tourism and supporting industries such as hospitality, food, and crafts. For instance, events like the HCMC Tourism Festival and the International Tourism Expo connect local businesses with global markets, creating opportunities for long-term growth. According to the HCMC Department of Tourism, the 2nd HCMC River Festival in 2024, held over 10 days (from May 31 to June 9), with nearly 20 activities, attracted 4.5 million HCMC residents and tourists. As a result, tourism and service revenue reached 4,250 billion VND (equivalent to 170 million USD).

*Legal basis related to festival management at HCMC:*

The work of festival management and organization is currently having certain achievements and advantages due to the policies, strategies, projects and implementation plans for both the festival and cultural sectors. The work of festival management and organization in HCMC is currently being carried out on the following basis at Table 3.3:

**Table 3.1 - Festival management legal documents**

| Legal documents | Description |
|---|---|
| Resolution No. 31-NQ/TW | Direction and tasks for developing HCMC to 2030, with a vision to 2045. |
| Directive No. 41-CT/TW (Feb 5, 2015) | Strengthening the Party's leadership in festival management and organization. |
| Decree No. 110/2018/ND-CP | Regulations on festival management and organization. |
| Decree No. 144/2020/ND-CP (Dec 14, 2020) | Regulating performing arts activities, effective from February 1, 2021. |
| Decision No. 1755/QD-TTg | Approving the Strategy for developing Vietnam's cultural industry to 2020, with a vision to 2030. |
| Circular No. 04/2023/TT-BTC | Guiding management and financial revenue/expenditure for festival organization and sponsorship activities. |
| Decision No. 4853/QD-UBND (Oct 25, 2023) | Approving the Project on developing HCMC's cultural industry for the period 2020-2030. |
| Plan No. 425/KH-UBND (Feb 14, 2022) | Organizing activities to celebrate major holidays and important historical/political events in 2022 in HCMC. |
| Plan No. 846/KH-UBND (Mar 21, 2022) | Implementing the Project "Organizing typical festivals, cultural, and sports events in HCMC, period 2020-2030". |

*Source: Prepared by author, 2024*

### 3.3. Festivals are a driving force for tourism and cultural economic activities in HCMC

Festivals serve as vital catalysts for cultural preservation, economic development, and community engagement, significantly enhancing local economies and creative industries. By attracting both domestic and international tourists, festivals generate substantial economic benefits for host communities.

For example, the Huế Festival in Vietnam, renowned for its traditional music, art, and cuisine, draws thousands of visitors annually, contributing to the local economy through tourism revenue, job creation, and increased demand for services like hospitality and transportation (Nguyen & Nguyen, 2020).

Similarly, the HCMC River Festival underscores the potential of festivals to serve as cultural and economic powerhouses. In addition to promoting the city's image, cultural identity, and unique tourism offerings, the festival captivated audiences with a breathtaking drone display involving over 1,000 drones lighting up the southern metropolis's sky, drawing thousands of spectators to the banks of the Saigon River (VNA, 2024). This event not only enriched the cultural tapestry of HCMC but also fueled tourism-related spending, reinforcing the festival's role as a driver of economic growth. Beyond tourism, festivals also provide fertile ground for the growth of creative industries, including art, music, and fashion.

The relationship between festivals and the cultural economy can be understood through the lens of supply and demand. On the supply side, festivals offer cultural experiences, performances, and products that attract both local and international audiences. These offerings create a diverse supply of cultural goods and services, from food and crafts to performances and artworks, which are tailored to meet various consumer preferences.

On the demand side, festivals generate interest from consumers who seek unique cultural experiences. This demand drives tourism, local attendance, and spending on accommodation, food, entertainment, and souvenirs. As demand increases, it creates economic opportunities for local businesses, artisans, and service providers to cater to festival-goers. The interplay between the supply of cultural offerings and the demand for those experiences helps drive growth in the cultural economy, benefiting both creators and consumers while boosting local economies (see Fig 3.3). On the contrary, the cultural economy not only provides a diverse range of goods and services but also plays a crucial role in shaping the identity and sustainability of cultural festivals. It encompasses traditional crafts, performances, heritage tourism, creative industries, and digital cultural content, all of which contribute to enriching festival experiences, attracting audiences, and driving economic activity.

Beyond economic contributions, the cultural economy fosters innovation by blending tradition with modern creative expressions. Festivals serve as platforms for artisans, musicians, and performers to showcase their work, helping preserve intangible cultural heritage while adapting to contemporary trends. The integration of digital technologies—such as virtual reality, live streaming, and interactive exhibits—further expands audience engagement, making cultural experiences more accessible to both local and international participants. (see Fig 3.3)

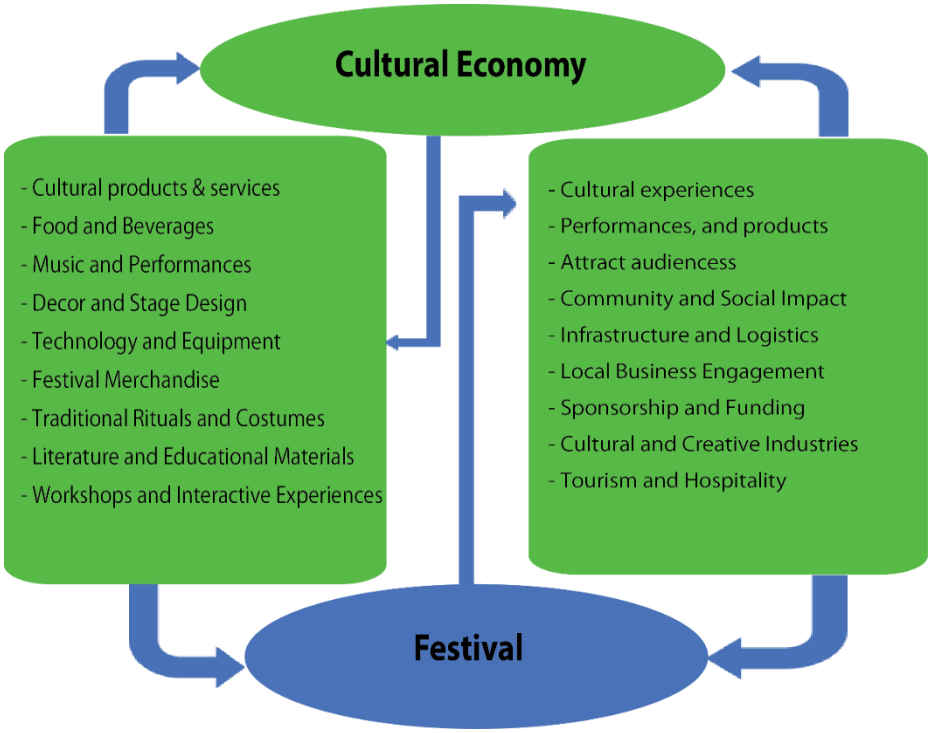



**Fig 3.3 - Diagram of the relationship between festivals and cultural economy**

*Source: Prepared by author, 2024*

In essence, festivals act as both suppliers and demand generators in the cultural economy, creating a cyclical relationship that fosters cultural and economic exchange.

### 3.4. Festivals Preservation and Promotion of Cultural Heritage in HCMC

Festivals play a critical role in preserving and promoting cultural heritage, ensuring its transmission to future generations. In particular, traditional festivals such as the Tet Lunar New Year celebrations in Vietnam are integral to cultural identity and attract international recognition. Moreover, many of HCMC's festivals are rooted in ancient Vietnamese traditions, with hidden layers of symbolism and forgotten rituals that have been passed down through generations. For example, celebrations such as Tet Nguyen Dan (Lunar New Year) and the Mid-Autumn Festival carry with them the secrets of past practices—ancient music, dances, and foods—whose meanings may be lost to many but are carefully upheld by those who understand their true significance. In this way, these festivals maintain and pass on cultural customs to younger generations, ensuring that the mystical essence of these traditions endures.

Festivals in Ho Chi Minh City are vital for preserving and promoting Vietnam's cultural heritage. They showcase local traditions, reviving arts and fostering cultural tourism. Each festival, such as the Tet Festival, not only celebrates cultural practices like ancestor worship and traditional cuisine but also adapts these customs to modern contexts (Nguyen & Tran, 2021). The Ao Dai Festival, for example, highlights Vietnam's iconic attire, blending tradition with contemporary fashion, and renewing interest in traditional textiles and craftsmanship (Pham, 2019). These festivals play a crucial role in maintaining the city's cultural identity while keeping its history alive.

Meanwhile, the Nghinh Ong Festival, celebrated by the fishing communities in HCMC, not only honors the Whale God (Ca Ong) for protection and good fortune but also reinforces communal bonds. According to Do and Vu (2020), "The Nghinh Ong Festival reflects the intergenerational transmission of marine folklore, uniting communities in both spiritual and cultural practices" (p. 45).

In addition, festivals like the International Music Festival and the Ao Dai Festival position HCMC on the global cultural map. Truong and Nguyen (2020) highlight, "Through these events, the city not only celebrates its heritage but also asserts its identity as a cosmopolitan hub blending tradition and innovation" (p. 93).

### 3.5. Impact of Digital Transformation on Festival Management in HCMC

Digital marketing has revolutionized the way festivals are promoted in HCMC. Through the use of social media platforms, websites, and mobile apps, event organizers are now able to reach larger and more diverse audiences, both locally and internationally. For instance, festivals in HCMC actively utilize platforms like Facebook, Instagram, and YouTube to promote their events, allowing them to connect with a global audience. Moreover, digital marketing campaigns enable organizers to engage with attendees both before the event and during the festival itself, building excitement and anticipation. As a result, virtual participation now constitutes a significant portion of audience engagement. In fact, virtual attendance accounted for 15% of total engagement in hybrid events such as the Ao Dai Festival (HCMC Cultural Affairs Report, 2023).

In addition to marketing improvements, digital transformation has significantly enhanced festival management in HCMC. Specifically, these advancements have increased marketing efficiency, boosted audience engagement, and fostered the creation of sustainable, inclusive cultural events.

One key area of improvement has been online ticketing and registration processes, which have become more efficient, accessible, and user-friendly. For example, major festivals such as the HCMC Ao Dai Festival, Tet Festival, and International Tourism Festival have greatly benefited from these innovations. According to the HCMC Department of Tourism (2023), 65% of tickets for the 2023 International Tourism Festival were sold online, representing a 30% increase compared to 2022. Furthermore, the adoption of online registration for the Ao Dai Festival in 2023 resulted in a 40% reduction in on-site registration times, thereby enhancing overall attendee satisfaction.

Impact of Digital Transformation on Festival Management are shown in Table 3.2 as below:

**Table 3.2: Impact of Digital Transformation on Festival Management**

| Aspects | Traditional Festival | Digital Era Festival |
|---|---|---|
| **Event Planning** | Manual scheduling, paper-based workflows. | Digital tools for festival management, online, enhance communication, collaboration platforms. |

| | | |
|---|---|---|
| **Marketing** | Flyers, posters, local radio/TV ads. | Social media campaigns, digital marketing, SEO, and data-driven targeting. |
| **Ticket Sales** | On-site or physical ticket outlets. | Online ticketing platforms, mobile apps, e-ticketing systems. |
| **Audience Engagement** | Limited to event duration, in-person experiences. | Virtual and hybrid events, livestreaming, interactive social media polls. Post-Festival Archives and Engagement |
| **Data Collection** | Anecdotal feedback, manual surveys. | Real-time analytics, online surveys, and audience tracking tools. |
| **Revenue Streams** | Ticket sales, vendor fees, sponsorships. | In-app purchases, crowdfunding, online merchandise sales, digital ads. |
| **Logistics and Operations** | Physical communication with vendors and stakeholders. | Automated communication, inventory management systems, and digital tools. |
| **Festival Planning** | Manual scheduling, paper-based workflows. | Digital tools for project management, online collaboration platforms. |
| **Accessibility** | Limited by geographic and physical constraints. | Global reach through online platforms, virtual attendance options. |
| **Cultural Preservation** | Risk of losing relevance among younger audiences. | Digital archives, multimedia storytelling, and gamification. |
| **Economic Efficiency** | High costs for physical marketing and logistics. | Reduced costs through digital marketing, support creative industries and cultural industries |

*Source: Prepared by author, 2024*

### 3.6. Challenges of Digital Transformation in Festival Management in HCMC

Digital transformation in festival management presents several challenges, requiring careful navigation to fully realize its potential. One major obstacle is limited access to resources and technology infrastructure, particularly for smaller festivals, which often struggle with financial constraints. As Getz and Page (2016) note, "Smaller festivals face significant hurdles in adapting to technological advancements due to financial and operational limitations" (p. 223). Furthermore, the digital divide continues to marginalize certain communities, creating inequities in participation and access.

Adopting digital tools, such as event apps, live streaming, and online ticketing platforms, often demands significant upfront costs, which can be prohibitive for festivals with limited budgets. Additionally, ongoing expenses, including software updates, licenses, and technical support, add to the long-term financial burden. Richards (2018) highlights that "the ongoing costs of digital tools can strain festival budgets, particularly for grassroots and community-driven events" (p. 45).

Moreover, technical reliability is a pressing concern, as issues such as internet connectivity problems or software glitches can disrupt the festival experience for both organizers and attendees. Another challenge lies in integrating new digital tools with existing festival management systems, such as scheduling and ticketing platforms, a process that can be both complex and time-consuming. Despite these hurdles, addressing these challenges is essential to successfully balance innovation with cultural preservation in festival management.

Digital transformation is considered one of the key, long-term tasks and the main driving force to improve and enhance the quality of service in the tourism sector in HCMC (Decision No. 749/QD-TTg of the Prime Minister: Approving the "National Digital Transformation Program to 2025, with a vision to 2030").

The Department of Tourism has issued a Plan to implement the Smart Tourism Development Project in 2024 with

3 key contents:Raising awareness of smart tourism, Building infrastructure, data centers, and deploying information technology activities; Plan to build a tourism service database system; Plan to implement the Program "Digital transformation of the tourism sector of the Ho Chi Minh City Department of Tourism". (Tcdulichtphcm.vn, 2024)

**3.7. Discussion and recommendations**

The integration of digital tools into festival management is transforming CED in HCMC, enhancing both cultural preservation and economic growth. This discussion highlights key aspects of this transformation, its implications, and challenges.

*Enhancing Cultural Economy and Creative Industries*

Cultural festivals stimulate local creative industries by promoting art, music, and performance, helping regions brand themselves as cultural hubs. For instance, the Montreux Jazz Festival supports the Swiss music industry while drawing significant international audiences. Showcasing local talent can open global markets and create a sustainable cultural economy. "The festival is estimated to generate around CHF80 million in economic income for Montreux and Vevey. During the two-week festival Montreux hotel owners earn around 20% of their annual turnover." (Bradley, 2024)

Digitalization has improved operational efficiency and boosted economic outcomes. For instance, automated systems reduce administrative burdens, while data analytics provide insights into audience preferences, enabling targeted marketing strategies. According to a 2023 report by the HCMC Department of Tourism, festivals adopting digital solutions reported a 30% increase in sponsorship and a 25% rise in visitor spending compared to traditional formats.

Moreover, festivals such as the Ho Chi Minh City Tourism Festival directly boost local economies. According to the Ho Chi Minh City Department of Tourism (2024), "The 2nd Ho Chi Minh City River Festival in 2024 attracted 4.5 million participants and generated tourism revenue of 4,250 billion VND (equivalent to 170 million USD)."

*Enhanced Accessibility And Engagement Through Digital Platforms*

Digital transformation has revolutionized the way festivals are managed and experienced. Online ticketing, virtual events, and social media marketing have made festivals more accessible to a global audience. For instance, the HCMC International Music Festival (HOZO), with its hybrid format, attracted over 100,000 attendees both online and offline in 2022. These tools not only expand audience reach but also generate additional revenue streams through advertisements, live-streaming fees, and digital merchandise sales.

*Preservation Of Cultural Heritage Through Digital Documentation*

Digital tools enable the documentation and archiving of cultural festivals, ensuring the preservation of intangible heritage. Virtual reality (VR) and augmented reality (AR) are now being used to create immersive cultural experiences, such as re-enactments of traditional rituals during the Nguyen Hue Flower Street Festival. Such practices promote cultural awareness among younger generations while attracting international tourists seeking unique cultural experiences.

*Recommendations*

To foster digital innovation in festival management, collaboration between the government, cultural institutions, and private enterprises is essential. Public-private partnerships can drive innovation by combining resources, expertise, and technology.

For instance, the government could facilitate collaborations by offering grants or subsidies to private enterprises developing digital solutions for the cultural sector. Additionally, training programs for festival managers and staff are crucial to enhance their digital skills and knowledge. These programs should focus on the latest tools for event planning, digital marketing, and virtual experiences to improve festival operations.

Furthermore, government policies supporting digital transformation, such as tax incentives or partnerships with tech companies, can create an ecosystem conducive to innovation. Promoting digital inclusivity is also vital, ensuring that small festivals and marginalized communities can benefit from technological advancements. By offering support such as affordable digital platforms or training, these groups can engage with the digital transformation.

Finally, the digital shift must be sustainable. Balancing the adoption of technology with environmental and social responsibility is essential, and festivals should consider eco-friendly technologies, such as energy-efficient digital systems, to minimize their carbon footprint. In this way, digital innovation can not only enhance festival management but also contribute to the broader goals of sustainability and inclusivity.

## IV. CONCLUSION

Festival management plays a pivotal role in the cultural and economic development of Ho Chi Minh City (HCMC), a vibrant urban hub renowned for its rich heritage and growing creative economy. More than just cultural celebrations, festivals serve as powerful economic drivers, promoting local traditions, attracting tourism, and stimulating creative industries.

This article examines the impact of digital transformation on festival management in HCMC, emphasizing how technology enhances the intersection of cultural heritage and economic growth. Festivals are not only a means of preserving tradition but also a platform for innovation, crucial to the city's development. However, challenges such as resource constraints and the digital divide must be addressed. The study advocates for strategic investments in technology, education, and public-private partnerships to ensure sustainable growth.

In conclusion, aligning cultural and economic priorities through digital innovation can position HCMC as a global leader in cultural creativity and sustainable development. This study provides valuable insights into festival management, though a comprehensive review of the broader theoretical framework lies beyond its scope. Future research is needed to further explore these dynamics and their long-term implications.

## NOTE:

[1]According to Throsby (2001), Cultural Economic Development refers to "the process through which cultural assets, activities, and industries are leveraged to generate economic growth, enhance social cohesion, and contribute to the sustainability of cultural resources" (p. 56).

## ABBREVIATION:

[1] HCMC: Ho Chi Minh City

[2] CED: Cultural Economic Development

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# THE ROLE OF VIRTUAL REALITY (VR) TECHNOLOGY IN INNOVATION AND SUSTAINABLE DEVELOPMENT OF INDOCHINE HERITAGE TOURISM IN THE INTERIOR OF HUE ROYAL PALACE

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**ABSTRACT**

This study explores the role of Virtual Reality (VR) technology in preserving and enhancing the Indochina heritage tourism experience, focusing on the interior of the Hue Royal Palace. A mixed-methods approach was used, including a visitor survey (n = 122), expert interviews (n = 12). The results show that 87% of participants reported having a deeper understanding of cultural heritage thanks to VR, and experts emphasized the potential of VR in minimizing physical damage to monuments. The study proposes solutions to integrate VR into heritage conservation.

Keywords: "Virtual Reality (VR) technology", "heritage conservation", "sustainable tourism", "Hue Royal Palace", "Indochine architecture".

## INTRODUCTION

### 1.1 Research Context

#### 1.1.1. The Huế Imperial City and Its Importance in Heritage Conservation

The Huế Imperial City, once the capital of the Nguyễn Dynasty from 1802 to 1945, is one of Vietnam's most significant historical sites. With its unique architectural style that blends traditional Vietnamese craftsmanship with Indochinese influences, this complex deeply reflects the history, culture, and royal lifestyle, as well as the political landscape of Vietnam over nearly 150 years. Among Vietnam's ancient capitals, Huế is the only one that has preserved its architectural and artistic integrity to a remarkable extent, retaining invaluable historical, cultural, and artistic values.

In 1993, UNESCO designated the Complex of Huế Monuments as a World Cultural Heritage site, underscoring its importance in preserving Vietnamese and Southeast Asian culture. However, over the past century, many structures within the Huế Imperial City have suffered damage or destruction due to wars, natural disasters, and the passage of time.

#### 1.1.2. The Degradation and Loss of Monuments in the Huế Imperial City

Despite being recognized as a World Heritage site, the Huế Imperial City faces numerous challenges in conservation, particularly concerning the degradation and loss of interior architectural elements. The Huế Monuments Conservation Center has preserved numerous archival photographs documenting the monuments from decades ago, revealing the loss of many distinctive structures and the severe deterioration of others. The Imperial Citadel now retains only 62 structures, a significant reduction from the original 130 buildings. During the wars of the early 20th century, many structures within the Huế Imperial City suffered extensive damage from bombings. Indochinese-style interior spaces, such as Kiến Trung Palace (which was recently restored and opened to the public in 2024), An Định Palace, and the Cửu Tư Đài Theater, were either severely damaged or completely lost. Each year, the ancient capital of Huế also faces heavy rainfall and flooding, which cause significant damage to heritage sites, some of which date back hundreds of years. Additionally, the high humidity levels accelerate the deterioration of traditional materials such as wood, lacquerware, gilded ornaments, and ceramic tiles. Furthermore, the large number of visitors each year increases the risk of wear on stone flooring, damage to wall paintings, artifacts, and structural elements. To prevent further deterioration, the Huế Monuments Conservation Center has had to restrict access to certain areas to limit direct human impact.

Over time and due to historical upheavals, many structures have faded into obscurity, making restoration efforts increasingly difficult due to the loss of original architectural elements. Some interior spaces now exist only in photographic archives, which are often incomplete or lacking in detail, with no physical remains available for reference.

Moreover, the disappearance of traditional building materials, construction techniques, and skilled artisans presents significant challenges in researching and restoring these cultural heritage sites.

#### 1.1.3. VR Technology and Solutions for the Conservation of Hue Heritage

In the context of globalization, cultural tourism in the Hue Imperial City faces significant challenges in heritage conservation due to natural disasters, urbanization, and war. According to Staff Researcher (2022), virtual reality (VR) technology plays a crucial role in reconstructing and preserving endangered heritage, helping to retain historical information and create an immersive educational environment. VR presents opportunities to restore the lost interiors of the Hue Imperial Palace, where many structures have deteriorated over time. The application of VR in conserving the Hue Imperial City not only aids in the reconstruction of architectural spaces but also enhances visitor experiences, safeguards heritage, and promotes sustainable tourism. The digitalization of architectural heritage has become a crucial trend. Zhang et al. (2023) highlight that converting heritage into a digital environment not only preserves it but also reconstructs lost structures such as Kien Trung Palace and An Dinh Palace, enabling visitors to experience their original spatial context. VR minimizes physical impact on heritage sites while enriching visitor engagement, allowing them to explore the Nguyen Dynasty's imperial citadel without direct contact with artifacts.

Metaverse technology— a virtual space built upon VR, augmented reality (AR), artificial intelligence (AI), blockchain, and the Internet of Things (IoT)— expands the potential for heritage conservation and interaction. Buragohain et al. (2023) emphasize that the metaverse not only reconstructs architecture but also creates an interactive environment where the public can participate in conservation efforts. This is particularly valuable for deteriorated or partially lost monuments. Heritage conservation goes beyond architectural digitalization—it also involves recreating historical contexts, rituals, and court life. He et al. (2024) argue that VR enables users to actively experience history rather than passively observe it. Furthermore, VR serves as an effective tool for heritage education, helping younger generations better understand imperial architecture and culture through immersive simulations.

### 1.2. Research Gap

The application of virtual reality (VR) technology in heritage conservation is a global trend, with numerous studies conducted on famous heritage sites. However, in Vietnam—specifically in the Hue Imperial City complex—research on VR applications in architectural and Indochinese interior conservation remains limited. This paper identifies existing research gaps and proposes new directions for implementing VR in the conservation of Hue's interior heritage.

#### 1.2.1. Lack of Research on VR Applications in the Conservation of Indochinese Heritage Interiors in Vietnam

According to the Ministry of Culture, Sports, and Tourism (2023), VR-related studies in Vietnam primarily focus on museum exhibitions and virtual tourism. Although major museums—such as the Vietnam National Museum of History, the Thang Long Imperial Citadel, and the Hue Imperial Citadel—have implemented heritage digitalization (BVHTTDL, 2022), there has been no in-depth research on reconstructing lost imperial interiors. Most studies remain limited to an architectural overview (Journal of Architecture, 2021) and lack comparative analysis of VR's impact on visitor experiences versus traditional tours. This study analyzes visitor experiences between physical and VR-based visits to assess the feasibility of VR projects in preserving interior heritage.

#### 1.2.2. Lack of Research on the Challenges of Implementing VR in Vietnam

The implementation of virtual reality (VR) technology in heritage conservation in Vietnam faces numerous challenges, including high investment costs, complex technology maintenance, a shortage of skilled professionals, and limited visitor acceptance. According to VR360 (n.d.), adopting VR technology requires significant financial resources for purchasing equipment, developing content, and maintaining systems, which can pose a major barrier to heritage conservation projects. Additionally, VR system maintenance is complex and demands continuous investment to ensure stable operation (VR360, n.d.). This study assesses the barriers to VR application in the Hue Imperial City and proposes solutions to make VR an effective tool in a sustainable heritage conservation strategy in Vietnam.

### 1.3. The Need for Research on the Effectiveness of VR in Hue's Heritage Conservation

Although VR has been successfully implemented in many international museums, Vietnam has yet to fully research and deploy this technology in Indochinese heritage conservation. Currently, there are no VR projects that have

accurately reconstructed the interior of the Hue Imperial City or evaluated the impact of VR on visitor perception. Challenges such as costs, workforce training, and technology maintenance have not been addressed in cultural tourism projects. This study examines the role of VR in heritage conservation and sustainable tourism development at the Hue Imperial City, comparing visitor satisfaction levels between VR experiences and traditional tours. Additionally, through expert interviews, the study proposes effective VR application solutions for the conservation of imperial interiors.

### 1.4. Research Objectives

This study has two main objectives:

– To explore visitors' perceptions of the VR experience in Hue and compare it with traditional sightseeing experiences.

– To investigate VR implementation strategies in heritage conservation and education from an expert perspective.

By evaluating the challenges of VR implementation in Vietnam, the study aims to propose a model integrating VR with sustainable heritage conservation.

## II. MATERIALS AND METHODS (RESEARCH OVERVIEW)

### 2.1. Conceptual Foundation

#### 2.1.1. Concept of Virtual Reality (VR)

Virtual Reality (VR) is a technology that creates simulated 3D environments, allowing users to explore and interact with virtual spaces through devices such as VR headsets, headphones, and controllers. This technology provides an immersive experience using 3D visuals, surround sound, and motion simulation, effectively recreating realistic spaces (ELCOM, n.d.). Augmented Reality (AR), on the other hand, overlays digital content onto the real world, combining images, sounds, and data to enhance experiences. Unlike VR, which creates a fully virtual environment, AR operates through smartphones, AR glasses, and smart wearables. It is widely applied in gaming, shopping, training, and interior design.

Post-pandemic, VR and AR have introduced new approaches to heritage conservation. While VR recreates heritage sites in vivid detail, AR allows visitors to interact more intuitively, offering enriched and engaging experiences.

#### 2.1.3. Applications of VR in Heritage Conservation Worldwide

Although still emerging, the application of VR in cultural heritage conservation at various museums and historical sites worldwide has achieved significant success.

**The Forbidden City VR Project (China):** The project, titled *"The Forbidden City Across Time and Space,"* utilizes VR technology to reconstruct palace structures that were destroyed during the Ming and Qing dynasties. Thanks to this project, millions of visitors have had the opportunity to explore a virtual version of the Forbidden City, helping to alleviate the overwhelming number of physical visitors to the site. Since its inception in 2008, the virtual Forbidden City has not only allowed users to observe the architecture but also to interact with AI-generated characters representing different historical roles in the royal court. This enables visitors to gain a deeper understanding of the historical, cultural, and ceremonial contexts in an engaging and interactive manner.

**VR at the Louvre Museum (France):** The Louvre has implemented VR to create high-resolution 3D models of its precious artifacts, allowing visitors to explore iconic masterpieces and paintings in a virtual environment while learning about their historical and artistic backgrounds.

**The Mogao Caves VR Project (China):** The *Dunhuang Digital Heritage Museum* has been developing VR applications since the 1980s to reconstruct the ancient Buddhist cave paintings and statues as they existed over 120 years ago. By utilizing VR, the project preserves the murals and sculptures, preventing them from further deterioration. Visitors can immerse themselves in the cave environment, appreciating its architectural details, colorful sculptures, and wall paintings while interacting with historical figures.

The application of VR in heritage conservation not only accurately restores historical structures but also allows visitors to engage with heritage sites in an interactive manner. According to Chen (2023), VR has been successfully implemented in China to digitize ancient architecture, such as the Forbidden City, aiding in cultural heritage

preservation and promotion by providing immersive experiences that enhance public engagement. This suggests VR's potential for preserving the **Huế Imperial City**, where many interior structures have been lost and are difficult to reconstruct using traditional methods. Furthermore, "Integrating haptic feedback into VR experiences enables users to interact with cultural artifacts more realistically, enhancing engagement and understanding of cultural heritage." (Krumpen et al., 2021). Thus, applying VR to heritage conservation is not only a global trend but also a necessary solution to protect the **Huế Imperial City** from damage.

### 2.1.4. The Impact of Virtual Reality Technology on Tourists, Researchers, and Heritage Conservation

VR technology is driving significant changes across various fields, particularly in cultural heritage conservation. According to Rigby & Smith (2013), "Recent advances in AR research and the rapid adoption of today's powerful mobile devices mean that AR systems are a viable option for heritage organizations." VR helps recreate historical sites, supports education, and expands access to heritage for tourists and researchers. This study analyzes the impact of VR on visitors and researchers while assessing the opportunities and challenges of integrating VR into this field.

#### Applications of VR in cultural heritage preservation

VR recreates damaged or inaccessible cultural heritage, aiding in the preservation and storage of historical structures in virtual spaces without affecting real artifacts. This technology introduces a new tourism experience, allowing remote visits to heritage sites, particularly beneficial when access is restricted due to weather, security, or conservation concerns. According to LaViola et al. (2009), "The ability of immersive virtual reality to let users 'be inside' their data and interact directly through body-centric interaction accelerates the processes of perception and interpretation." VR contributes to sustainable heritage preservation by digitizing and reconstructing cultural structures lost due to natural disasters, war, or time, protecting cultural values without harming the original heritage. Additionally, VR expands accessibility and promotes cultural tourism, enabling visitors to explore heritage sites without being limited by geographical distance or site conditions. As noted by Rigby & Smith (2013), advances in AR technology and the rapid adoption of powerful mobile devices make VR a viable tool for heritage institutions. VR also enriches visitor experiences by allowing interaction with artifacts, historical spaces, and re-enacted past events. This technology supports individuals with disabilities in accessing cultural heritage more easily. Moreover, VR enhances learning experiences, helping students, researchers, and scholars gain deeper insights into cultural and historical contexts, fostering emotional engagement and increasing participation.

#### The Impact of VR on Tourists and Researchers

For researchers, VR enhances heritage research and preservation by enabling detailed analysis of architecture, art, and historical contexts without risking damage to real artifacts. It also fosters international collaboration, allowing experts from different countries to share resources and knowledge more efficiently. As Rigby & Smith (2013) note, "AR allows experts from different countries to share resources and collaborate on research more effectively."

Furthermore, VR contributes to the development of new analytical tools. Advanced 3D tools support heritage space research, offering deeper insights into how historical sites were constructed and used.

#### Challenges in Applying VR to Cultural Heritage Preservation

To maximize the benefits of VR, challenges related to cost, data, and accessibility must be addressed. Developing high-quality VR systems requires significant investment in hardware, software, and skilled personnel, especially when aiming for high-precision heritage reconstructions, which substantially increase costs. Accurate and complete data is crucial but often lacking, affecting the quality of VR simulations. As Koebel et al. (2020) note, cultural heritage data is often incomplete, imprecise, and heterogeneous, requiring careful processing to avoid misrepresenting the original information. Additionally, technological accessibility remains limited, particularly in remote or economically disadvantaged areas where VR devices are not widely available. High technical requirements and the need for realism in simulations present further obstacles. Inaccurate reconstructions can distort historical values, necessitating collaboration among historians, architects, and technology experts to ensure precision.

## 2.2. Research Methodology

This study employs a mixed-methods approach, integrating quantitative research (visitor surveys) and qualitative

research (expert interviews and VR document analysis) to ensure accuracy and objectivity in evaluating the application of VR in the preservation of Hue Imperial Heritage.

The data collection process involves three main methods:

**A. Visitor Survey**

This method assesses visitor satisfaction with VR experiences in Hue heritage preservation and compares real-life visits with VR experiences to determine whether VR enhances heritage awareness. The survey targets 122 visitors who experienced VR at the Hue Imperial City test zone, ranging in age from 18 to 65, ensuring insights from both younger and older audiences.

**Survey Content**

- Personal information (age, experience with VR).
- Heritage knowledge before and after the VR experience.
- Satisfaction level with the VR experience.
- Comparison between VR and real-life visits.

**Survey Methods:**

- Questionnaire distribution at the VR experience zone and real-life heritage sites.
- Online survey for visitors who used VR at home.

**Data Collection and Analysis Tools:**

- Survey questionnaires (Google Forms, paper-based surveys at the site).
- SPSS software for statistical analysis of satisfaction levels and comparison between groups.

**Key Research Questions:**

- Does VR help visitors better understand the architecture and history of Hue Imperial City?
- Do visitors find VR more engaging than real-life visits?

**B. Expert Interviews**

This method gathers expert opinions on the feasibility, benefits, and challenges of applying VR in Hue heritage preservation. It also analyzes technical, historical, and economic aspects of VR implementation. The study includes 12 experts from the following fields: 5 heritage conservation experts from the Hue Monuments Conservation Center, 3 VR technology experts from software development companies and university VR training programs, 2 historians and architects from universities specializing in heritage research, 2 tourism and heritage management experts from the cultural tourism sector.

**Interview Methodology:**

- Semi-structured interviews to facilitate open discussions and gain in-depth insights.
- Recording, note-taking, and content analysis for data synthesis.

**Key Interview Questions:**

**Feasibility of VR in heritage preservation**

- How can VR reconstruct lost structures such as Dien Kien Trung and Cung An Dinh?
- How accurate is VR in restoring colors, materials, and decorative patterns compared to real artifacts?

**Impact of VR on visitor experiences**

- Can VR completely replace real-life visits, or does it serve as a complementary tool?
- Does VR enhance visitors' understanding of Hue’s imperial culture?

**Challenges of implementing VR in Vietnam**

- What technological, financial, and social barriers hinder VR adoption?

– How can VR be integrated into a long-term conservation strategy?

**Data Collection and Analysis Tools:**

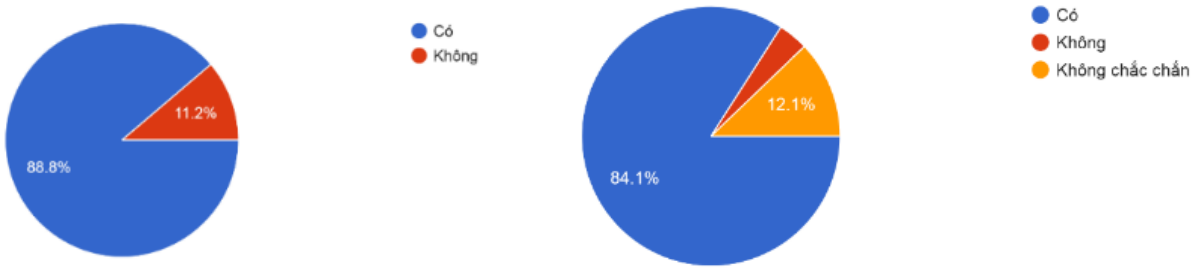
– Interview recordings, transcribed into text.

– Content analysis to extract key themes and insights.

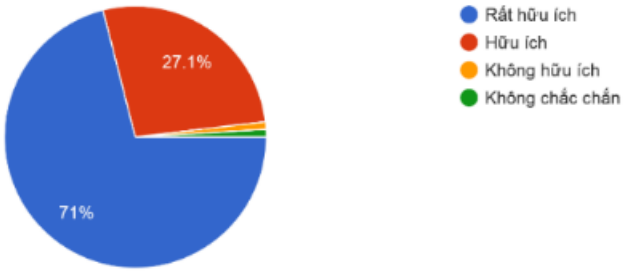
## II. RESULTS AND DISCUSSION

### 3.1. Research Findings:

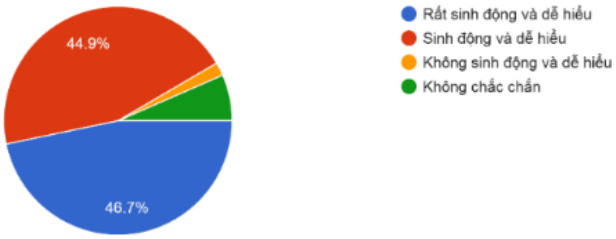
**Survey Data:** Results from the survey indicate that nearly **89%** of participants were already familiar with virtual reality, and **84%** expressed willingness to participate in VR-based tourism experiences.




*Survey chart of the number of people familiar with VR technology and the number of people willing to participate in the experience.*




*Survey chart evaluating the effectiveness of VR technology in visiting areas under restoration.*

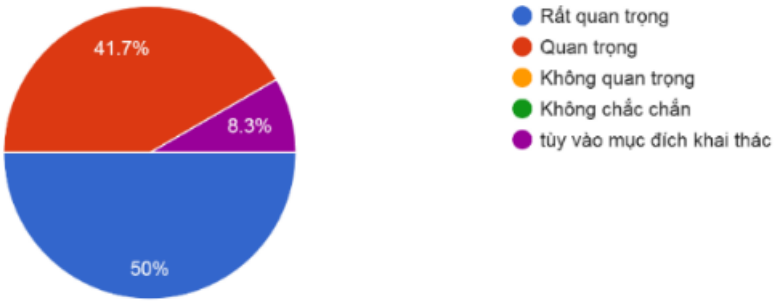



*Survey chart evaluating whether VR can effectively recreate historical spaces and events, making them easier to understand and more engaging for visitors.*

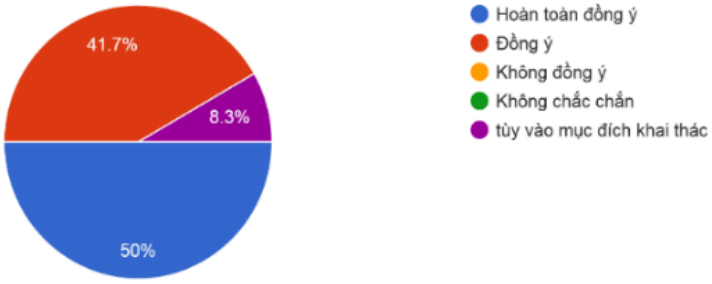
Virtual reality (VR) technology is highly regarded for its ability to recreate heritage, especially in inaccessible or restoration sites. 98% of visitors agreed that VR enriches tourism experiences by providing an immersive way to visualize historical spaces and events. Additionally, 84% of visitors expressed willingness to participate in VR tours instead of directly interacting with artifacts, reducing stress on heritage sites and minimizing damage. VR has proven effective in heritage education, helping users gain deeper insights into history, architecture, and culture. It is particularly beneficial for international tourists and younger generations, who may have limited access to information about Hue. However, VR cannot completely replace real-life experiences, as 18% of visitors still prefer to engage with heritage using multiple senses, such as smell and touch. Studies by He et al. (2024) and Zhang et al. (2023) confirm that while VR enhances interaction and memory retention, it cannot fully replicate the emotional connection of on-site visits. This research supports that perspective, highlighting VR as an effective complementary tool rather than a complete substitute

for real-world experiences.

**Expert Interviews:** Interviews with heritage site managers, VR technology experts, and researchers in history, art, and architecture indicate that VR technology can be a **powerful tool** for heritage preservation and promotion.




*Survey chart on the role of VR technology in heritage preservation and promotion.*




*Survey chart on the necessity of a robust technological infrastructure for implementing VR programs.*

However, experts also highlighted challenges in implementation, including technological infrastructure, high initial investment costs, and workforce training requirements. Some specialists emphasized that VR should be integrated harmoniously with traditional conservation methods to preserve the authenticity of physical heritage. Additionally, community acceptance and government support policies play a crucial role in the successful adoption of VR. The study indicates that VR in Vietnam is still in its experimental phase and requires adjustments to align with local conditions.

### 3.2. Discussion

**Comparison with Previous Studies:**

The findings of this study align with previous research on the application of VR in heritage preservation. For instance, Rigby & Smith (2013) found that VR enhances public engagement in understanding cultural heritage. Other studies have also indicated that VR can provide a more immersive experience compared to traditional methods like guidebooks or documentaries. This research contributes to the field of VR applications in heritage preservation by specifically analyzing the case of Hue Imperial City, whereas many previous studies focused on museums or globally recognized heritage sites.

Rigby & Smith (2013) suggested that Augmented Reality (AR) is a more suitable solution for heritage conservation since it integrates digital content with the real world, allowing visitors to experience sites firsthand. However, this study highlights VR's advantage in reconstructing lost structures, a challenge for AR, which relies on existing physical objects as reference points. VR enables the recreation of destroyed interiors, such as Dien Kien Trung and Cung An Dinh, providing a more immersive and comprehensive experience than AR.

Zhang et al. (2023) emphasized that VR plays a crucial role in digitizing heritage for long-term preservation, though it cannot fully replace the authenticity of physical visits. Our study supports this argument, as 18% of surveyed visitors still prefer real-world experiences over VR. However, we expand on this perspective by proposing a hybrid model combining VR and physical visits to optimize the experience.

He et al. (2024) argued that VR's immersive quality should be combined with interactive storytelling to enhance engagement. Our survey results reinforce this idea, as many younger visitors expressed a preference for more dynamic

VR experiences rather than static 3D models. This suggests the need to improve VR by incorporating gamification and interactive storytelling elements to better attract and retain visitors.

**Key Differences of This Study**

This study focuses on Indochinese heritage in Vietnam, specifically in interior spaces, an area that has been underexplored in VR applications, whereas most previous research has focused on European and Chinese heritage. By integrating visitor and expert analysis, the study evaluates VR not only from a user experience perspective but also from the conservation and technological standpoint. Furthermore, it proposes a practical implementation model for Hue Imperial City, covering technological solutions, financial considerations, and the integration of VR in heritage management.

**New Directions from This Study**

Based on the above comparisons, VR shows great potential but cannot completely replace real-life experiences. Therefore, this study proposes a new approach: using VR to recreate lost spaces while still allowing for physical visits to protected areas, besides Developing more interactive VR experiences (immersive storytelling, video games) to attract visitors, especially the younger generation, and exploring the emotional impact of VR on visitors to optimize experience design. Therefore, this study not only consolidates previous findings but also expands the scope of VR applications in Vietnam heritage conservation, proposing a model that integrates VR with physical tours to enhance sustainable tourism.

### 3.3. Benefits of VR in Heritage Preservation

**The research highlights several key benefits of VR:**

**1. Enhancing Visitor Experience** : VR allows visitors to interact with heritage instead of just passively observing. It also reduces direct physical impact on fragile heritage sites. "The findings indicate that VR can reconstruct Hue Imperial City's architectural spaces with high detail. However, static VR models do not provide an engaging experience, especially for younger visitors. This aligns with He et al. (2024), who emphasized that incorporating immersive elements into VR enhances emotional engagement and historical perception, allowing users to not only see but also feel the cultural context as part of history."

**2**. **Expanding Accessibility**: VR allows people unable to visit heritage sites physically to explore and experience them in virtual spaces. "Research has shown that VR can help recreate heritage sites damaged by war or natural disasters. According to Staff Researcher (2022), VR has been used to restore heritage sites in conflict zones such as Ukraine, Iraq, and Syria, enabling digital preservation and vivid reconstructions of historical landmarks. This suggests that VR could also be applied to Hue Imperial City, where many interior structures were lost due to war and time. Our findings indicate that VR not only digitizes architecture but also accurately recreates cultural spaces, enhancing experiences for visitors and historians alike."

**3. Quality and Effectiveness of the VR Experience**: Survey results show that VR enhances cultural understanding, but some younger visitors fear it might diminish the authenticity of real-world experiences. Therefore, a balance between technology and historical integrity is needed to ensure interactivity while respecting physical heritage. Visitors suggested improving VR quality by increasing realism, interactivity, and gamification elements. Infrastructure upgrades are also necessary, including better guidance, device maintenance, and battery life improvements. While VR is valuable for those unable to visit heritage sites, accurate simulation is crucial to prevent over-reliance on technology, ensuring an objective and balanced tourism experience.

**4**. **Sustainable Tourism Development Through VR**: Experts believe that VR reduces the impact of visitors on heritage sites while preserving fragile spaces and providing engaging experiences. However, for VR to be effective, it is necessary to: firstly, adjust conservation policies, secondly, improve image quality to meet user expectations, and finally: Stronger public awareness campaigns to increase accessibility

**3.4. Challenges in implementing VR in Hue Imperial CityDespite its advantages, VR technology faces several challenges:** Although VR technology offers many benefits, it still faces several challenges. First, the high investment cost includes the development of 3D models, software, equipment, and system maintenance. Vietnam also

lacks experts in VR for heritage conservation, requiring international collaboration and significant funding. Second, visitor accessibility remains limited, especially for the elderly or those unfamiliar with technology. Lastly, VR cannot completely replace real-life experiences; it should only be considered a supplementary tool to enhance awareness and interaction with heritage**.**

### 4.4. Proposed Solutions

VR technology contributes to heritage preservation and sustainable tourism development by reducing the negative impact of tourists, allowing virtual visits without affecting fragile sites. However, for VR to be truly effective, supportive policies, enhanced image quality, and strengthened communication efforts are necessary to increase accessibility. The implementation of VR requires interdisciplinary collaboration among historians, architects, and technology experts to ensure accuracy and effectiveness. At the same time, developing user-friendly VR platforms that are compatible with various devices—including PCs, VR headsets, and mobile phones—will help expand the visitor experience. Government investment and support from cultural organizations will be crucial in driving research and development efforts for VR applications in heritage conservation.

## IV. CONCLUSION

The study demonstrates that virtual reality (VR) technology plays a crucial role in preserving and promoting the cultural heritage of the Hue Imperial Citadel, particularly for structures featuring Indochinese architectural styles. VR not only enables an authentic and vivid reconstruction of heritage spaces but also minimizes the physical impact of visitors on valuable artifacts, contributing to the protection of historical sites from overexposure. The VR experience allows visitors to engage with and gain a deeper understanding of the history and culture of the Hue Imperial Citadel. According to surveys, 88% of visitors believe that VR enhances their awareness compared to traditional tours. Moreover, VR technology supports sustainable tourism development by dispersing visitor traffic, reducing pressure on heritage sites, and expanding remote access for individuals with geographical or time constraints. Despite its proven effectiveness, the VR model in Hue still requires improvements in image quality, sound, and interactivity to meet the increasing demands of visitors. Expanding the application of VR to different target groups, such as students, researchers, and scholars, as well as implementing it in other heritage sites, will further enhance the preservation of national cultural heritage. In summary, VR is not only a tool for heritage conservation but also a means to enrich tourism experiences and foster sustainable tourism models. With continued investment and interdisciplinary collaboration, VR is expected to remain an effective solution for safeguarding and promoting Vietnam's cultural heritage.

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# MANAGING GREEN HUMAN RESOURCES AND ENVIRONMENTALLY FRIENDLY BEHAVIOR OF TOURISTS TOWARDS THE IMAGE OF A SUSTAINABLE TOURISM DESTINATION

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**ABTRACT**

Research discussing the impact of implementing Green Human Resource Management and tourists' environmentally friendly behavior at tourist destinations, especially in sustainable tourism, is limited. It is important to understand how to implement good Green Human Resource Management practices in tourism sector organizations. The findings show the importance of environmentally friendly behavior as implementing Green Human Resource Management can improve tourism management. The unique point of this research is that it develops a human resource readiness model to implement environmentally friendly behavior towards sustainable tourism. This resource readiness will be reflected in the GHRM model in supporting sustainable tourism. The results of this study present a Sustainable Green Tourism model that includes premises, implementation, and outcomes. These premises come from internal and external managers (environmental ethics and management commitment) which will lead to good GHRM implementation. This model will be the basis for implementing sustainable tourism and highlighting the destination image in human resource management practice based on literature review and also tourism management practice.

*Keywords*: “Green human resources”; “behavior”; “sustainable image”

## I. BACKDROP AND RESEARCH OBJECTIVES

Tourism is an important industry that can play a significant role in improving human well-being. Sustainable tourism, if well managed, can bring positive benefits. However, there is still a lack of understanding of sustainable tourism behavior. Research on the influence of policies and leadership on employees’ pro-environmental behavior can help shed light on this issue, especially in examining the relationship between pro-environmental human resource management (GHRM) and pro-environmental innovation activities (Ababneh, 2021; Darvishmotevali and Altinay, 2022a, 2022b; Gholamiet et al., 2016; Ribeiro et al., 2022).

In the context of increasing ecological damage caused by production processes, GHRM is necessary to mitigate these conditions. HRM aims to utilize, develop and study existing human and natural resources to manage them effectively, and green training and development emphasizes the practices implemented while managing this destination (Murni et al., 2023). Therefore, it is necessary to work and plan for training and development of employees towards green knowledge and competence.

This study aims to explore the role of green human resource management (GHRM) in promoting environmentally friendly behavior of employees in the tourism industry. The goal is to build a suitable GHRM model to contribute to the sustainable development of the tourism industry, while enhancing the image of the destination, minimizing negative impacts on the environment and preserving natural resources for the future.

## 2. OVERVIEW

### 2.1. Green human resource management

Green human resource management (GHRM) is the application of human resource management practices to promote environmental protection and sustainability activities. GHRM focuses on how HR decisions affect the environment and society, including policies such as recruitment, training and development of employees with the aim of

raising environmental awareness, encouraging green behavior and creating a sustainable culture.

Research by Kumar and Jain (2013) shows that GHRM can improve business performance through raising environmental awareness. Research by Ren and Zhang (2018) shows that GHRM is not only related to policies but also affects organizational culture.

GHRM is not only a trend but also an important part of a business's sustainability management strategy. In the future, GHRM is expected to become an essential part of many businesses' strategies, and technological developments can also support GHRM initiatives.

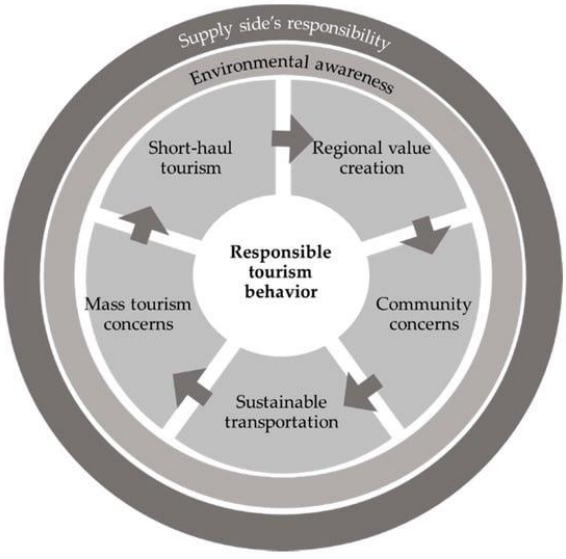
**2.2. Customer behavior**

Customer behavior in tourism studies consumer actions and decisions regarding travel, from initial need recognition to post-trip evaluation. It encompasses the psychological, social, cultural, and personal factors influencing travel choices. Moutinho (2000) explored the travel decision process, outlining steps like destination information seeking and option evaluation. Cano and Lera-Lospez (2010) focused on travel consumption behavior, including how customers choose and use services, influenced by budget, time, and preferences. Kozak (2001) researched post-trip evaluation, noting its impact on future travel and recommendations. Understanding these behaviors is crucial for tourism businesses to develop effective marketing strategies, enhance customer experience, and achieve sustainable success.

**2.3. Friendly behavior**

Customer-friendly behavior in sustainable tourism involves tourists minimizing negative environmental, cultural, and social impacts. Han and Hwang (2015) define eco-friendly consumption as tourists actively choosing environmentally positive products and services, like green accommodations and transportation, and reducing waste. Gossling and Peeters (2007) add that this includes minimizing resource waste and using economical methods, like saving energy and water. Bramwell and Lane (2011) highlight the importance of stakeholder cooperation for effective green management policies.

Ultimately, this friendly customer behavior is crucial for sustainable tourism, limiting negative impacts, boosting the local economy, and encouraging environmentally and culturally friendly measures from businesses and destinations.




**Responsible tourist behavior triggered by the COVID-19 pandemic**

*Source: Exploring the Role of Tourists: Responsible Behavior Triggered by the COVID-19 Pandemic*

**2.4. Sustainable destination image**

Sustainable destination imagery is crucial for sustainable tourism. It encompasses not just natural beauty but also environmental protection, cultural respect, and community support. Gossling and Peeters (2007) highlight the importance of environmental commitment (resource conservation, pollution reduction, renewable energy) in attracting

eco-conscious travelers. Bramwell and Lane (2011) emphasize respecting and preserving local culture and heritage, attracting tourists seeking authentic experiences. Dwyer and Kim (2003) connect sustainable destinations with social responsibility, supporting the local economy and community development. A strong sustainable destination image, built authentically, attracts tourists and promotes sustainable development.

## III. RESEARCH METHODS

This qualitative study explores green HRM and environmentally friendly behavior in sustainable tourism. Informants include tourism actors in coastal areas, tourists, government agencies, community leaders, and destination management representatives, selected via snowball sampling. Data collection methods include focus group discussions, in-depth interviews, questionnaires, document analysis, and observation, supplemented by a literature review. Data trustworthiness was assessed through reliability (researcher involvement), validation (theory and prior research), consistency (monitoring, evaluation, and triangulation), and transferability.

The research comprised three stages: literature review on tourism behavior and green HRM to identify tourism management strategies; TLN with stakeholders to assess current management practices; and identification of internal/external factors and strategic alternatives for green HRM to promote environmentally friendly behavior. Results from documentary and field studies highlight the importance of organizational support and internal/external triggers in fostering eco-friendly behavior for sustainable tourism and destination image.

## IV. DISCUSSION

Based on several documentary studies and field studies conducted, it shows many factors that determine the creation of sustainable tourism and highlight the destination image. Eco-friendly behavior focuses not only on practice but also on how the organization supports it and also the triggers that come from outside and within the organization.

### 4.1. Premise of green human resource management

Environmental problems are moral problems stemming from human behavior, not just technical issues (Keraf, 2010). Human ethics and environmental ethics are crucial for environmentally friendly behavior, which aims to mitigate global warming and ensure survival. This behavior is linked to human resource management, especially in tourism where environmental sustainability is critical. Renwick et al. (2013) highlight challenges in green human resource management (GHRM) implementation, including management practices. Lack of environmental awareness in tourism management requires capacity building and green management understanding. Effective leadership is also essential for strategic decision-making in management policies (Susanto et al., 2021).

### 4.2. GHRM implementation process in HR practice

In the process, the implementation of the GHRM requires a commitment to management, in this case, to the tourism managers. Policies implemented by tourism managers or managers can be implemented in various forms that are integrated with environmental performance (Arulrajah et al., 2015). The study explains that there are a number of management practices such as training and development, and safety management. Some of these activities will support sustainable environmental activities.

Environmentally friendly practices and also an understanding of human capital practices. GHRM tends to maximize the use of all available resources to raise employee awareness in order to support an environmentally conscious sustainability attitude. The role of management in organizations plays an important role in environmental responsibility. GHRM also focuses employees on environmentally conscious behavior and also motivates employees and develops their sense of pride as part of the organization and green program.

### 4.3. Green training

Environmental HRM, including training on waste disposal, cleanliness, and digitalization, is crucial for implementing environmental management programs (Curkovic, 2003). A GHRM Implementation Model for Sustainable Tourism comprises premise, implementation, and outcomes. The premise includes internal and external factors like environmental ethics (Keraf, 2010; Renwick et al., 2013) and organizational commitment (Susanto, Kurniaty, et al., 2021; Susanto et al., 2021). In this study, tourism managers demonstrate environmental awareness through policies, technology use, and green infrastructure. Implementation involves increasing GHRM understanding

via training (Ahmad, 2015; Arulrajah et al., 2015; Farooq et al., 2022; Siyambalapitiya et al., 2018; Veerasamy et al., 2023; Zhang et al., 2019), focusing on IT skills for finance, marketing, and operations. The desired outcome is sustainable tourism (Budeanu et al., 2016; Farooq et al., 2022; Hardy et al., 2002; Higgins-Desbiolles, 2018; Lu and Nepal, 2009), leading to resource and image efficiency, and competitive advantage.

Hilton Hotels has implemented eco-friendly measures, such as hiring employees with sustainable experiences, eliminating plastic straws, switching to digital room key cards, and eliminating plastic water bottles from events. These efforts have significantly reduced plastic waste.

Six Senses Resorts & Spa regularly rewards employees for environmental initiatives, such as limiting plastic consumption or saving water.

Radisson Group has integrated environmental criteria into its performance evaluation, incentivizing employees through reward programs for those who actively contribute to green activities.

In short, GHRM is not just a disruptive movement but a long-term strategy to build a more sustainable tourism industry. Incorporating eco-friendly human resources policies from recruitment, training to incentives and evaluation will create positive changes not only for the business but also for the community and the environment.

Intrepid Travel: Intrepid Travel is a leading sustainable travel company in the world. The company has a number of green policies, such as a no-single-use plastic policy, a policy to support local communities, and a policy to protect wildlife. The company also hires and trains employees in sustainable travel.

### 4.4. The relationship between green management and green behavior in tourist destinations

The interplay between green management and green behavior is crucial for sustainable tourism. Green management (policies and measures to minimize tourism's environmental impact) provides the foundation for green behavior (environmentally beneficial actions by tourists and stakeholders). Gössling and Peeters (2007) highlight how green management (e.g., waste management, renewable energy) encourages tourist green behavior (e.g., recycling). Tourists' green behavior (e.g., water conservation, waste reduction) strengthens the destination's sustainable image, attracting environmentally conscious tourists (Brown and Morrison, 2003). This creates a reciprocal relationship: green management fosters green behavior, which in turn motivates better green management (Bramwell and Lane, 2011).

Challenges remain, including resource limitations and lack of awareness. Education, incentives, and government support are needed. Ultimately, a strong link between green management and green behavior is key to sustainable tourism, balancing economic development, environmental protection, and cultural respect.

### 4.5. Green behavior towards a sustainable image

Green tourist behavior is crucial for a sustainable destination image, contributing to sustainable tourism development. It encompasses actions like energy saving, waste reduction, using eco-friendly products, and respecting local culture, minimizing tourism's negative impact and supporting resource conservation. Han and Hwang (2015) show that environmentally friendly tourist behavior protects ecosystems and reduces waste, creating a sustainable image that attracts green-conscious travelers. A sustainable image builds trust, encouraging repeat visits and recommendations (Bramwell and Lane, 2011), and promoting a wider green tourism movement. Destination commitment, including supportive policies and amenities (recycling, renewable energy, resource guidelines), plus education and promotion of the sustainable image, are key to fostering green behavior (Gössling and Peeters, 2007).

## V. RESULTS

Green HRM positively impacts sustainable tourism management by fostering environmentally conscious behavior. A sustainable Green Tourism model involves premises (environmental ethics and management commitment from internal and external managers), implementation (environment-based policies and green training), and results (resource efficiency and improved image, leading to competitive advantage). Challenges to maintaining green behavior include lack of tourist awareness and inadequate infrastructure. Brown and Morrison (2003) highlight the need for collaboration between tourists, authorities, and businesses.

Green behavior is crucial for sustainable tourism development, minimizing negative impacts and encouraging green management. While promoting green behavior is challenging, stakeholder cooperation and effective management

can strengthen a destination's sustainable image.

## VI. VALUES

The significance of this study is to create a model of green tourism implementation in human resource management practice based on document evaluation and tourism management practice. With this model, it is hoped that sustainable tourism management can be achieved and a positive impact on the destination image.

Future research requires a more in-depth study to be able to find other determinants related to sustainable green tourism in human resource practice.

Research on customer green behaviour and sustainable tourism images is important, helping to promote sustainable tourism development and create long-term benefits for both local communities and visitors. In the context of climate change, environmental pollution, and the increase in the tourist population, it is essential to understand the green behavior of customers and build a sustainable image. Here are some theses on the significance and value of studying these aspects.

This study aims to model green tourism implementation in human resource management for sustainable tourism and positive destination image. Future research should explore other determinants of sustainable green tourism in HRM. Research on customer green behavior and sustainable tourism image is crucial for sustainable tourism development. Understanding traveler motivations and perceptions (Han & Hwang, 2015) allows destinations to tailor green programs. Encouraging green behavior (Gössling & Peeters, 2007) builds a broader movement for environmental protection. A sustainable image attracts eco-conscious customers (Dwyer & Kim, 2003) and fosters loyalty. Research informs sustainable tourism policies (Bramwell & Lane, 2011). It also supports local economies and preserves culture (Brown & Morrison, 2003). Ultimately, studying green behavior and sustainable image is essential for building sustainable destinations and a harmonious tourism future.

Research on green behavior of customers and sustainable images in tourism is of great significance in building sustainable destinations, developing green tourism strategies, and protecting the environment. These studies not only help create economic and cultural value, but also contribute to spreading awareness about the protection of local resources and culture. With the increase in tourist awareness and the importance of sustainable development, the research and application of green behavior factors and sustainable images will be the foundation for the tourism industry to move towards a more harmonious and sustainable future.

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# POST-NET ZERO TOURISM AND HOSPITALITY: A BIBLIOMETRIC REVIEW OF EMPLOYEE ENGAGEMENT AND SUSTAINABILITY

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**ABSTRACT**

This bibliometric analysis explores the crucial role of employee engagement in driving sustainability within the tourism and hospitality industry (THI) in the context of emerging post-Net Zero trends. Addressing a significant research gap – the lack of bibliometric analysis exploring the understanding of specific contributions of employee engagement to sustainability within this evolving post-Net Zero THI landscape, this bibliometric analysis analyzed 11 high-quality (Q1, Q2) peer-reviewed articles, selected from 50 Scopus records using pre-defined criteria related to employee engagement and sustainability in the THI. Rigorous selection criteria focused on the intersection of employee engagement and sustainability in THI by adopting the PRISMA framework. Using bibliometric methods and Flourish visualization tools, the analysis explores key publication characteristics, including publication timeline, geographical distribution, major subject area, influential journals, dominant research type, and cited trends. Furthermore, the reviews identify prevalent terminology and research themes after analyzing author keywords, revealing key areas of focus within the field. This analysis highlights three prominent themes: Proactive Involvement, Behavioral Change, and a Culture of Sustainability. Notably, this study contributes by explicitly focusing on the post-Net Zero THI, providing a novel roadmap for future scholarly inquiry.

*Keywords*: “a bibliometric review”, “employee engagement”, “hospitality and tourism industry”, “post-Net Zero”, “sustainability”

## I. INTRODUCTION

### 1.1 Background of the study

Employee engagement has become a critical area of focus for both academics and practitioners in today's competitive business environment (Rai & Maheshwari, 2021). Employee engagement, characterized by dedication, vigor, and absorption (Schaufeli & Bakker, 2004), is vital in today's competitive business landscape. Engaged employees display energy, enthusiasm, and focus, driving superior performance and enhancing organizational productivity and profitability (Karatepe & Demir, 2014; Paek et al., 2015; Demerouti & Cropanzano, 2010). This connection is especially crucial in the tourism and hospitality industry (THI), where positive customer interactions are essential. Engaged employees are the critical link between organizations and customers, delivering quality service, fostering loyalty, and contributing to business success (Babakus et al., 2017). They are more likely to go the extra mile, anticipate customer needs, and create memorable experiences, vital for customer satisfaction and repeat business in this service-oriented sector. However, sustaining high engagement levels in the THI is challenging. Studies show that the leisure and hospitality sector often faces lower engagement compared to other industries due to cost-cutting measures, understaffing, demanding schedules, and long hours that affect well-being (Deery and Jago, 2015). These challenges have been further exacerbated by the COVID-19 pandemic, which introduced unprecedented levels of uncertainty, isolation, and job security (Liu et al., 2022; Jung et al., 2021), leading to widespread job losses and a decline in employee morale.

Beyond these existing pressure, the THI faces increasing scrutiny regarding its environmental impact and is under growing pressure to adopt sustainable practices in line with post-Net Zero commitments the tourism and hospitality sector alone is responsible for a significant portion of global greenhouse gas emissions (UNWTO&IFT, 2019), making the transition to Net-Zero crucial for mitigating climate change. The increasing global commitment to achieving net–zero emissions has placed unprecedented pressure on industries, including THI, to drastically reduce their carbon footprint. This commitment necessitates a fundamental shift in operational practices and the widespread adoption of

sustainable initiatives across all aspects of the industry. This context highlights the urgent need to find effective solutions to meet these ambitious targets. One such solution, and the central focus of this research, is understanding how employee engagement can foster sustainability initiatives within the THI. Recent research has begun to explore this intersection, recognizing that engaged employees are more likely to contribute to organizational sustainability efforts (Kim & Kim, 2020). Furthermore, engaged employees can act as powerful advocates for sustainability, influencing customer behavior and promoting eco-friendly choices (Lai et al., 2020). Therefore, enhancing employee engagement emerges as a potentially crucial strategy for THI to effectively implement and archive its Net-Zero commitments.

### 1.2 Research questions and objectives

While the literature on employee engagement in the HTI spans over two decades (Kusluvan et al., 2010), its intersection with sustainability, particularly within the specific context of the post–Net Zero transition, remains a relatively under-developing area. Most existing research focuses on general sustainability practices, or employee engagement before the Net Zero era, with limited attention to the unique challenges and opportunities presented by the post–net zero agenda, and in the THI context. This study addresses this critical gap by conducting the first bibliometric analysis to explore how employee engagement drives sustainability within the THI in the post–Net Zero era. This research aims to achieve the following objectives: (1) To identify key publication characteristics, including publication timeline, geographical distribution, major subject area, influential journals, dominant research type, and cited trends; (2) To analyze keywords and identify prevalent terminology and research themes within the literature; (3) To suggest avenues for future research based on the identified trends and gaps. To accomplish these objectives, the following are important questions that will be answered in this research: RQ1: What are publication characteristics (publication timeline, geographical distribution, major subject area, influential journals, dominant research type, cited trends)? RQ2: Which research theme is more popular by analyzing keywords? RQ3: What are suggested avenues for future research?

This bibliometric review, titled “Post Net Zero Tourism and Hospitality: A Bibliometric Review of employee engagement and Sustainability”, is structured into four parts: firstly, the research introduces the objectives and research questions; secondly, in the material and method part, the research background defines the employee engagement and its importance in driving sustainability initiatives in post-Net Zero THI context, and the research method; next, providing result and discussion to address the research questions; finally, it concludes the research. This structure provides a clear and organized framework for presenting the research process, findings, and implications. This study contributes by mapping the current state of research. Identifying key research themes, and providing a novel roadmap for future scholarly inquiry in this increasingly important area within the context of the post–Net Zero transition. It specifically addressed the need for research that explicitly links employee engagement to the achievement of Net – Zero targets in the THI.

## II. MATERIAL AND METHOD

### 2.1. Employee engagement definition

Employee engagement, encompassing emotional, cognitive, and behavioral commitment, reflects the level of enthusiasm, dedication, and connection employees have toward their work and organization (Macey, W. H., & Schneider, B., 2008). In the tourism and hospitality industry (THI), this translates to employees not only performing their core duties but also actively contributing to creating positive guest experiences and promoting organizational values, including sustainability (Karatepe & Demir, 2014). This multifaceted concept, often interlinked with job-specific engagement, integrates loyalty and proactive workplace behavior, making it a multifaceted concept central to productivity, innovation, and organizational success (Babakus et al., 2017). Factors, including job satisfaction, leadership, workplace environment, and recognition significantly influence employee engagement, creating a foundation for positive outcomes like higher performance, retention, and well-being (Kurnia & Hendriani, 2023; Chandani et al., 2016). Theoretical models such as the Job Demands-Resources framework and Social Exchange Theory further highlight how engagement develops and how it can be cultivated through balanced job demands, adequate resources, and reciprocal relationships (Sun & Bunchapattanasakda, 2019).

In the context of the post-Net Zero transition, employee engagement takes on an even greater significance in the

THI. As the industry strives to meet ambitious emissions reduction targets, engaging employees in sustainability initiatives becomes crucial. Employees are not just implementers of green policies; they are also key communicators and advocates for sustainable practices, both within the organization and with guests (Albrecht et al., 2020). Recent research suggests that employees who are engaged with sustainability initiatives demonstrate a higher level of environmental awareness and are more likely to adopt pro-environmental behaviors at work (Bissing – olson et al., 2013). This is particularly important in the post-net zero context, where innovation and adaptation are essential for implementing new technologies and practices aimed at reducing carbon emissions. Therefore, fostering employee engagement in sustainability becomes a key driver for THI to achieve its Net – Zero commitments.

**2.2 The importance of employee engagement in the tourism and hospitality field to develop sustainable initiatives effectively**

In the tourism and hospitality industry (THI), where success relies on employee performance, customer satisfaction, and adaptability, employee engagement plays a pivotal role in effectively developing and implementing sustainable initiatives. Engaged employees, characterized by enthusiasm, dedication, and a sense of ownership, are crucial for enhancing service quality, fostering positive guest experiences, and creating lasting impressions that contribute to customer loyalty and positive word-of-mouth (Rastogi & Karatepe, 2022). This positive impact on customer experience is a key driver of business success in THI. However, the benefits of employee engagement extend far beyond customer interactions. Engaged employees also drive critical organizational outcomes such as increased productivity, reduced employee turnover rate, and enhanced organizational resilience, creating a stable foundation upon which sustainability efforts can thrive (Rabiul et al., 2022). These employees are more likely to collaborate effectively with colleagues, generate innovative solutions, and readily adapt to the evolving demands of sustainable tourism practices, including the adoption of new technologies and procedures (Jyoti & Dimple, 2022).

The impact of engaged employees on sustainability is multifaceted. They actively advance eco-friendly practices within the organization, enthusiastically support social responsibility initiatives, and play a vital role in aligning daily operational activities with broader sustainability goals (Darban et al., 2022). This alignment not only reinforces long-term environmental and social responsibility but also fosters workforce well-being by creating a sense of purpose and shared value. Furthermore, it stimulates green creativity, encourages employees to develop innovative solutions to sustainability challenges, and promotes adaptive behavior, enabling the organization to respond effectively to changing environmental regulations and consumer preferences. Various organizational factors can further enhance employee engagement and align it with sustainability objectives. Effective leadership styles that prioritize sustainability, the implementation of green human resource management (HRM) practices that incentivize and reward sustainable behaviors, and the creation of inclusive and supportive workplace environments all contribute to fostering a culture of engagement and sustainability (Rabiul et al., 2022; Jyoti & Dimple, 2022).

Given the increasing reliance on proactive and committed employees for achieving sustainability in the THI, integrating robust engagement strategies is not merely beneficial but essential for success. Engaged employees are the driving force behind the adoption and consistent implementation of green practices, the innovative resolution of sustainability challenges, and the consistent demonstration of behaviors aligned with these crucial goals. Therefore, fostering a culture of employee engagement is a strategic imperative for THI organizations seeking to effectively develop and implement sustainable initiatives. Future research should continue to explore this critical relationship, focusing on developing practical strategies to maximize the positive influence of employee engagement on tangible sustainability outcomes within the THI.

**2.2. The Bibliometric Review Approach**

This study employs bibliometric analysis to evaluate the literature on employee engagement and its role in fostering sustainability within the tourism and hospitality industry, specifically in the post-net zero context. Bibliometric analysis, a quantitative method analyzing scholarly publications, provides a broad overview of a research field by examining patterns in publication data (Guiling et al., 2022; Martin-Del-rıo et al., 2021; Palacios et al., 2021). This approach identifies key research trends, influential authors, prominent themes, and collaborations. Scopus was chosen as the primary data source due to its extensive coverage of peer-reviewed literature, including a wider journal

range than Web of Science (WoS) while encompassing most WoS- indexed journals (Mongeon and Paul-Hus, 2016; Vieira & Gomes, 2009).

This bibliometric analysis provides insights into global research trends related to employee engagement and sustainability in the post–net Zero THI using key indicators: publication timeline, geographical distribution, influential journals, dominant research type, and cited trends. Additionally, the authors will analyze keywords and identify prevalent terminology and research themes within the literature. While SCOPUS analytical tools were used for initial data visualization (Choudhri et al., 2015), this study utilizes Flourish Studios for enhanced data visualization. Flourish provides interactive and dynamic visualizations, effectively communicating complex bibliometric data like publication trends, geographical distributions, and keyword co-occurrence networks. This enhances the accessibility and interpretability of findings, offering a clearer understanding of the research landscape. While tools like VOSviewer (van Eck & Waltman, 2010) and R's biblioshiny function (Aria and Cuccurullo, 2017) are valuable for science mapping, Flourish offers a more user-friendly and visually engaging way to present the descriptive bibliometric data relevant to this study's research questions. The final Scopus database search was conducted on December 25, 2024, as the primary data source. The query string focused on the main topic about employee engagement, so the string was: TITLE-ABS-KEY ("employee engagement" OR "work engagement" OR "staff engagement" OR "job engagement" OR "employee involvement" OR "staff participation" OR "employ* engagement" OR "team* engagement" OR "organization* engagement" OR "manager* engagement"). Focusing on publications from 2021 to the present to capture the influence of post-COP26 and Net Zero commitments, the string added AND ( "carbon emission" OR "carbon neutrality" OR "sustainable transition" OR "net-zero" ) AND PUBYEAR > 2021 AND PUBYEAR < 2025, and under the pressure of sustainability initiatives, which was AND ( "sustainab*" OR "sustainable practices" OR "environmental responsibility" OR "green practices" OR "CSR" OR "corporate social responsibility" OR "environmental sustainability" OR "environmental management" OR "sustainable development" ). Additionally, depending on the scenario in tourism and hospitality context, the query string added AND ( "tourism" OR "hospitality" OR "travel industry" OR "hotel" OR "hospitality industry" ). Ensuring that the analysis was more accurate, the paper only use English articles in published stage (e.g. DOCTYPE , "ar"; PUBSTAGE , "final"; LANGUAGE , "English"). The field search was "Economics, Econometrics and Finance", "Social Sciences", "Business, Management, and Accounting"; "Environmental Sciences", so the query string added LIMIT-TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA , "ECON" ) OR LIMIT-TO ( SUBJAREA , "SOCI" ) OR LIMIT-TO ( SUBJAREA , "ENVI"). Finally, 50 eligible records used for this bibliometric analysis. Table 1 provides detailed information about the search strategies and query strings.

**Table 1. Search strings for selected literature sources**

| Database | Article part searched | Field Search | Search string |
|---|---|---|---|
| SCOPUS | TITLE-ABS-KEY (Title – Abstract – Keywords) | Business, Management and Accounting; Social Sciences; Environmental Science; Economics, Econometrics and Finance | TITLE-ABS-KEY ("employee engagement" OR "work engagement" OR "staff engagement" OR "job engagement" OR "employee involvement" OR "staff participation" OR "employ* engagement" OR "team* engagement" OR "organization* engagement" OR "manager* engagement") AND ( "carbon emission" OR "carbon neutrality" OR "sustainable transition" OR "net-zero" ) AND ( "tourism" OR "hospitality" OR "travel industry" OR "hotel" OR "hospitality industry" ) AND ( "sustainab*" OR "sustainable practices" OR "environmental responsibility" OR "green practices" OR "CSR" OR "corporate social responsibility" OR "environmental sustainability" OR "environmental management" OR "sustainable development" ) AND PUBYEAR > 2021 AND PUBYEAR < 2025 AND ( LIMIT-TO ( PUBSTAGE , "final" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA , "ECON" ) OR LIMIT-TO ( SUBJAREA , "SOCI" ) OR LIMIT-TO ( SUBJAREA , "ENVI" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) ) |

*Source: Authors, 2024*

### 2.3. PRISMA framework

The PRISMA technique is a structured process for careful screening and inclusion of relevant studies from multiple databases and helps to achieve objectivity and reliability in the research (Hahn & Kuhnen, 2013). Adhering to PRISMA guidelines for article selection (Moher et al., 2009) to finalize the number of articles in the papers (Figure 1). The details of each stage of study selection are as follows:

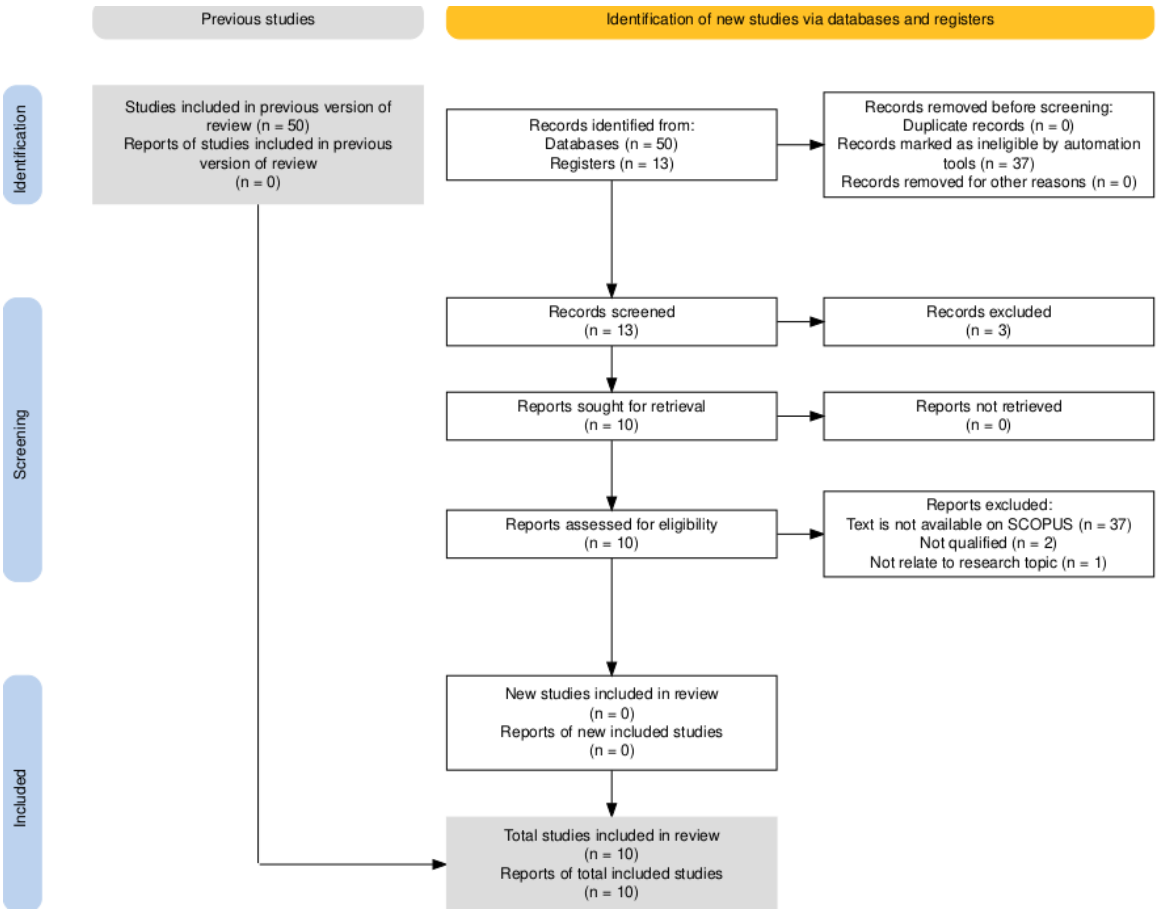



**Figure 1. PRISMA flow diagram steps**

*Source: Haddaway et al., 2022*

In Figure 1, at the identification phase, 50 articles were retrieved from Scopus, but only 13 papers can be downloaded from the database. The screening stage focused on relevance to the employee engagement impact on sustainability in the THI field, excluding articles not directly connected to the topic, only publish article were included, resulting in 12 articles. Eligibility assessment then focused on article quality, retaining only those published in Scopus-indexed journals and ranked as Q1 and Q2 to have the best quality, reducing the selection to 10 articles. Finally, a quality and content assessment of these remaining articles resulted in the final inclusion of 10 research articles for the review.

## III. RESULT AND DISCUSSION

### 3.1 (RQ1) What are publication characteristics (publication timeline, geographical distribution, major subject area, influential journals, dominant research type, cited trends)?

Figure 2 illustrates the years of publications from 2022 to 2024 in post- Net Zero era. The publication timeline experiences a clear upward trend over the three years provided (2022 – 2024). By 2022, there were 3 articles published. Then, the number of publication increased to 4 articles in 2023 and continuously developed to 6 documents in 2024. In general, this indicates a growing interest and increasing research activity in the topic area over this period. The substantial jump in publications from 2023 to 2024 suggest a recent surge in scholarly attention. However, the total number illustrated that this topic still under explored in THI context, this suggests a focus on research activity in the topic area.

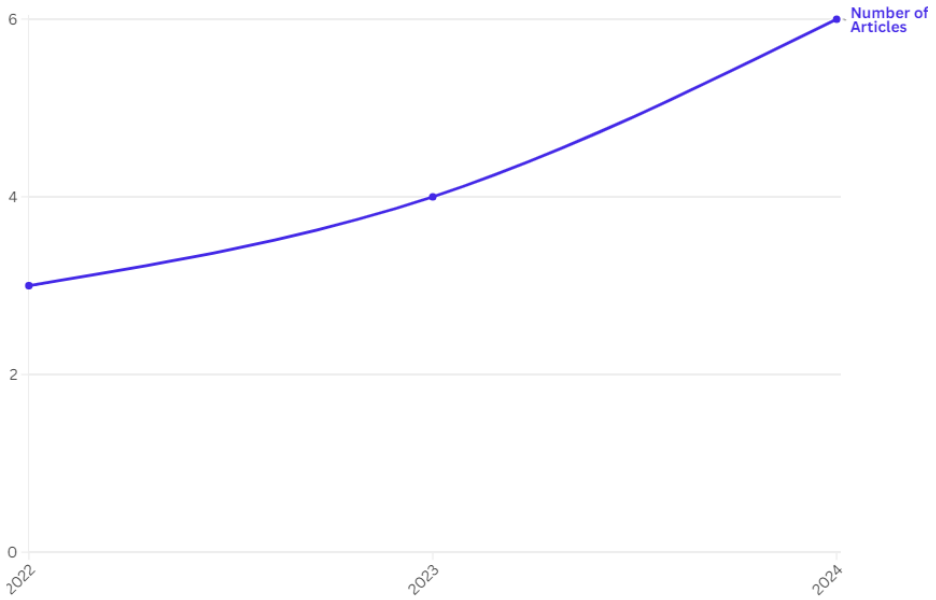



**Figure 2. Articles by year**

*Source:* SCOPUS database and Authors, 2024

In terms of geographical area of studies, the result shows (Figure 3) that most of the studies are conducted in Asia countries, including China (3), India (3), Malaysian (2), Pakistan (2), Saudi Arabia (2), United Arab Emirates (2), Indonesia (1), (arranging in orders); except United States (2) is from America, Ghana (1) is from Africa, and France (1) is from Europe.

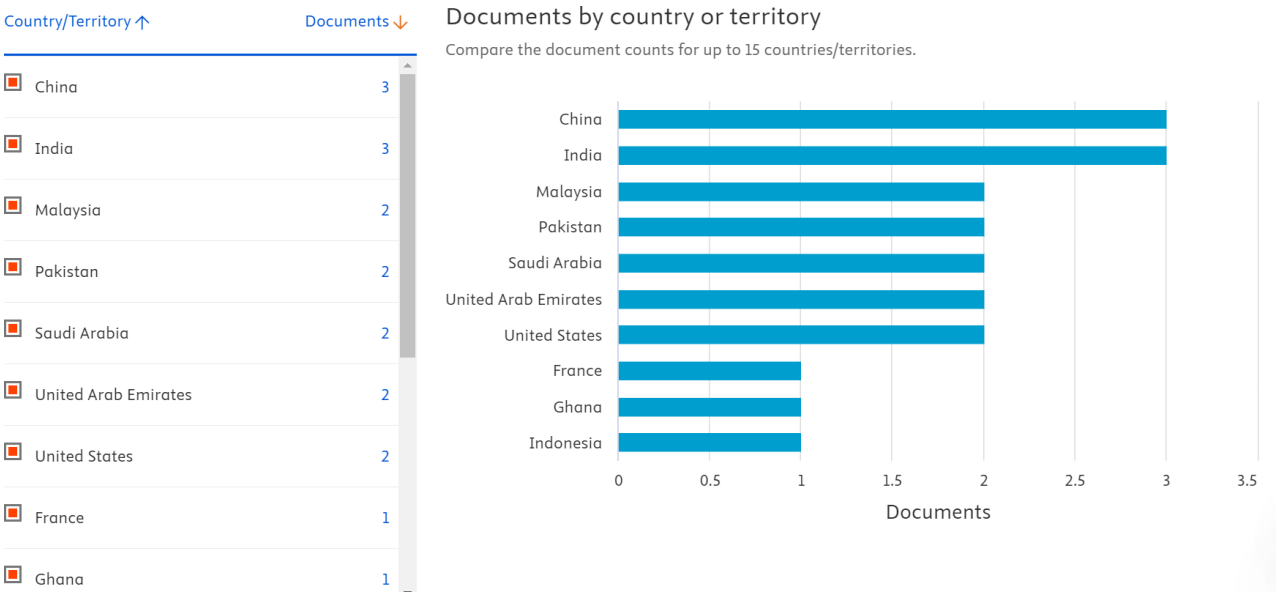



**Figure 3. Articles by country and territory**

*Source: SCOPUS database, 2024*

Figure 4 shows a breakdown of articles by subject area, presented in both a list view and a pie chart graph. Business, Management and Accounting, Environmental Science, and Social Sciences appear to be dominant fields related to research topic of this paper, each representing approximately 20.7% of the total articles. The remaining portions are distributed among various disciplines including Computer Science, Economics/ Econometrics/ Finance, Energy, Psychology (Each at 6.9%), Art and Humanities, Decision Science, and Medicine (each at 3.4%). The left side of the graph provided illustrates a numerical list indicating the number of articles in each category, with Business, Management and Accounting, Environmental Science, and Social Sciences each having 6 documents, while Computer Science, Economics/ Econometrics/ Finance, Energy, and Psychology have 2 articles each, and Art and Humanities has 1 article. This visualization effectively demonstrates the distribution of academic or research documents across different

disciplines.

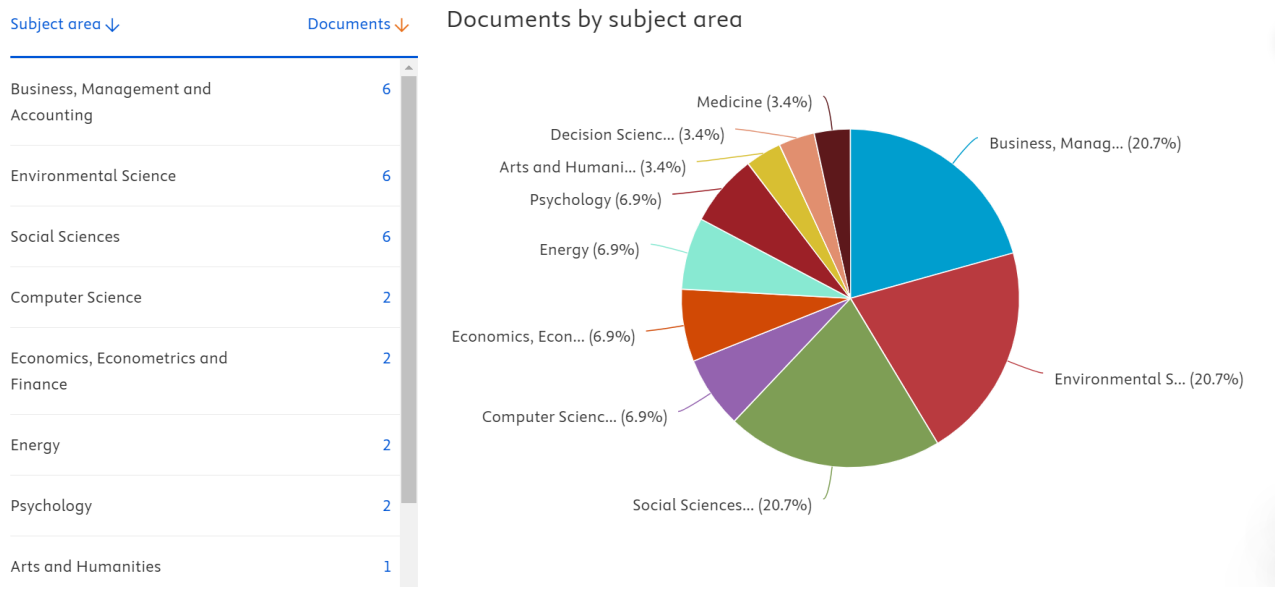



**Figure 4. Documents by subject area related to research topic**

*Source: SCOPUS database, 2024*

In term of the type of research articles. Each article has different journal published, including Qubahan Academic Journal, Current Research in Ecological and Social Psychology, Personnel Review, ABAC Journal, Frontiers in Environmental Science, Business Strategy and the Environment, International Journal of Environmental Research and Public Health, Journal of Knowledge Management, Sustainable Futures, International Journal of Renewable Energy Development. All of the papers are empirical studies.

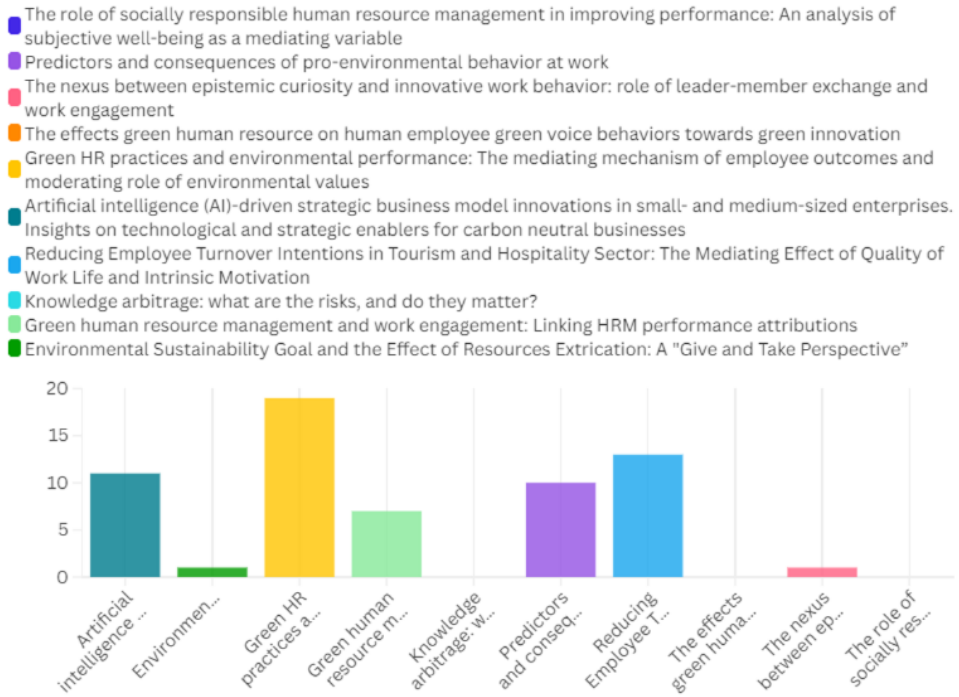



**Figure 5. The most cited paper *(Source:* Authors, 2024)**

The bar graph (Figure 5) illustrates the citation impact of various research themes related to employee engagement and sustainability. "Green HR practices and environmental performance: The mediating mechanism of employee outcomes and moderating role of environmental values" (Adeelet al., 2022) – stands out as the most highly cited paper, with approximately 19 citations. This suggests that research exploring the link between green HR practices, employee outcomes, and environmental performance, particularly considering the moderating influence of environmental values,

has garnered significant attention and influence within the field. The second popular article is "Reducing Employee Turnover Intentions in Tourism and Hospitality Sector: The Mediating Effect of Quality of Work Life and Intrinsic Motivation" (Xu et al., 2022), with around 13 citations, highlighting the importance of research on employee retention and the role of quality of work life in this context. Both of them meets the Q2 quality and is indexed in SCOPUS database. "Predictors and consequences of pro-environmental behavior at work" (Composto et al., 2023) also shows a considerable citation count of approximately 10, indicating a strong interest in understanding the factors that drive and result from pro-environmental actions in the workplace. The remaining themes, including other papers have received fewer citations, suggesting that these areas have either been less impactful or are relatively newer areas of research within the broader domain. "Knowledge arbitrage" appears to have the lowest set citation count in this dataset. Overall, the graph emphasizes the high impact of research focusing on green HR practices and their connection to environmental performance, as well as the important role of employee retention in the THI.

**3.2 (RQ2) Which research theme is more popular by analyzing keywords?**

Keyword analysis forms the foundation of robust literature reviews (Kabil et al., 2021). Several visualization methods exist for analyzing keywords, including frequency counts, word clouds, and thematic maps based on centrality and density. This study employs two of these techniques: thematic graph and word clouds.

Figure 6 as a world cloud highlighting key themes in employee engagement and sustainability within tourism and hospitality in the post-Net Zero era. Central terms like "Green", "innovation", "engagement", and "management" emphasize *Sustainability and Organizational Strategies* focusing. Other significant keywords include "knowledge", "performance", and "human resource", reflecting the importance of *HRM* in fostering the green practices. Words such as "environmental", "responsibility" and "citizenship" highlight *pro-environmental behaviors* and *corporate social responsibility*. Additionally, concepts like "curiosity", "exchange", and "strategic" suggest a focus on *innovation, leadership, and organizational learning*. Overall the word cloud underscores the integration of net zero strategy and innovation, employee engagement, and strategic sustainability.




**Figure 6. Keywords word cloud**

*Source: Authors, 2024*

Analyzing deeply into the research themes related to the topic to set a light into research trend, the results are shown in figure 7. This graph categorizes key themes related to employee engagement and sustainability in tourism and hospitality, emphasizing their role in the post Net Zero era. A central focus is on *"Employee engagement in Pro-environmental behaviors (PEB)"*, highlighting elements such as workplace engagement, organizational citizenship behavior of the environment, and perception of behavioral control, which collectively encourage employees to adopt environmentally responsible practices. Another significant theme involves *"Net zero strategies and de-carbonization"*, where concepts like carbon neutrality, strategic intent, green technology innovation, and AI-driven business model innovation underscore the importance of leveraging technology and strategic frameworks to reduce emissions. *"Green human resource management (GHRM) for sustainability"* plays a pivotal role in embedding sustainability within organizational culture, with practices such as green HR initiatives, training, and managerial support driving employee participation in green activities. The *"Sustainable operations and Performance"* theme contrasts green and non-green performance, emphasizing environmental management and corporate social responsibility (CSR) as vital elements for

archiving sustainability goals. *"Leadership for Sustainable engagement",* including leader-member exchange and fostering environmental values, are critical in shaping pro-sustainability attitudes and behaviors among employees. Furthermore, the *"Organizational Culture for sustainability"* is also another supportive theme to archive Net-Zero goals including organizations, environmental values. Overall, the graph underscores the integration of employee behaviors, organizational strategies, HR practices, and leadership as key drivers for achieving sustainability and de-carbonization in the post Net-Zero era.

The identified themes in the paper highlighting the unique interplay between sustainability and employee engagement in the THI. *"Employee engagement in Pro- environmental behaviors (PEB)"* theme is similar to findings in environmental psychology, where individual attitudes significantly influence PEB, the THI shows that engages employees are keys drivers of sustainable behaviors. *"Net zero strategies and de-carbonization"* theme focus on Net Zero strategies aligns with other industrial efforts in energy, transportation and construction sectors, which have been prioritizing carbon reduction through technological innovation and policy implementation. In the THI, *"Green human resource management (GHRM) for sustainability"* theme focuses on training, rewards, and recruitment to foster a culture of sustainability. It contrast with manufacturing or IT industries, where GRHM may prioritize more technical or process-driven sustainability improvements. The *"Sustainable operations and Performance"* theme resonates with lean management practices in other sectors, but in THI, sustainable operations also emphasize experiential aspects, such as eco-friendly guest experiences, which differ from the more product-centric focus in manufacturing. In THI, *"Leadership for Sustainable engagement"* theme shows that leaders with green transformational leadership play a crucial role in setting sustainability agendas and motivating staff to align with these goals to systemic change. This aligns with findings in healthcare and education sectors, but more challenging since in THI, leaders need to balance profitability with sustainability in a highly competitive market. *"Organizational Culture for sustainability"* in THI also uniquely integrates sustainability into daily operations and guest experiences, reflecting its service – oriented nature and urgent adaptation to post-Net Zero goals.

In general, keyword and thematic analyses reveal a strong focus on sustainability, organizational strategies, and HRM's role in driving green practices within the post- Net Zero THI. While the word cloud shows about word frequency, the graph illustrates the dominance research theme. Key themes highlights the importance of employee engagement in pro – environmental behaviors, net-zero strategies, GHRM, sustainable operations, organizational culture for sustainability, and leadership for sustainable engagement.




**Figure 7. Keywords arranged in research themes**

*Source: Authors, 2024*

### 3.3 (RQ3) What are suggest avenues for future research?

The thematic analysis of employee engagement and sustainability within THI in the post Net Zero context highlights several critical research areas. Longitudinal studies are essential to capture the dynamic interplay between

engagement levels and sustainability outcomes over time, particularly under the pressures of net-zero transitions (Pekaar & Demerouti, 2023). Broadening the research scope through diverse sampling across THI segments – hotels, restaurants, and tour operators – can enhance the generalizability of findings, while sector-specific studies address unique challenges such as energy efficiency in hotels or waste reduction in restaurants (Ababneh, 2021). Investigating the influence of digital tools and emerging technologies on employee engagement is also crucial, as these innovations can enhance operational efficiency and sustainability transparency (Albrecht et al., 2021). Cross-cultural research is needed to understand how cultural differences impact engagement in global sustainability initiatives, as frameworks like Hofstede's cultural dimensions and leadership strategies underscores the importance of cultural adaptation (Pansini et al., 2024). Additionally, the findings highlight that integrating sustainability into the THI requires a comprehensive approach involving employee engagement, leadership, and organizational culture. Practical implications include implementing policies that promote pro- environmental behaviors, Net Zero strategies, and GHRM. Future practices could involve sustainability – focused training, leadership roles dedicated to environmental goals, and embedding sustainability, aligning operational practices with long-term environmental objectives. This multifaceted approach is crucial for THI to effectively navigate and meet post – Net Zero sustainability targets. Finally, developing robust metrics to measure the tangible impacts of engagement of sustainability outcomes, potentially through composite indices or established environmental performance indicators, will enable more rigorous analysis. Together, these directions offer a roadmap to advance employee engagement's role in fostering THI sustainability in the post-Net Zero era.

## IV. CONCLUSION

This study highlights the critical role of achieving sustainability goals in THI, particularly in the post- Net Zero era. Employee engagement emerges as a key driver of pro-environmental behaviors and sustainable practices, suggesting that organizations can strategically leverage engagement to advance their sustainability agendas. By aligning workforce motivations with organizational environmental objectives, business can foster a culture of responsibility that supports long-temr ecological and operational goals.

*Theoretical and practical implications*

This study enriches the theoretical discourse by illustrating how employee engagement can shape sustainability outcomes, bridging the gap between organizational behavior and environmental management literature. Furthermore, it provides a foundation for developing initiatives, offering structured guidance for future scholarly exploration. In the tourism and hospitality context, the findings emphasize the importance of adopting strategic green human resource management (GHRM) practices that nurture employee engagement, thereby amplifying sustainability efforts. Additionally, policy-markers and industry leaders can draw on these insights to craft policies and initiatives that prioritize employee engagement as a core strategy for achieving sustainability objectives.

*Potential biases*

Bibliometric analysis can introduce biases such as publication bias, favoring well-known journals over emerging ones, and language bias, which limits the inclusion of non-english research. Database bias may result from relying on a single database, potentially omitting relevant studies from other sources. Citation bias also skews results toward highly cited works, potentially neglecting newer or less-cited but significant studies. These biases can lead to a narrowed view or the research landscape, overemphasizing dominant perspectives and possible overlooking innovative or diverse contributions.

*Challenges, Limitations and Future Research Directions*

However, the study acknowledges challenges, including limited access to comprehensive data. The reliance on existing literature may not fully capture the breadth of the topic, and the rapidly evolving nature of sustainability and employee engagement research poses difficulties in maintaining relevance.

The scope of this bibliometric review is constrained by its reliance on specific keywords and publication types, potentially excluding valuable contributions from grey literature or adjacent fields. It provides only a snapshot of current research, potentially missing evolving trends. Additionally, geographical biases in research distribution may overlook insights from underrepresented regions, limiting the global applicability of the findings.

To address the gaps, future research should prioritize longitudinal studies that explore the evolving dynamics of employee engagement and sustainability over time or the systematically qualitative approaches. Expanding the scope to sector- specific studies across diverse segments of the THI will also enhance the generalizability of findings. Further, exploring the role of digital tools and emerging technologies in fostering engagement can provide actionable insights for modern organizations. Cross – cultural studies are needed to understand the impact of cultural nuances on employee involvement in sustainability efforts Finally, the development of robust, quantifiable metrics to measure the outcomes of employee engagement I sustainability pratices will facilitate more rigorous and impactful research.

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# VISUAL ARTS IN SUSTAINABLE TOURISM: INNOVATING AWARENESS OF GREEN LIVING AND ENVIRONMENTAL RESPONSIBILITY

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**ABSTRACT**

In the context of globalization and digital transformation, visual arts—through their potent expressive power and profound emotional impact—are increasingly recognized as essential, innovative tools in promoting sustainable tourism and cultivating public awareness of green living. This paper examines the perspectives of multiple stakeholders, including local communities, tourism managers, environmental organizations, and artists, to illustrate how visual arts (e.g., public art, recycled sculptures, and interactive installations) effectively communicate sustainability messages and shape environmentally responsible behaviors. Drawing on mixed-methods research that includes in-depth interviews, surveys, and case analyses at sustainable destinations, the study underscores the synergy of visual arts with digital technologies such as Virtual Reality (VR) and Augmented Reality (AR). This synergy offers immersive, emotionally engaging experiences that significantly enhance tourist involvement and amplify creative outreach.

The findings demonstrate that visual arts transcend mere cultural expression, functioning as a robust strategy for establishing green artistic spaces, *galvanizing public awareness*, and nurturing a more harmonious, responsible relationship between humans and nature. Practical implications include recommendations for further investment in art-based attractions, guidance on effective management strategies to support these initiatives, and an outline of how policymakers and local tourism authorities can capitalize on the long-term impacts of visual art integration in Vietnam's tourism industry. The article concludes with suggestions for future research that bridges art, technology, environmental stewardship, and sustainable destination development.

*Key words:* "green living", "social responsibility", "sustainable tourism", "visual arts"

## I. INTRODUCTION

In the era of globalization and digital transformation, environmental issues and sustainable development have become central to global socio-economic policies. The tourism industry, with its rapid growth, significantly contributes to global GDP but also poses considerable negative impacts on the environment, including resource overexploitation, pollution, and increased waste generation. This has led to the emergence of the concept of "sustainable tourism," emphasizing the balance between economic development, natural resource conservation, and social responsibility.

According to the United Nations World Tourism Organization (UNWTO), "sustainable tourism is the development of tourism activities that meet the current needs of tourists and local communities while preserving natural, cultural, and ecological resources to meet future demands" (Nguyen Dinh Hoa, 2016). In Vietnam, the 2017 Tourism Law also defines sustainable tourism development as the harmonious integration of economic, social, and environmental factors, ensuring long-term benefits for both present and future generations. In 2023, the theme "Tourism and Green Investment" chosen for World Tourism Day highlighted the urgent need to increase investment in green tourism for sustainable development (Than Trong Ngoc Tram, 2024).

In this domain, visual arts play an essential role in raising environmental awareness and promoting sustainability. Artistic interventions—such as public sculptures made from recycled materials, interactive installations, and immersive exhibitions—provide a compelling medium to engage audiences emotionally and intellectually, fostering a deeper connection with nature (Guttentag, 2010). Research suggests that art is a powerful tool for shaping human perceptions and behaviors, as visual storytelling enables individuals to grasp complex ecological issues more intuitively than conventional environmental campaigns (Tran Thanh Nam, 2024).

Numerous studies have demonstrated the effectiveness of visual arts in sustainable tourism by influencing visitor

attitudes and encouraging eco-friendly actions. For example, large-scale environmental art installations—such as the "Washed Ashore" project in the United States—have successfully educated millions of tourists on ocean pollution through sculptures crafted from marine debris (Sovhyra, 2022). Similarly, public art initiatives in European eco-tourism destinations, like Denmark's ARKEN Museum's green art projects, have promoted responsible tourism by integrating artistic expressions with local environmental narratives (Omran et al., 2024).

Moreover, in the digital era, the fusion of visual arts with emerging technologies—such as Virtual Reality (VR) and Augmented Reality (AR)—has revolutionized how environmental messages are conveyed. Digital art experiences provide tourists with interactive and immersive encounters, significantly enhancing their engagement and retention of sustainability principles (Zulkifli et al., 2021). VR-based simulations, for instance, allow visitors to explore endangered ecosystems virtually, fostering empathy and inspiring conservation efforts. A study by Omran et al. (2024) confirmed that digital storytelling through AR applications strengthens tourists' emotional bonds with nature and positively influences their willingness to adopt green behaviors.

In light of these developments, an increasing body of literature emphasizes how the visual arts and associated digital technologies can create transformative experiences that deepen visitors' ecological awareness. In particular, large-scale exhibitions and installations have been shown to reshape local communities' perceptions of fragile environments, reduce ecological footprints through interactive education, and serve as a catalyst for sustainable lifestyle choices (**Sovhyra, 2022; Omran et al., 2024; Trần, 2024**). Moreover, the use of Virtual Reality and Augmented Reality can enhance these installations by offering immersive, emotionally resonant experiences that further encourage pro-environmental behavior (**Guttentag, 2010; Zulkifli et al., 2021**). These positive impacts underscore the need to examine how art- and technology-driven interventions can be systematically integrated into tourism strategies to foster long-term environmental stewardship.

In Vietnam, the application of visual arts combined with digital technology in sustainable tourism is gaining traction. Initiatives such as eco-art parks, immersive VR experiences in conservation areas, and recycled-material art festivals contribute not only to visitor engagement but also to long-term environmental awareness (Ngo Thanh Loan, 2023). Notably, projects at Flamingo Dai Lai Nature Reserve showcase how artistic and technological integration can create compelling narratives that educate the public on sustainability issues.

This article aims to explore the role of visual arts in fostering sustainable tourism, emphasizing how artistic interventions—both traditional and technology-enhanced—can be leveraged to communicate environmental messages, promote eco-conscious behaviors, and enhance visitor experiences. Additionally, it proposes strategic solutions to optimize the potential of visual arts in sustainable tourism planning and policy-making, contributing to the broader discourse on art, technology, and environmental stewardship in the digital age.

## II. MATERIAL AND METHODOLOGY

### 2.1. Theoretical Framework

Visual arts, encompassing sculpture, installations, murals, and public art, operate as potent instruments for social education and cultural expression. Their effectiveness lies in the ability to visually communicate multifaceted environmental messages (e.g., pollution, climate change, natural resource conservation) in a manner that is simultaneously accessible and impactful. Within the sustainable tourism model, visual arts thus serve a dual purpose:

– **Enriching Tourist Experiences**: By integrating cultural and aesthetic elements, visual artworks offer novel ways for tourists to engage with local environments.

– **Promoting Green Living**: Through the careful design of spaces and messages, visual art installations can elicit long-term behavioral shifts toward eco-friendly habits (Nguyen Dinh Hoa, 2016).

Such engagements are increasingly augmented by digital technologies, including VR and AR, which break geographical barriers and foster deeper interactions with artworks (Guttentag, 2010). This convergence of art and technology aligns with the overarching goal of sustainable tourism: balancing economic, social, and environmental priorities. Furthermore, recent meta-analyses indicate that art-focused interventions in tourism settings can boost visitors' willingness to participate in pro-environmental actions by up to 30% (Omran et al., 2024). Such findings underscore the critical role of visual arts not only in amplifying the appeal of tourist destinations but also in reinforcing

community-based sustainability initiatives.

### 2.2. Research Methodology

To gain a comprehensive understanding of the roles, impacts, and implications of visual arts in sustainable tourism, the study employed a mixed-methods design comprising both qualitative and quantitative approaches. Unlike single-method designs, mixed methods provide a more robust and nuanced examination by triangulating data from multiple sources.

#### 2.2.1. Qualitative Approach

– **Expert Interviews:** Ten in-depth, semi-structured interviews were conducted with artists, tourism managers, environmental officers, and local community representatives. The sample was purposive, focusing on individuals with direct experience or expertise in implementing visual art projects at tourist destinations.

– **Interview Guide:**

+ Perceptions of visual arts' contribution to raising environmental awareness

+ The integration of VR and AR technologies in art displays

+ Challenges in planning and managing art-based tourism products

+ Opportunities for further investment and policy support in Vietnam's tourism industry

– **Focus Groups with Local Stakeholders:** In addition to expert interviews, focus groups (6–8 participants each) were organized with local community members and small business owners operating in the vicinity of Flamingo Đại Lải Natural Resort and Hoàn Kiếm Lake. Discussions revolved around economic benefits, environmental concerns, and social acceptance of art-based tourism initiatives.

#### 2.2.2. Quantitative Approach

– **Survey Design and Data Collection**: A structured questionnaire was administered to 100 visitors at Flamingo Đại Lải and 100 visitors at Hoàn Kiếm Lake Walking Street. A convenience sampling method was adopted at each site, intercepting tourists who had just experienced art installations. The survey featured a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) to measure:

+ Visitor engagement and satisfaction (e.g., "The art installations enhanced my overall experience.")

+ Environmental awareness (e.g., "I have learned new information about the impacts of waste on the environment.")

+ Behavioral intentions (e.g., "I am more likely to reduce my use of single-use plastic after this visit.")

– **Sampling Rationale:** While convenience sampling can limit generalizability, the primary intent was to gather immediate perceptions of art experiences. The demographic profile varied from domestic visitors to international tourists, ensuring representation of multiple viewpoints.

– **Research Model and Statistical Analysis**: Following standard procedures, data were coded and analyzed using SPSS (version 26). The research model hypothesized:

+ Visual arts interventions → ↑Visitor engagement → ↑Environmental awareness → ↑Behavioral change

+ Integration of VR and AR → ↑Emotional resonance → ↑Long-term sustainable tourism practices Multiple regression analyses tested these pathways, while correlation analysis assessed the strength of relationships between key variables.

Multiple regression analyses tested these pathways, while correlation analysis assessed the strength of relationships between key variables. In addition, reliability of the survey instrument was confirmed with a Cronbach's Alpha of 0.87, indicating high internal consistency. ANOVA tests were also conducted to compare mean differences in environmental awareness between the two survey locations ($F = 6.45$, $p < .05$), and independent t-tests were used to determine whether visitors' engagement levels differed significantly by demographic groups ($t = 2.12$, $p < .05$). These statistical results reinforce the quantitative validity of the findings and highlight the importance of robust software-based (SPSS) analyses in drawing meaningful conclusions about the impact of visual arts on sustainable tourism.

**2.2.3. Study Process**

– **Pre-Field Research:**

+ Designing the semi-structured interview guide in consultation with tourism and environmental experts

+ Crafting the survey questionnaire, pilot-testing it with 10 participants

– **Data Collection:**

+ Conducting expert interviews and focus groups over two weeks

+ Distributing surveys at Flamingo Đại Lải (eco-resort environment) and Hoàn Kiếm Lake (urban public space)

– **Data Analysis**:

+ Thematic analysis for qualitative insights

+ Statistical tests (e.g., regression, correlation) for quantitative findings

– **Synthesis & Reporting:**

+ Integrating findings from both qualitative and quantitative strands

+ Highlighting implications for investment, management, and further research

**2.3. Case Study Selection**

Two destinations in Vietnam were chosen for their distinctive characteristics:

– **Flamingo Đại Lải Natural Resort (Vinh Phuc)**: An eco-resort recognized for innovative art installations crafted from recycled materials and the integration of VR.

– **Hoàn Kiếm Lake Walking Street (Hanoi)**: An urban public space frequently hosting street art projects and outdoor exhibitions to raise community awareness of environmental protection.

These cases were analyzed to illustrate various stakeholder perspectives, from local authorities and artists to visitors and environmental NGOs involved in planning or participating in the events.

**III. RESULT AND DISCUSSION**

**3.1. Key Findings from Mixed Methods**

**Qualitative Outcomes**

– **Multiple Stakeholder Perspectives:**

+ Artists: Highlighted the importance of creative autonomy and financial backing to produce large-scale installations that effectively communicate sustainability.

+ Tourism Managers: Emphasized the need for strategic planning and logistical support to integrate art installations seamlessly into existing tourism products.

+ Community Representatives: Expressed strong support when art-based initiatives lead to tangible economic benefits (e.g., local handicraft sales, increased foot traffic) while also voicing concerns about environmental preservation.

– **Challenges and Opportunities:** Stakeholders acknowledged significant logistical challenges (e.g., high production costs and maintenance), but also recognized opportunities to diversify tourism offerings, enhance destination branding, and bolster environmental education.

**Quantitative Outcomes**

– **Survey Findings:**

+ 72% of respondents reported adopting at least one new eco-friendly habit (reducing plastic use, saving energy) after visiting the art installations.

+ 80% stated they experienced a heightened sense of emotional involvement when VR or AR elements were integrated.

+ Regression analysis revealed that visitor engagement ($\beta = 0.45$, $p < .01$) and integration of VR/AR ($\beta = 0.38$, $p <$

.01) significantly predicted environmental awareness and behavioral change.

– **Additional Statistical Evidence:** The ANOVA results ($F = 6.45$, $p < .05$) showed a statistically significant difference in environmental awareness scores between visitors at Flamingo Đại Lải and Hoàn Kiếm Lake, suggesting that the context and style of art installations can influence the degree of eco-consciousness. Moreover, independent t-tests revealed that younger tourists (under 35) reported significantly higher interest in VR/AR-enhanced artworks ($t = 2.12$, $p < .05$), underlining the importance of demographic factors in shaping engagement levels.

– **Long-Term Sustainability Intentions:** A majority of survey participants expressed willingness to share their experiences on social media and revisit the sites, indicating a potential ripple effect for destination marketing and ongoing eco-conscious behaviors.

### 3.2. Case Study Analysis

Flamingo Đại Lải Natural Resort (Vinh Phuc, Vietnam)

Situated in a vast ecological space, Flamingo Đại Lải leverages visual art as a key tool for raising awareness about environmental protection. Iconic works like "The Sun Gate" and "Fragments from the Sky," along with hundreds of other sculptures crafted from recycled stone and steel, attract over 200,000 visitors annually. Surveys show that nearly all visitors deeply resonate with the message of nature conservation conveyed through these artworks.Interactive activities such as outdoor exhibitions and artistic experiences in nature foster a closer connection between visitors and the ecological space. Visitors at Flamingo Đại Lải Nature Reserve find that artworks made from recycled materials such as plastic, metal, and wood help them gain a deeper understanding of environmental pollution and the urgent need to mitigate its negative impacts.



**Fig 1 - Artistic installation in a natural setting: Flamingo Đại Lải Natural Resort.**

One of the most iconic pieces is **"The Sun Gate"** by Artist Nguyễn Hồng Dương, located near the lakeside.



**Fig 2 - Artwork: The Sun Gate. Artist: Nguyễn Hồng Dương. (Flamingo Contemporary Art Museum)**

In addition to their aesthetic appeal, green art spaces strongly convey messages of sustainability and environmental responsibility. Many visitors acknowledge gaining a deeper understanding of environmental pollution issues after participating in these immersive experiences. According to a report by Flamingo Group, more than 75% of visitors who attended the "Art in the Forest" program stated they were deeply inspired to take action to protect the environment.

The sculptures placed amidst the pine forests are not merely aesthetic symbols but also clear conveyors of messages about nature conservation and sustainable development. By integrating these artistic creations into natural settings, these spaces create a profound connection between visitors and the environment, emphasizing the importance of harmony with nature.

In addition, Flamingo Đại Lải employs VR technology to offer virtual tours of its art exhibits, expanding visitors' immersive experiences:



**Fig 3 - Visitors experiencing VR technology at Đại Lải Natural Resort.**

This digital integration not only elevates visitor engagement but also overcomes the spatial limitations of physically large sculptures, enabling tourists to explore intricate artistic details and underlying environmental messages more deeply.

**Hoàn Kiếm Lake Walking Street (Hanoi)**: Hoàn Kiếm Lake is a prime example of an urban public space regularly hosting cultural and artistic events. This public space has hosted numerous street art projects and outdoor exhibitions aimed at raising community awareness about environmental protection. The continuous cultural, artistic, and recreational activities along the walking street have transformed it into a vibrant cultural hub.

Notably, frequent art events draw significant participation from both residents and tourists. One standout event was the **Hanoi Creative Design Festival 2023**, held in the Hoàn Kiếm Lake walking area. The festival focused on promoting sustainable design ideas, showcasing many outdoor installations and sculptures made from recycled materials.

These aesthetically striking artworks delivered powerful messages about environmental protection and sustainable development, engaging the audience with their innovative design and inspiring a deeper sense of environmental responsibility.




**Fig 4 – "The Windows." Sculptors: Mai Thu Vân, Nguyễn Ngọc Lâm; Architect: Đỗ Anh Tuấn.**

Frequent cultural programs—like the Hanoi Creative Design Festival—showcase how sustainable design and visual arts can synergize to promote green living behaviors. According to official statistics, pedestrian flows can reach 15,000–20,000 visitors on weekends, illustrating the significant reach of such events. Observations and interviews indicate a positive shift in environmental awareness among both residents and international tourists.



**Fig 5 – "The Creative Gate." Hanoi Creative Design Festival 2022.**

Overall, Hoàn Kiếm Lake's vibrant art scene underscores the collective impact of combining cultural entertainment with environmental education in highly accessible public domains. The integration of art with public spaces at Hoàn Kiếm Lake Walking Street has contributed to a diverse cultural environment, promoting green living and fostering a sense of nature conservation among the public. Organizing cultural and artistic activities in this area provides entertainment for locals and visitors and serves as an effective medium for conveying environmental protection messages, helping to build community awareness about sustainable development. Visitors highly appreciate the artworks in this space for their clear communication of environmental conservation messages, creating a strong emotional connection between people and nature. Outdoor exhibitions and interactive art experiences in natural settings also foster a deeper bond with nature, inspiring responsibility and encouraging actions to protect ecosystems. This exemplifies the effective combination of visual arts and environmental education.

### 3.3. Impact of Visual Arts on Green Living Awareness

In Vietnam, visual arts have emerged as a powerful medium to raise community awareness about green living and environmental protection. Through their visual expressiveness and emotional impact, public art, sculptures, and installations have become effective channels for conveying environmental messages. These works draw attention and foster deeper understanding of the importance of preserving natural resources and minimizing negative environmental impacts.

**Raising Environmental Awareness:** Public art, particularly sculptures made from recycled materials, has significantly contributed to changing public perceptions. For instance, street art projects in Hanoi and Ho Chi Minh City have garnered substantial community interest, spreading awareness of environmental protection. A survey conducted at Flamingo Dai Lai Nature Reserve revealed that the majority of visitors found sculptures made from recycled plastics, metals, and wood helped them better understand issues like environmental pollution and the necessity of conserving natural resources. This underscores the vital role of art in communicating complex environmental messages in an accessible and visually engaging manner.

**Strong Emotional Impact and Perceptual Change:** These findings align with the research of Tran Thanh Nam (2024), which affirms that visual arts in public spaces create powerful interactions with audiences due to their large

scale and striking visual appeal. Far from being mere aesthetic expressions, these artworks act as potent educational tools, delivering sustainable development messages clearly and effectively. The integration of artistic forms with public spaces evokes emotions that change perceptions and inspire positive actions among viewers.

**Promoting Green Living Behavior:** Beyond raising awareness, visual arts stimulate behavioral changes. Visitors exposed to sculptures with environmental messages have reported modifying daily habits, such as reducing single-use plastics, increasing recycling efforts, and sorting waste. These actions demonstrate the practical effectiveness of visual arts in encouraging environmentally friendly lifestyles.



**Fig 5 & 6 - The structure designed by STUDIOKCA is made from 53,780 recycled plastic bottles—the number of bottles discarded in New York City in a single day. Visitors can step inside and admire the light and colors shining through these discarded plastic bottles.**

**Connection to the Sustainable Development Goals (SDGs):** Immediate changes in awareness and behavior resulting from visual arts have a contributing impact on achieving the Sustainable Development Goals (SDGs) in the long term. In particular, goals such as SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action) are promoted through public awareness education and the dissemination of green living messages.

**The Importance of Emotional Connection:** One remarkable aspect of visual art is its ability to establish a strong emotional bond between humans and nature. Through highly symbolic works, visitors perceive nature as a resource and a part of the ecosystem that must be respected and protected. This connection lays the groundwork for sustainable actions, from changing personal habits to participating in community environmental protection efforts.

These impacts demonstrate the role of visual art as a versatile medium that combines aesthetic value with practical contributions to raising awareness, promoting green behavior, and creating sustainable community values. This underscores art as a cultural field and a strategic tool for education and social change in the context of global sustainable development.

### 3.4. Integrating Digital Technology for Enhanced Effectiveness

Both AR and VR are deployed to enrich the interpretive layers of art installations:

– **Augmented Reality (AR)**: Provides real-time information overlays about materials, creative processes, and sustainability tips, making the viewing experience highly interactive. AR helps visitors understand the origin of recycled materials, for instance, and fosters a sense of personal connection with environmental narratives (Sovhyra, 2022).

– **Virtual Reality (VR)**: Offers immersive simulations of pre- and post-pollution environments, amplifying the emotional urgency to adopt eco-friendly behaviors (Phạm Quốc Toàn, 2024). A robust correlation exists between the quality of VR experiences and long-term visitor satisfaction (Zulkifli et al., 2021), underscoring the need for high-quality, smoothly functioning VR interfaces.

### 3.5. Long-Term Impacts and Practical Implications

The integration of visual arts into sustainable tourism does more than enhance visitor experiences; it can also trigger profound and enduring transformations in the way individuals and communities perceive and interact with the environment. These long-term impacts manifest at both the individual and collective levels, directly shaping ecological awareness, social engagement, and local policymaking. Consequently, practical measures for investment and

management emerge as indispensable for maintaining and amplifying these positive effects in Vietnam and beyond.

### 3.5.1. Behavioral Change and Community Influence

#### Driving Individual Lifestyle Shifts

As evidenced by survey data, over 70% of visitors report renewed commitment to resource conservation after experiencing art installations. This behavioral change often translates into tangible actions, such as reduced use of single-use plastics, increased recycling, and a heightened sense of stewardship for local habitats. Research in environmental psychology indicates that *emotional resonance*—spurred by powerful visual cues and immersive experiences—forms a cornerstone for prompting these long-lasting lifestyle changes. Tourists who form strong emotional bonds with an artwork's message are more likely to carry that awareness back home, integrate eco-friendly habits into daily routines, and potentially influence friends and family to do the same.

#### Catalyzing Community-Level Outcomes

While initial change starts with the individual, repeated exposure to art-based sustainability messages fosters broader shifts in community culture. Projects featuring large-scale sculptures made from reclaimed materials, for example, can galvanize local residents into forming conservation groups, organizing grassroots recycling initiatives, or volunteering for ecosystem restoration activities. These collaborative efforts often extend the life cycle of an artwork beyond a tourist attraction, transforming it into a civic landmark that anchors community identity around sustainability. Communities with limited resources can also adapt and replicate art-based approaches—like small-scale recycled-art workshops or traveling pop-up installations—to enhance environmental awareness and rally support for local conservation efforts.

#### Reinforcing Sustainable Social Norms

Over time, the repeated visibility of public art and community-based events helps normalize eco-friendly behavior. In sociological terms, sustainability transitions require not only structural policies and financial incentives but also a redefinition of what is socially acceptable or desirable. Art projects, especially when endorsed by local institutions and integrated into popular public spaces, contribute to this redefinition. As more residents and visitors participate in eco-art festivals or interact with sculptures that illustrate pressing environmental issues, sustainability becomes embedded in everyday discourse. This peer-driven form of reinforcement makes green habits more likely to endure, even as economic and demographic changes occur.

### 3.5.2. Implications for Investment and Management in Vietnam

To ensure that visual arts can catalyze and sustain these transformative outcomes, strategic investments and sound management practices are essential. In the context of Vietnam—a nation that balances rapid tourism growth with the need for environmental preservation—the following considerations are paramount.

– **Infrastructure Investment**

+ **Artistic Infrastructure:** Governments and private investors should actively collaborate to establish dedicated art zones - such as sculpture parks, cultural corridors, or designated urban squares for art installations—that blend harmoniously with local landscapes. These zones not only draw tourists but also serve as loci for environmental education programs. Choosing locations with proximity to natural features (e.g., lakes, forests) can further reinforce ecological messages.

+ **Digital Upgrades:** Adequate funding and planning are required to integrate and maintain VR/AR systems, especially if installations are designed to be interactive or if curated exhibits rely on augmented digital content. Reliable internet coverage, user-friendly interfaces, and ongoing technical support are crucial. This is particularly true in rural or semi-urban areas of Vietnam, where digital infrastructure may still be developing.

– **Policy and Collaborative Management**

+ **Regulatory Frameworks**: Clear guidelines on waste management, public space usage, and environmental impact assessments ensure art installations contribute to, rather than detract from, sustainability. For instance, imposing requirements for recycled or locally sourced materials can reinforce the ecological messages communicated by the artworks themselves.

+ **Inter-agency Coordination**: Sustainable tourism initiatives often span different government bodies, including cultural affairs, tourism boards, and environmental agencies. Formalized coordination mechanisms—such as joint task forces or interdepartmental committees—help optimize resource allocation, avoid overlapping efforts, and maintain consistent messaging across public outreach campaigns.

+ **Stakeholder Engagement**: Meaningful engagement of local communities, youth groups, and artists from the earliest planning stages is pivotal. By encouraging shared ownership of these art projects, communities are more likely to invest in their long-term upkeep and champion sustainability beyond the initial launch. Early involvement also mitigates conflicts, ensures respect for local customs, and boosts acceptance among residents who might otherwise feel excluded.

– **Capacity Building and Community Education**

+ **Workshops and Training:** Tailored training programs enable local communities to see the economic potential in sustainable art tourism—such as micro-entrepreneurship linked to craft production or eco-friendly souvenirs—while also clarifying their environmental responsibilities. These sessions can be delivered through public-private partnerships or local NGOs already engaged in community development work.

+ **Educational Programs:** Strengthening collaboration with schools, colleges, and non-governmental organizations ensures art installations serve as real-world learning platforms, where students can experience hands-on demonstrations of environmental challenges and creative solutions. Such integration with formal curricula can institutionalize sustainability values in the next generation of citizens and local leaders.

– **Long-Term Research and Monitoring**

+ **Continuous Evaluation:** Implementing structured monitoring programs that track how visitor behaviors and attitudes evolve over time is invaluable for policymakers. Surveys, observation checklists, and digital analytics (e.g., VR interaction logs) can reveal patterns of engagement and identify areas for improvement.

+ **Academic-Industry Collaborations:** Encouraging partnerships between universities, research institutes, and the tourism sector can yield new insights into emerging digital art forms, measure visitor satisfaction, and quantify the return on investment for large-scale installations. The findings can then be fed back into policy design, guiding future investments and ensuring that resources are allocated to initiatives with the greatest sustainable impact.

**3.6. Sample of Secondary Data: Vietnam's International Tourist Arrivals (2018–2022)**

| Year | International Arrivals (Millions) | Annual Growth Rate (%) | Tourism Revenue (USD Billion) |
|---|---|---|---|
| 2018 | 15.5 | 19.9 | 26.8 |
| 2019 | 18.0 | 16.1 | 32.8 |
| 2020 | 3.8 | –78.8 | 8.4 |
| 2021 | 0.157 | –95.9 | 0.4 |
| 2022 | 3.66 (est.) | +2236 (vs. 2021) | 8.7 (est.) |

*Source: General Statistics Office of Vietnam, VNAT Reports, 2023*

Although international arrivals dropped sharply due to global events (COVID-19), domestic tourism recovery has been robust. These data highlight the opportunity to reinvigorate tourism through sustainable and art-centered strategies that meet evolving demands for both environmental responsibility and innovative visitor experiences.

## IV. CONCLUSION

This study underscores how visual arts, enriched by emerging technologies like VR/AR, function as a catalyst for fostering green living habits and elevating environmental consciousness within the tourism sector. Integrating stakeholder perspectives reveals that art-based interventions contribute not only to visitor satisfaction and destination competitiveness but also to long-term sustainability goals—changing daily habits, mobilizing local communities, and offering a robust platform for environmental education.

Key findings from the mixed-methods analysis validate the proposed research model, in which strong visitor engagement and emotional resonance drive heightened environmental awareness and meaningful behavior change. Moreover, ANOVA and t-test results confirm significant differences in eco-consciousness and engagement among

different demographic segments and tourism settings, further illustrating the model's relevance across diverse contexts.

From a practical standpoint, the research highlights a pressing need for further investment in art infrastructure, managerial expertise in art-based tourism, and cross-sectoral collaborations that align cultural expression with eco-conscious principles. Local and international policymakers can harness these insights to design comprehensive guidelines that streamline funding, regulatory frameworks, and management strategies supportive of art-centered sustainable tourism. In Vietnam, incorporating visual arts into local planning documents, providing incentives for creative projects, and systematically monitoring environmental impacts can significantly amplify the transformative potential of these initiatives.

The managerial implications extend to developing "smart tourism" platforms that integrate real-time visitor data, AR/VR enhancements, and collaborative engagement with local stakeholders. By leveraging these tools, tourism planners and community leaders can optimize resource allocation, personalize visitor experiences, and strengthen environmental stewardship. This approach not only enhances the short-term appeal of tourist sites but also contributes to sustainable destination management in the long run.

Future Research Directions

– **Longitudinal Studies**: More in-depth, long-term studies are necessary to examine whether the behavioral changes prompted by art installations persist.

– **Technology Innovations**: Investigations into AI-driven art could reveal novel ways to broaden accessibility and enhance visitor engagement.

– **Comparative Analyses**: Cross-cultural studies contrasting Vietnam's experience with that of other Southeast Asian nations could enrich the global dialogue on art's role in promoting environmental responsibility.

In sum, visual arts are not mere decorative tools; they form powerful and versatile instruments in the mission toward sustainable tourism. By combining artistry, technological innovation, and strategic policy, Vietnam and other emerging markets can create visually compelling, eco-conscious travel experiences that leave enduring impacts on both local communities and international visitors.

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# RESEARCH ON THE IMPACT OF GREEN FINANCE ON SMALL AND MEDIUM-SIZED TOURISM BUSINESSES: THE INTERMEDIARY ROLE OF GREEN TECHNOLOGY AND INNOVATION

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**ABSTRACT**

This study investigates the impact of green finance (GF), green technology (GT), and innovation (IV) on the performance (TES) and competitiveness (CTI) of small- and medium-sized enterprises (SMEs) in Vietnam's tourism industry. Data were collected from 448 respondents through a survey questionnaire and analyzed using structural equation modelling. The analysis process involved testing the reliability, convergence, and divergence of the scales as well as evaluating the structural model to test the hypotheses. These results indicate that GF has a direct and positive effect on GT, IV, operational efficiency, and competitiveness. Furthermore, GT and i IV serve as significant intermediaries, reinforcing the relationship between GF and competitiveness. This study contributes a novel perspective by constructing an integrated model of GF, GT, IV, operational efficiency, and competitiveness, particularly in the context of tourism SMEs in Vietnam, a sector with substantial potential that faces numerous challenges related to sustainability and international competition. The research findings not only contribute to the theoretical foundation but also provide practical governance recommendations, such as promoting access to GF and investing in GT and IV to enhance competitiveness and sustainable development.

*Keywords*: "Small and medium-sized SMEs", "Sustainable development", "Green Finance – GF", Green Technology – GT", Innovation – IV", "Tourism Enterprise Efficiency – TES", "Vietnam's tourism industry

## I. INTRODUCTION

In the context of globalization and increasing environmental pressures, small- and medium-sized enterprises (SMEs) encounter challenges not only in maintaining operational efficiency, but also in their capacity to compete in the international market. The tourism industry, a significant sector of Vietnam's economy, must not only meet the escalating requirements of consumers, but also ensure adherence to sustainable criteria to adapt to current development trends. Thus, businesses seek innovative and environmentally sustainable solutions to maintain and enhance their competitive positions.

Green Finance is conceptualized as the mobilization of financial resources for sustainable projects, particularly environmentally sustainable economic activities. According to UNEP (2016), green finance encompasses financial products such as green bonds, green credits, and sustainable investment funds, which aim to support businesses in transforming their business models towards sustainability and minimizing negative environmental impacts. In the tourism industry, access to green finance plays a crucial role in investing in environmentally sustainable technology, developing green infrastructure, and improving resource-use efficiency (Zhang et al., 2021). Furthermore, Wang et al. (2022) demonstrate that tourism businesses with access to green finance often reduce operating costs, improve energy efficiency, and enhance competitiveness. However, the primary challenge for SMEs in the tourism industry is access to capital, owing to limitations in financial capacity, information, and stringent green finance standards (Nguyen & Pham, 2023).

Green Technology (GT) plays a significant role in minimizing the negative environmental impacts. According to the OECD (2017), green technology encompasses technical and technological solutions to optimize the use of natural resources, reduce greenhouse gas emissions, and improve operational efficiency. Hall et al. (2019) indicate that the application of green technology not only helps businesses comply with environmental policies but also enhances the experience of visitors and reduces operating costs. In the context of the increasing trend of sustainable tourism, the

application of green technology will confer a competitive advantage to businesses and create more favorable conditions for accessing green finance (Gössling & Scott, 2021).

Innovation (IV) is considered to be the primary driving force behind the development of SMEs in the tourism industry. According to Schumpeter (1934), innovation enables businesses to create new products, enhance operational processes, and improve service value, thus increasing their competitive advantage. In the tourism industry, innovation can be demonstrated through the application of digital technology, development of novel business models, and implementation of sustainable strategies to attract customers and optimize costs (Hjalager, 2010). Camison and Monfort-Mir (2012) indicated that tourism businesses that innovate in technology, business models, and marketing strategies tend to exhibit higher financial performance than traditional businesses. Notably, by combining innovation with green finance and technology, SMEs can utilize resources more effectively, enhance operational efficiency, and create sustainable value for customers (Bocken et al., 2014).

Consequently, green finance, technology, and innovation play crucial roles in the development of SMEs in the tourism industry. Green finance facilitates businesses' access to sustainable capital; green technology aids in reducing environmental impacts; and innovation serves as the key to enhancing competitiveness. Therefore, this study focuses on analyzing the relationship between green finance, green technology, innovation, and the performance of SMEs in the tourism industry. This study also aims to elucidate the intermediary role of green technology and innovation, contribute to the construction of a comprehensive theoretical model, and provide practical recommendations for businesses and policymakers.

## II. MATERIAL AND METHOD

### 2.1. Related concepts

**Green finance** is an innovative concept aligned with the financial industry's responsibility to address contemporary major challenges in a manner that ensures the creation of business and social value without environmental detriment (Thomson 2021). Green finance serves as a mechanism to increase the level of financial flows (banking, microcredit, insurance, and investment) from the public, private, and non-profit sectors to promote sustainable development priorities (Desalegn & Tangl, 2022). Consequently, green finance functions as an instrument for achieving development goals that consider green growth. Green finance also contributes to mitigating and building resilience to the adverse impacts of climate change. According to UNEP (2021), if the world aims to achieve its goals of climate change, biodiversity, and land degradation, it will require financing of $4.1 trillion by 2050.

**Green technology** refers to technologies developed with the objective of environmental protection and minimizing the negative impact of human activities on the ecosystem throughout production and use processes. Green technological solutions emphasize sustainability and address current needs without compromising the responsiveness of future generations. According to Zaid (2021), green technology has been extensively applied in fields such as energy, transportation, waste management, water and air purification.

**Green finance and technology are interrelated**; green finance provides the resources necessary for the development and deployment of green technologies. Conversely, the advancement of green technology can generate new investment opportunities, thereby promoting green finance. This synergy not only addresses environmental challenges, but also creates economic value for society (Thomson, 2021). Green finance and technology are critical factors for constructing a sustainable future (UNEP, 2021). Investing in green projects not only yields environmental benefits but also creates new economic opportunities, contributing to the sustainable development of society.

### 2.2. The context of GF affecting SMEs tourism enterprises in Vietnam

GF has emerged as a significant factor in promoting sustainable development of SMEs in Vietnam, particularly in the tourism industry, which is susceptible to environmental concerns. In the context of increasing demand to mitigate negative environmental impacts, GF not only provides capital for sustainable projects, but also assists businesses in enhancing their competitiveness through technological and innovative initiatives.

According to Chien et al. (2021), GF plays a crucial role in mitigating the financial barriers SMEs frequently encounter when implementing environmental projects. Specifically, for tourism businesses in Vietnam, access to GF facilitates the implementation of solutions to reduce emissions, utilize renewable energy, and improve resource

efficiency. Pu et al. (2021) emphasized that, in the context of the COVID-19 pandemic, GF has supported SMEs in improving their adaptability through investment in GT and innovative projects. Kumar et al. (2022) noted that the utilization of GF assists tourism businesses in optimizing operating costs and enhancing operational efficiency, which is particularly significant in the context of intense competition. GF promotes these businesses to establish a sustainable image, thereby attracting more customers and partners. Hu and Zhu (2023) further posited that, in the tourism industry in Vietnam, GF not only improves environmental performance but also enhances the competitiveness of businesses in the face of global market fluctuations.

Furthermore, as a key economic sector, the tourism industry in Vietnam is subject to considerable pressure from the international requirements for sustainable development. Sun et al. (2021) asserted that GF, in conjunction with GT, enables tourism businesses to not only meet international standards but also increase their competitive advantage in the global market. In conclusion, GF has established a robust financial foundation for SMEs in Vietnam's tourism industry, fostering sustainability and IV initiatives, thereby improving operational efficiency and competitiveness in an increasingly challenging business environment.

### 2.3. Research hypotheses

#### 2.3.1. Green finance

GF are defined as financial services that support sustainable economic practices, including investments, credit, insurance, and other financial instruments, to mitigate negative environmental impacts and promote climate protection initiatives. This encompasses efficient use of clean resources and technologies (Kumar et al. 2022). Zhang et al. (2021) further defined GF as a financial system that focuses on promoting sustainable investment, reducing environmental risks, and supporting projects for climate protection, energy conservation, and effective resource management. Additionally, the OECD (2017) emphasizes that GF is the integration of a traditional financial system with environmental objectives. It encompasses loans, equity investments, green bonds, and other financial products that are intended to finance projects or activities that benefit the environment. Pu et al. (2021) emphasized that innovative finance and technology adaptation play a crucial role in supporting the sustainability of SMEs through support from GF, particularly in challenging situations such as the COVID-19 pandemic. GF facilitates investment in clean technologies to minimize negative environmental impacts. Similarly, Kumar et al. (2022) assert that GF plays an essential role in promoting the development and application of green technologies, especially in textile and leather SMEs in Pakistan. According to Chien et al. (2021), GF not only helps reduce environmental barriers but also encourages IV through the provision of long-term capital and specialized financial solutions. Sun et al. (2021) demonstrated that GF supports the dissemination of advanced technology, thereby promoting IV in the tourism and hospitality industry in China. Kumar et al. (2024) also emphasized that GF contributes to improving the operational efficiency of tourism businesses through financing sustainable projects and energy optimization. Moreover, Hu and Zhu (2023) argued that GF not only improves environmental efficiency but also enhances the productivity and competitiveness of businesses in the tourism industry during the pandemic. Chien et al. (2021) and Kumar et al. (2024) both concur that GF helps SMEs reduce energy costs, improve operational efficiency, and build a sustainable image. Based on these studies, we propose the following hypotheses:

*H1: GF has a positive effect on GT.*

*H2: GF demonstrates a positive impact on IV*

*H3: GF exerts a positive effect on the performance of SMEs (TES)*

*H4: GF influences the competitiveness of SMEs (CTI)*

#### 2.3.2. Green Technology (GT)

Sun et al. (2021) define green technologies as technologies designed to mitigate environmental impact through the utilization of clean energy sources, resource recycling, and enhancement of energy efficiency. These technologies play a crucial role in the sustainable development of tourism and hospitality industries. According to a study by Kumar et al. (2024), GT encompasses technologies and methodologies that contribute to reducing the negative environmental impact of business operations, particularly in environmentally sensitive industries such as tourism. Hu and Zhu (2023) emphasized that GT is not solely an environmental protection solution, but also a factor that promotes innovation and

competitiveness of enterprises in the context of globalization and increasing environmental challenges. Sun et al. (2021) assert that the adoption and dissemination of GT not only improves environmental efficiency but also promotes innovation, especially in technology-dependent industries such as tourism and hospitality. GT is considered a catalyst for businesses to develop innovative solutions to achieve their sustainability goals. Similarly, Pu et al. (2021) argue that adaptation to modern technology, particularly GT, can enhance innovation capacity through the establishment of financial and supporting technology platforms. Kumar et al. (2022) further posit that the adoption of GT enables businesses to improve operational efficiency by optimizing resources and reducing environment-related costs, as evidenced by a study of textile and leather SMEs in Pakistan. Moreover, Hu and Zhu (2023) affirmed that GT improves the operational efficiency of tourism businesses by addressing the growing demand for minimizing environmental impact. Chien et al. (2021) emphasize the role of GT in enhancing the competitiveness of SMEs through reducing energy costs and building a sustainable corporate image, thereby attracting customers and business partners. Finally, Kumar et al. (2024) argue that GT not only provides a competitive advantage but also becomes an essential factor in enabling tourism SMEs to maintain and strengthen their position in the international market. Therefore, hypotheses H5, H6, and H7 were proposed.

*H5: GT has a positive impact on IV of tourism SMEs*

*H6: GT has a positive impact on the efficiency of tourism SMEs (TES)*

*H7: GT has a positive impact on the competitiveness of tourism SMEs (CTI)*

**2.3.3. Innovation (IV)**

According to a study by Sun et al. (2021), IV plays a crucial role in promoting sustainable development, particularly when organizations implement novel technologies and concepts to mitigate environmental impacts and enhance operational efficiency. Chien et al. (2021) define IV as the capacity of enterprises to transform ideas into practical solutions that benefit businesses, consumers, and society. This is especially significant in SMEs, where IV facilitates overcoming business and environmental obstacles. Pu et al. (2021) emphasized that IV is the outcome of applying modern technology and finance, enabling businesses to develop distinctive products and services, thereby enhancing their efficiency and competitive position. Pu et al. (2021) assert that IV plays a pivotal role in improving the sustainability and operational efficiency of SMEs. Research indicates that organizations adopting innovative ideas and processes can optimize resources and enhance performance, particularly in challenging contexts such as the COVID-19 pandemic. Concurring with this perspective, Chien et al. (2021) emphasize that IV assists SMEs in overcoming business barriers by applying novel solutions, thereby improving operational efficiency and minimizing costs. In the tourism and hospitality industry, Sun et al. (2021) posited that IV supports businesses in enhancing operational efficiency by upgrading products and services to better meet market demand. Kumar et al. (2024) stated that IV is a strategic factor that enables SMEs to improve their competitiveness. Innovative enterprises frequently offer products and services that are unique and differentiated and attract consumers. Furthermore, Chien et al. (2021) emphasized that IV not only optimizes processes but also cultivates a professional and sustainable corporate image, thereby enhancing competitiveness. Hu and Zhu (2023) also noted that in sensitive industries such as tourism, IV not only enhances adaptability to challenges but also creates a long-term competitive advantage. Therefore, we propose the following hypotheses:

*H8: IV has a positive impact on the efficiency of tourism SMEs (TES)*

*H9: IV has a positive impact on the competitiveness of tourism SMEs (CTI)*

**2.3.4. Small- and medium-sized business efficiencies**

Enterprises' operational efficiency is a core factor in improving competitiveness. Pu et al. (2021) asserted that when SMEs achieve high operational performance, they can optimize resources, increase productivity, and create additional value, thereby enhancing their competitiveness in the market. Concurring with this perspective, Chien et al. (2021) emphasized that the superior performance of SMEs in the tourism industry contributes to improved product and service quality, fostering customer trust and enhancing their competitive position. Hu and Zhu (2023) further affirmed that, in the tourism industry, operational efficiency not only minimizes costs but also facilitates flexibility in responding to market fluctuations, directly contributing to improved competitiveness. Sun et al. (2021) emphasize that business

efficiency supports process and service improvements, enabling businesses to create a distinctive advantage in the highly competitive environment of the tourism and hospitality industry. Therefore, we propose the following hypotheses:

*H10: The efficiency of tourism SMEs (TES) has a positive impact on the competitiveness of tourism SMEs (CTI)*

**2.3.5. The intermediary role of Green finance (GF) and Innovation (IV)**

GF enables businesses to invest in GT through loans, financial support, and environment-friendly financial products (Kumar et al. 2022). In turn, GT assists businesses in reducing energy costs, improving operational efficiency, and enhancing corporate image, thereby augmenting competitiveness (Sun et al., 2021). Hu and Zhu (2023) affirmed that GF support encourages the adoption of advanced technologies, contributing to improved enterprise competitiveness in the context of a volatile business environment. Chien et al. (2021) emphasized that GT not only aids businesses in achieving sustainability goals but also enhances their ability to meet market requirements, contributing to competitiveness.

GF plays a significant role in providing financial resources while simultaneously encouraging businesses to develop innovative solutions to enhance operational efficiency and minimize negative environmental impacts (Pu et al., 2021). IV not only enables businesses to create unique products and services but also optimizes operational processes, providing a competitive advantage in the market (Kumar et al., 2024). Sun et al. (2021) and Hu and Zhu (2023) emphasized that, in the tourism industry, IV is a key factor in helping businesses improve their adaptability and flexibility to market fluctuations, thereby enhancing competitiveness. Chien et al. (2021) also noted that IV driven by financial support not only improve operational performance but also help businesses strengthen their position in a highly competitive environment. Therefore, we propose the following hypotheses:

*H11. GT plays an intermediary role between GF and the CTI*

*H12: IV plays an intermediary role between GF and CTI*

**2.4. Proposed research model**

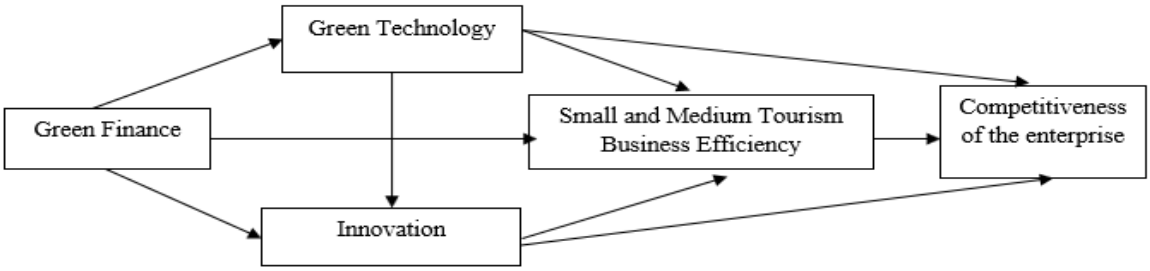



**Fig.1. Proposed research model**

## III. RESEARCH METHODS

This study employs a quantitative methodology utilizing a linear structure model (SEM) to investigate the relationship between green finance (GF), green technology (GT), innovation (IV), operational efficiency (TES), and competitiveness (CTI) of small and medium-sized enterprises in the tourism industry in Vietnam. The research process was conducted in specific stages: (1) Constructing a research model and hypothesis: The study identified the primary variables and their interrelationships based on previous studies; (2) survey design: the questionnaire was developed based on scales that have been validated in previous studies (Chien et al., 2021; Kumar et al., 2024; Sun et al., 2021) and adapted to the Vietnamese context. The scale utilizes a 5-point Likert scale, with 1 representing "completely disagree" and 5 for "completely agree"; (3) Sample selection: The convenience sampling method is applied to collect data from small and medium-sized enterprises operating in the tourism industry, including the travel industry, hotels, and related tourism services. The minimum sample size was determined according to Hair et al. (2017), which required at least 200 observations.

Data were collected through in-person and online surveys, from October to November 2024. Following data collection, the data were cleaned to eliminate invalid responses and were analyzed using SmartPLS 3.0. The SEM method was selected because of its capacity to simultaneously assess multiple relationships between potential variables

(Bagozzi & Yi, 2012) and to facilitate testing the mediating impact of green technology (GT) and innovation (IV) on the relationship between green finance (GF) and competitiveness (CTI). This method is consistent with studies in the field of management and finance that measure abstract concepts (Hair et al., 2019).

The reliability and validity evaluation process of the scale comprised the following steps: reliability assessment using Cronbach's alpha coefficient (>0.7) and composite reliability (CR > 0.7) to ensure internal consistency (Hair et al., 2019). Convergent validity was examined using average variance extracted (AVE > 0.5), and discriminant validity was examined using Fornell-Larcker and Heterotrait-Monotrait criteria (HTMT < 0.85) to confirm the discriminant scales (Fornell & Larcker, 1981). To ensure the validity and reliability of the collected data, we conducted tests such as Common Method Bias (CMB) testing using Variance Inflation Factor (VIF) testing, with a VIF value of < 5, to ensure that there was no excessive correlation between the observed variables (Kock, 2015). Data conformity testing using SEM was conducted by testing data distribution, multicollinearity, and outlier values to confirm that the data met the conditions of the SEM model. These validations play a crucial role in ensuring the reliability of the data and accuracy of the research results, establishing a robust foundation for subsequent analyses

## IV. RESULT AND DISCUSSION

### 4.1. Study sample and descriptive statistical results

Over a two-month period, from the beginning of July to the end of August 2024, 450 questionnaires were distributed to SMEs in Vietnam's tourism industry. The survey participants were companies operating in the fields of travel, accommodation, and related tourism services, with employees or managers directly involved in innovative activities, GF, and GT. The survey questions focused on aspects such as GF utilization, GT implementation, IV, operational efficiency, and business competitiveness.

To ensure the quality of the collected data, the questionnaire was designed using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) and pilot-tested on a small group of businesses to assess its comprehensibility and practical applicability. Consequently, 448 valid responses were collected with a response rate of 99.5%. Responses that were incomplete or did not meet the specified criteria were excluded from analysis. With a minimum sample size exceeding 200, the collected data ensured reliability and suitability for SEM analyses (Hair et al., 2021). The research sample was obtained from businesses in major urban centers such as Hanoi, Da Nang, and Ho Chi Minh City, where the tourism industry is prominent. The participants were evenly distributed among the following industry groups: travel (30%), accommodation (40%), and related tourism services (30%).

The results of the demographic analysis revealed the following: gender distribution: 60% male and 40% female; educational attainment: 85% had a university degree or higher; age distribution: 78% fell within the 25-45 year age group; and work experience: 70% had five years or more of experience in the tourism industry. These data indicate that the research sample adequately and accurately reflects the characteristics of SMEs in Vietnam's tourism industry, ensuring representativeness and relevance to the research objectives.

### 4.2. Common Method Variance Bias Test (CMB)

The researcher examined variance inflation factor (VIF) values, as recommended by Kock (2015). The VIF values reported for the structures ranged from 1 to 1,661 (Table 1), which is substantially below the recommended threshold of 5, thus confirming the absence of common method bias (CMB).

**Table 1. Inner VIF Value**

| | CTI | GF | GT | IV | TESTS |
|---|---|---|---|---|---|
| **GT** | 0.323 | | | 0.356 | 0.383 |
| **GF** | | | 0.527 | 0.329 | 0.220 |
| **CTI** | | | | | |
| **IV** | 0.245 | | | | 0.374 |
| **TESTS** | 0.188 | | | | |

**Notes:** *Green technology – GT; Green finance – GF; Innovation – IV; Tourism efficiency of SMEs – TES; Competitiveness of the tourism industry - CTI*

*Source: Extracted from PLS*

### 4.3. Completion of scale evaluation

A partial least squares structure equation model (PLSSEM) was used to analyze the data. The factor load values (Table 2) were examined to assess the convergence reliability. All factor load values exceeded the recommended threshold of 0.7 (Hair et al. 2019). Furthermore, the Cronbach Alpha values were all above the minimum threshold of 0.7 and · 0.95 (Hair et al., 2019), confirming the internal consistency reliability of the structures (Table 3). These findings indicate that the model demonstrates high reliability and can be applied to subsequent analyses.

**Table 2. Factor Load Factor**

| Element | Factor | Factor loading | VIF |
|---|---|---|---|
| **Green finance – GF** | GF1 | 0.789 | 1,920 |
| | GF2 | 0.748 | 1.781 |
| | GF3 | 0.801 | 2.467 |
| | GF4 | 0.774 | 2.437 |
| | GF5 | 0.746 | 1.602 |
| **Green technology – GT** | GT1 | 0.817 | 1.556 |
| | GT2 | 0.850 | 1.796 |
| | GT3 | 0.857 | 1.753 |
| **Innovation – IV** | IV1 | 0.812 | 1.695 |
| | IV2 | 0.830 | 1.837 |
| | IV3 | 0.785 | 1.675 |
| | IV4 | 0.805 | 1.792 |
| **Tourism efficiency of SMEs – TES** | TES1 | 0.786 | 1.803 |
| | TES2 | 0.830 | 1.969 |
| | TES3 | 0.850 | 2.034 |
| | TES4 | 0.838 | 1.896 |
| **Competitiveness of the tourism industry – CTI** | CTI1 | 0.839 | 1.475 |
| | CTI2 | 0.756 | 1.346 |
| | CTI3 | 0.791 | 1.379 |

*Source: Extracted from PLS*

The scale test table shows that all the loading factors are greater than 0.7, proving that the observed variables have a strong correlation with the latent variable. Cronbach's Alpha and the Composite Reliability (CR) of the scales were both above 0.7, confirming the reliability of the scale. The median extract variance (AVE) all exceeded the threshold of 0.5, indicating that the scales had good convergence, reflecting the good interpretation of potential variables. Overall, the results of the confirmatory factor analysis showed that the scales have high reliability and good convergence, meet the requirements of quantitative research, and can be used for further research.

**Table 3. Reliability and value**

| | CA | CR | AVE | CTI | GF | GT | IV | TES |
|---|---|---|---|---|---|---|---|---|
| **GT** | 0.711 | 0.838 | 0.634 | 0.796 | | | | |
| **GF** | 0.831 | 0.880 | 0.596 | 0.645 | 0.772 | | | |
| **CTI** | 0.794 | 0.879 | 0.708 | 0.584 | 0.527 | 0.841 | | |
| **IV** | 0.823 | 0.883 | 0.653 | 0.546 | 0.517 | 0.530 | 0.808 | |
| **TES** | 0.846 | 0.896 | 0.683 | 0.582 | 0.615 | 0.697 | 0.690 | 0.826 |

**Note**: *CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted*

*Source: Extracted from PLS*

### 4.4. Structural model

**Table 4. Impact Relationship Assessment**

| H | Relationship | Original Sample (O) | STDEV | t Statistics | P- Values |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| H1 | GF → GT | 0.527 | 0.074 | 11.126 | 0,000 |
| H2 | GF → IV | 0.517 | 0.051 | 10.143 | 0,000 |
| H3 | GF → TES | 0.615 | 0.035 | 17.685 | 0,000 |
| H4 | GF → CTI | 0.412 | 0.040 | 10.390 | 0,000 |
| H5 | GT → IV | 0.356 | 0.053 | 6.678 | 0,000 |
| H6 | GT → TES | 0.517 | 0.040 | 12.889 | 0,000 |
| H7 | GT → CTI | 0.508 | 0.049 | 10.380 | 0,000 |
| H8 | IV → TEST | 0.374 | 0.044 | 8.528 | 0,000 |
| H9 | IV → CTI | 0.315 | 0.066 | 4.769 | 0,000 |
| H10 | CTI → TES | 0.188 | 0.067 | 2.810 | 0,005 |
| H11 | GF → GT → CTI | 0.374 | 0.044 | 8.528 | 0.000 |
| H12 | GF → GF → CTI | 0.188 | 0.067 | 2.810 | 0.005 |

**Notes:** *Green technology – GT; Green finance – GF; Innovation – IV; Tourism efficiency of SMEs – TES; Competitiveness of the tourism industry - CTI*

*Source: Extracted from PLS*

The results of linear structure model (SEM) analysis demonstrated that all hypotheses from H1 to H10 exhibited high statistical significance ($p < 0.001$ or $p < 0.005$), confirming the positive relationship between the variables in the study model. Specifically, green finance (GF) exhibited a significant impact on green technology (GT) ($\beta = 0.527$, $t = 11.126$, $p = 0.000$) and innovation (IV) ($\beta = 0.517$, $t = 10.143$, $p = 0.000$), indicating that access to green finance facilitates SMEs' promotion of green technology adoption and innovation initiatives in business operations. Furthermore, green finance (GF) demonstrated a strong influence on enterprise performance (TES) ($\beta = 0.615$, $t = 17,685$, $p = 0.000$) and competitiveness (CTI) ($\beta = 0.412$, $t = 10,390$, $p = 0.000$), indicating that the mobilization and utilization of green capital not only optimizes operations but also enhances the competitiveness of enterprises in the market. Green technology (GT) also exhibited a significant impact on innovation (IV) ($\beta = 0.356$, $t = 6.678$, $p = 0.000$), enterprise performance (TES) ($\beta = 0.517$, $t = 12.889$, $p = 0.000$), and competitiveness (CTI) ($\beta = 0.508$, $t = 10.380$, $p = 0.000$). This indicates that the application of green technology not only improves operational efficiency but also enhances the competitive advantage of businesses. Moreover, innovation (IV) demonstrated a positive effect on enterprise performance (TES) ($\beta = 0.374$, $t = 8.528$, $p = 0.000$) and competitiveness (CTI) ($\beta = 0.315$, $t = 4.769$, $p = 0.000$), emphasizing the critical role of innovation in improving enterprises' operational efficiency and market position. Finally, enterprise performance (TES) exhibited a significant impact on competitiveness (CTI) ($\beta = 0.188$, $t = 2.810$, $p = 0.005$), indicating that enterprises with superior operational performance demonstrate higher competitiveness. The two indirect relationships (H11 and H12) also revealed a close connection between green finance, green technology, and competitiveness, with impact coefficient ($\beta$) values of 0.374 and 0.188, respectively.In summary, the analysis results affirm that green finance plays a central role in promoting green technology and innovation, thereby improving operational performance and enhancing the competitiveness of small and medium-sized enterprises in the tourism industry. The intermediate impacts of green technology and innovation were also confirmed, underscoring the importance of these factors in sustainable development strategies.

## V. CONCLUSION

### 5.1. Conclusion

This study elucidates the roles of GF, GT, and IV in enhancing the operational efficiency (TES) and competitiveness (CTI) of SMEs in the Vietnamese tourism industry. The findings indicate that GF not only exerts a direct and positive influence on GT, IV, operational efficiency, and competitiveness but also operates through the mediating roles of GT and IV. These mediators strengthen the relationship between green financing and business competitiveness. These findings are consistent with those of previous studies. Pu et al. (2021) demonstrate that GF promotes IV and improves the performance of SMEs in the context of crises such as the COVID-19 pandemic. Similarly, Chien et al. (2021) and Kumar et al. (2024) emphasized that GF not only enhances operational efficiency, but also augments competitiveness by supporting GT and IV initiatives. Sun et al. (2021) have also elucidated the role of

GT in optimizing processes and enhancing competitiveness in the tourism and hospitality industry. However, this study contributes novel insights by highlighting the significant mediating role of GT and IV, an aspect that has not been elucidated in previous studies, such as those by Kumar et al. (2022) and Hu and Zhu (2023). The results demonstrate that these mediating factors not only enhance the efficacy of GF, but also directly improve enterprises' competitiveness. This study developed a comprehensive model that integrates GF, GT, IV, operational efficiency, and competitiveness. This model provides a more holistic and in-depth perspective, focusing on SMEs in the tourism industry in Vietnam, a sector with substantial growth potential that faces numerous challenges related to sustainable development and international competition.

### 5.2. Administrative implications

***First, to strengthen access to GF,*** SMEs should proactively seek and utilize GF sources from financial institutions and support funds to invest in environmentally friendly projects, implement green technologies, and foster IV. To achieve this, businesses should develop a comprehensive business plan aligned with their development goals to persuade investors and GF partners. Furthermore, the government and financial institutions need to implement specific support policies, such as reducing interest rates and providing credit incentives for projects utilizing renewable energy, clean technology, and environmental protection. Concurrently, it is necessary to enhance communication to increase SMEs' awareness of the benefits and conditions of accessing GF, thus enabling businesses to comprehend the value and potential of applying GF for sustainable development.

***Second, Substantial investment in green technology (GT):*** businesses should prioritize investment in GT to optimize production processes, reduce energy costs, and enhance operational efficiency. This approach not only yields economic benefits but also contributes to improving the organization's image, thereby increasing trust from customers and partners. In addition, businesses should actively participate in programs and seminars on GT to acquire knowledge, understand new trends, and improve their technological capabilities. The government should provide financial support for GT research and application activities through investment funds and Technology IV incentive programs specifically tailored to SMEs. Moreover, it is essential to strengthen environmental protection policies and establish clear requirements for businesses to apply GT to minimize negative environmental impacts and promote sustainable development.

***Third, Promoting Innovation (IV):*** Organizations should prioritize the development of novel products and services to address customer needs more effectively, particularly in the context of intense competition in the tourism industry. It is essential to cultivate a culture of creativity within an organization by encouraging employees to propose innovative ideas and implement modern technology in operational processes. Furthermore, governmental bodies and supporting organizations should provide comprehensive training programs and in-depth support for IV in SMEs. The establishment of centers that support IV in the tourism industry, with a focus on product improvement and the enhancement of customer experience, is recommended.

***Fourth, Improve operational efficiency (TES):*** Organizations should leverage GF and GT to optimize processes, thereby minimizing costs and improving labor productivity. The utilization of Key Performance Indicators (KPIs) to measure and align business strategies is crucial to ensure the achievement of performance goals. It is necessary to develop policies that encourage businesses to apply advanced operational efficiency management tools such as digitalization and automation in the tourism industry.

***Fifth, Enhancing Competitiveness (CTI):*** GF, GT, and IV should be integrated to develop unique products and services that facilitate market differentiation. The promotion of a sustainable marketing strategy, emphasizing the organization's efforts in environmental protection and IV, is essential to attract customers and partners. Concurrently, increased investment in green infrastructure and support for businesses in the tourism industry to access resources and sustainable development networks are recommended. Establishing standards and regulations to support businesses in achieving sustainability certifications is crucial for enhancing competitiveness in international markets.

***Sixth, collaboration and experience sharing are encouraged.*** It is imperative to strengthen cooperation among businesses in the industry to share experiences in the application of GF, GT, and IV. It is advisable to form industry alliances in order to implement large-scale projects on green and sustainable technologies. Establishing connecting

platforms to promote cooperation among businesses, financial institutions, and GT providers is recommended. The organization of national and international forums is necessary to provide SMEs with opportunities to learn from successful businesses in sustainable development.

These implications not only contribute to the improvement of operational efficiency and competitiveness for businesses but also foster the sustainable development of the tourism industry in Vietnam.

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# UNDERSTANDING INTERNATIONAL GUESTS' DECISION TO STAY AT GREEN HOTELS IN VIETNAM

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**ABSTRACT**

Global tourism has increasingly embraced sustainability, driven by the need to reduce environmental and community impacts, heightened awareness, and the growing demand for responsible travel options. This study aims to deepen the understanding of hotel guests' environmentally conscious behaviors by integrating the theory of planned behavior with the value-belief-norm theory of environmentalism into a unified framework. It offers insights into how guests make decisions regarding their intentions to stay at green hotels. The research comprises two phases: a qualitative study involving in-depth discussions with 10 experts to refine the scales, and a quantitative study surveying 550 international tourists staying at green hotels in Vietnam in 2024 to evaluate the theoretical model. The findings suggest that: (1) green attitudes, moral obligation, environmental concerns, egoistic values, biospheric values, and altruistic values are key factors influencing guests' intentions to stay; (2) guests' intentions significantly impact their final decision; and (3) green attitudes mediate the relationship between value components and guests' intentions to stay at green hotels. This study contributes to the growing body of literature on sustainable tourism by providing valuable insights into the factors that influence guests' decision in staying at green hotels, particularly within the context of Vietnam.

*Keywords:* "Environmentalism", "green hotel", "sustainable tourism".

## I. INTRODUCTION

In the Sustainable Travel Report (2023) which surveyed over 33,000 travelers worldwide, Booking.com found that a significant majority of travelers are seeking more sustainable ways to travel, with approximately 76% of respondents expressing a desire to travel sustainably in the next 12 months. Sustainability has thus become a central focus across various industries, including hospitality (Shen et al., 2020). The growing emphasis on sustainable development principles, combined with increasing pressure from media, governments, and consumers, is motivating many hotels to adopt environmentally friendly practices (Kapera, 2018).

Research has shown that the rapid expansion of the hotel sector significantly contributes to global environmental degradation, primarily due to high energy and water consumption for heating, cooling, and lighting, which adversely affects the environment. It is clear that failing to integrate sustainability and resource conservation into business strategies will threaten the industry's long-term viability, as environmental pollution undermines the foundation for future growth (Sarkar, 2013). Consequently, some hotels have proactively implemented environmental policies aimed at promoting conservation and enhancing human well-being (Abdel-Maksoud et al., 2016). The hotel industry has introduced a variety of sustainability initiatives, such as acquiring eco-label certifications, adopting sustainable business practices, and implementing environmental management systems (Leroux & Pupion, 2018). Hotels that implement sustainable initiatives gain two main benefits: improved resource efficiency and cost savings in energy and water usage, and positioning themselves as attractive options for eco-conscious travelers (Fukey & Issac, 2014).

Green hotels are environmentally friendly establishments where managers actively implement programs to conserve water and energy, reduce waste, and save costs, while also contributing to environmental protection (Verma & Chandra, 2016). One notable approach in this direction is green hotel practices, which aim to minimize environmental impact by conserving energy (e.g., installing energy-efficient appliances and utilizing renewable energy solutions), reducing water consumption (e.g., adopting water-efficient fixtures and linen/towel reuse programs), and managing waste effectively (e.g., implementing recycling initiatives and replacing single-use items with durable alternatives) (Singh et al., 2024; Taghipour et al., 2024). Eco-certifications are official labels awarded to businesses or products that meet environmental and sustainability standards, emphasizing efforts in energy conservation, waste management, and

resource conservation. In the hospitality industry, these certifications are given to hotels and resorts that adopt eco-friendly practices, and these hotels can be referred to as green hotels. Several accommodations in Vietnam have earned notable eco-certifications, including The Anam and Six Senses Con Dao (Green Globe), Hotel Nikko Saigon, InterContinental Danang Sun Peninsula Resort, and Mia Resort Nha Trang (Green Key), La Veranda Resort Phu Quoc (EarthCheck), and Rex Hotel and Vinpearl Resort & Spa Nha Trang (ISO 14001). The concept of green hotels has recently gained significant attention in research (e.g., Nguyen et al., 2017; Trang et al., 2019; Thai & Nguyen, 2022; Hien et al., 2023; Van Huy et al., 2024). However, many aspects remain unexplored, such as the key factors that influence tourists, especially international guests, in choosing a green hotel as their place of stay while traveling to Vietnam.

This study integrates the theory of planned behavior (TPB) with the value-belief-norm (VBN) theory of environmentalism to provide comprehensive insights into guests' decision-making regarding their intentions to stay at green hotels. The research was conducted in two phases: a qualitative study involving in-depth discussions with 10 tourism experts to refine the scales, followed by a quantitative phase evaluating the theoretical model with data from 550 international tourists who stayed at green hotels in Vietnam in 2024. This study contributes to the growing literature on sustainable tourism by offering valuable insights into the factors influencing guests' behavior when staying at green hotels, particularly in the context of Vietnam. The research findings also serve as a reference for green marketing managers in building a hotel brand that meets sustainable tourism standards.

## II. MATERIAL AND METHOD

### 2.1. Literature review

Environmentalism is defined as the tendency to engage in actions that reflect pro-environmental intent (Stern, 2000), including environmentally relevant actions, environmentally friendly actions, environmentally significant actions, and green actions (Canlas et al., 2022). In the hospitality industry, environmentalism involves adopting sustainable practices to reduce environmental impact. As major contributors to energy use, water consumption, and waste, hotels and resorts face growing pressure from consumers and regulators to become more eco-friendly. Several sustainability measurement frameworks for hotels have been developed, offering structured approaches, models, or systems tailored to the unique characteristics and practices of green hotels (e.g., Hussain et al., 2019; Bagheri et al., 2020; Abdalla Eltoum et al., 2024). These frameworks guide the implementation of sustainable practices in hotel management, focusing on areas like energy efficiency, water conservation, waste management, and sustainable sourcing. By incorporating standards, certifications, and strategies, they help hotels achieve eco-friendly operations, meet environmental goals, and enhance guest experiences while reducing their ecological impact. Examples include green building certifications (Wei et al., 2020), sustainability ratings (Bianco et al., 2023), and eco-labeling programs (Yılmaz et al., 2019) designed specifically for the hospitality industry.

In research, the TPB (Ajzen & Fishbein, 1980) not only predicts behaviors based on attitudes but also explains the process linking them. This theory suggests that behavioral intentions are the most direct predictors of behavior, and these intentions are influenced by three key factors: (a) individuals' attitudes toward the behavior, (b) their perceptions of social norms and conventions (subjective norms), and (c) the degree to which they perceive the behavior to be under their personal control (perceived behavioral control). The TPB has been widely used to study pro-environmental behaviors, with several recent studies confirming its effectiveness in predicting green behaviors (e.g., De Leeuw et al., 2015; Yuriev et al., 2020; Correia et al., 2022). Meanwhile, Stern et al. (1999) proposed a behavioral theory that effectively identifies the antecedents and dimensions of pro-environmental behavior. According to Stern et al. (1999), individuals who align with a movement's core values, perceive that valued objects are under threat, and believe their actions can restore those values develop a sense of obligation for pro-environmental action. This sense of obligation drives them to provide support, with the specific type of support depending on their capabilities and constraints. Stern later refined this theory by categorizing environmentally significant behaviors into four types: environmental activism, non-activist public sphere behaviors, private sphere environmentalism, and other environmentally significant actions (e.g., influencing organizational practices). The VBN theory of environmentalism (Stern, 2000) has since been commonly used as a foundational framework for scholars examining pro-environmental behavior. It has been instrumental in modeling, explaining, predicting, and describing the antecedents of pro-environmental behavior, as well

as determining the continuum of such behaviors.

**2.2 Research model**

Integrating the TPB with the VBN theory of environmentalism, this study proposes a theoretical model outlining key factors that positively influence guests' intentions to stay at green hotels, ultimately affecting their final decision. These factors include green attitudes, moral obligation, environmental concerns, egoistic values, biospheric values, and altruistic values. Green attitudes (attitudes toward the behavior), moral obligation (subjective norms), and environmental concerns (perceived behavioral control) align with the TPB. Egoistic values, biospheric values, and altruistic values, as components of value orientations or value systems, align with the VBN theory of environmentalism. These values reflect individuals' motivations and priorities in decision-making, particularly regarding environmental behavior and sustainability. They are frequently explored in studies on pro-environmental behavior, social responsibility, and ethical decision-making.

First, attitudes toward green hotels play a significant role in predicting guests' intentions to stay at such establishments. Numerous studies have confirmed a strong positive correlation between attitude, intention, and behavior (Wang, 2022). Accordingly, hotel guests' attitudes, habits and perceived behavioural control influence their purchase intentions towards an eco-friendly hotel (Tavitiyaman et al., 2024). Wang et al. (2024) found that implicit and explicit attitudes, personal norms, and perceived behavioral control positively influence intention. Van Huy et al. (2024) highlight the importance of providing tourists with environmental information through social media platforms, which enhances green attitudes and intentions to stay at green hotels. Attitude has also been recognized as a critical determinant of green purchase intentions and behaviors in numerous contexts (e.g., Lim et al., 2019; Costa et al., 2021; Shehawy & Khan, 2024). This aligns with the theory of planned behavior, which identifies attitude as a key determinant of behavior. Therefore, the following hypothesis is proposed: ***(H1) Green attitudes positively influence guests' intentions to stay at green hotels.***

Second, Sia & Jose (2019) highlight the significance of personal moral obligation in the choice of eco-friendly houses, noting that moral obligation mediates the relationship between both attitude and subjective norm with the intentions to build such houses. Similarly, moral obligation, green self-identity, environmental concern, and social pressure are positively associated with green purchase intentions (Sun et al., 2022). Annamdevula et al. (2022) emphasize the role of moral obligation in promoting youth's higher intentions for waste recycling and actual recycling behavior. Moreover, moral obligation influences the relationship between green consumption values and behavioral intentions (Chae et al., 2024). Addressing why environmental concern does not always translate into green purchase intention, Kumar (2024) demonstrates that the effect of environmental concern is mediated through attitude and ethical obligation. Therefore, the following hypothesis is proposed: ***(H2) Moral obligation positively influences guests' intentions to stay at green hotels.***

Third, the empirical results by Wang et al. (2018) show that environmental concern has positive effects on the attitude and the intention of consumers to visit green hotels in China. Suhartanto et al. (2023) indicated that environmental concern is the most influential factor affecting consumers' attitudes and behavioral intentions, both directly and indirectly. As young Muslims' concern for the environment increases, their attitudes toward environmental issues improve, motivating them to purchase and promote green plastic products. Environmental concern indirectly influences the intentions to purchase organic food (Xu et al., 2024). Investigating carriers' intentions to switch to green vehicles for last-mile delivery in an emerging market, (Le, 2024) found that environmental concerns and attitudes significantly influenced their intentions to adopt green vehicles. Waste reduction behavior is significantly influenced by waste reduction intentions, which, in turn, is strongly impacted by environmental concern, climate change concern, and healthy environmental norms among young coastal tourists in Bangladesh (Hasan & Aziz, 2024). Therefore, the following hypothesis is proposed: ***(H3) Environmental concerns positively influence guests' intentions to stay at green hotels.***

Fourth, according to Sony & Ferguson (2017), Thai consumers' green lifestyle behavior is primarily driven by their egoistic and social-altruistic values. Dong & Gao (2024) found that egoistic values significantly predict behavioral intentions in the context of organic wine purchases. Waris et al. (2024) discovered that egoistic values have the greatest

impact on pro-environmental beliefs and environmentally responsible behavior, ultimately influencing the intentions to visit green hotels. In particular, Jebarajakirthy et al. (2024) indicated that psychological factors based on the VBN theory of environmentalism and the theory of planned behavior mediate the effects of altruistic, biospheric, and egoistic values on green purchase intention. Therefore, the following hypothesis is proposed: ***(H4) Egoistic values positively influence guests' intentions to stay at green hotels.***

Fifth, biospheric values are positively associated with eco-socially conscious consumer behaviors (Saleem et al., 2018). In the study by Mukherjee & Chandra (2022), biospheric values are identified as a direct and important antecedent of environmental concern, which in turn are influential predictors of environmental intentions. Chen & Lee (2022) highlighted that biospheric values have a positive indirect influence on the psychological benefits of supporting green activities and utilitarian environmental benefits. According to Stadlthanner et al. (2022), biospheric values moderate the relationship between gain-framed messages and cause involvement. Cause involvement, in turn, enhances consumer attitudes, which positively influence consumers' behavioral intentions. Therefore, the following hypothesis is proposed: ***(H5) Biospheric values positively influence guests' intentions to stay at green hotels.***

Sixth, consumers' altruistic values tend to positively influence their personal norms, environmental attitudes, and subjective norms, while also mitigating perceived barriers related to the purchase of energy-efficient appliances (Nguyen et al., 2017). Biospheric and altruistic values have been found to positively influence attitudes, which in turn shape intentions toward selecting green hotels (Wang et al., 2020). Altruistic values are one of the key factors that positively influence tourists' intention to stay in green hotels (Patwary et al., 2022). Javed et al. (2024) identified a direct and positive relationship between green brand image and consumer purchase intentions, emphasizing the need for marketers in the clothing and textile industry to strategically promote altruistic values in their sustainability efforts within the Chinese context. Additionally, the meta-analysis by Jebarajakirthy et al. (2024) which integrates findings from 173 studies, demonstrates the effects of altruistic, biospheric, and egoistic values on green purchase intention. Therefore, the following hypothesis is proposed: ***(H6) Altruistic values positively influence guests' intentions to stay at green hotels.***

Seventh, the effect of intentions on final behavior has been demonstrated in numerous studies based on the theory of planned behavior. In the context of selecting green accommodation in tourism, guests' intentions have been confirmed as a key antecedent of their final decision. Hasan (2023) study on green hotel visitors in Bangladesh found that intentions to revisit green hotels significantly influenced the actual decision to revisit. Jana et al. (2024) indicated that green attitudes significantly affect green purchase intentions among affluent consumers, with a strong positive correlation between green purchase intentions and actual green purchase behaviors. Additionally, the study highlighted that the unavailability of green hotels weakens the intention-behavior link. Therefore, the following hypothesis is proposed: ***(H7) Guests' intentions to stay at green hotels positively influence their final decision.***

Finally, value components such as altruistic, biospheric, and collectivistic values positively influence pro-environmental attitudes in green marketing (Özekici, 2022; Wang, Wang, et al., 2022) or implicit attitudes (Wang et al., 2020; Wang, Zhang, et al., 2022) in green marketing. Verma et al. (2019) found that biospheric values significantly affect attitudes, with attitudes towards green hotels predicting the intention to visit them. Wang et al. (2023) showed that biospheric and collectivistic values positively influenced explicit attitudes, while altruistic value had a negative impact. This suggests that China, as a highly collectivistic society, is characterized by nature-oriented cultures, making individuals from collectivist countries more likely to adopt environmentally friendly behaviors. Dong & Gao (2024) noted that biospheric-altruistic and egoistic values positively correlate with attitudes towards organic wine, with attitude mediating the relationship. Therefore, the following hypothesis is proposed: ***(H8) Green attitudes mediate the relationship between values and guests' intentions to stay at green hotels.***

### 2.3. Research methodology

The scale was adapted from previous related studies, including Wang's (2022) scale on green attitudes and intentions to stay, Annamdevula et al.'s (2022) scale on moral obligation and final decision, Xu et al.'s (2024) scales on environmental concerns and egoistic values, and Mukherjee & Chandra's (2022) scales on biospheric values and altruistic values. The research process consists of two phases: (1) a qualitative study and (2) a quantitative study. The

qualitative phase focuses on refining the proposed scale through in-depth interviews with 10 experts from Vietnam's tourism industry. These experts include two members of the management boards of Green Globe-certified hotels in Ho Chi Minh City, four directors of eco-friendly hotels in Hanoi and Da Nang, two lecturers specializing in tourism and travel services management, and two professionals from the Vietnam National Authority of Tourism. A semi-structured questionnaire is used during face-to-face interviews to validate the relevance of the measurement variables and refine the wording to align with the context of green hotels in Vietnam (see Table 1).

**Table 1: Definitions and measurements of research concepts**

| Concept | Code | Definition | Source of measurement | Items | Examples |
|---|---|---|---|---|---|
| Green attitudes | GRE | The predisposition or tendency to evaluate the environment positively and support environmental-friendly practices. | (Wang, 2022) | 5 | "I believe environmental protection is important" |
| Moral obligation | MOR | The sense of duty or moral responsibility towards environmental protection and sustainable practices. | (Annamdevula et al., 2022) | 4 | "I feel it is my responsibility to make environmentally conscious decisions" |
| Environmental concerns | CON | The level of concern and awareness about environmental issues and their impact on the planet. | (Xu et al., 2024) | 6 | "I am worried about the effects of climate change on future generations" |
| Egoistic values | EGO | Values focusing on personal benefits, including how environmental behavior impacts individual well-being. | (Xu et al., 2024) | 4 | "I make green decisions because they benefit me personally" |
| Biospheric values | BIO | Values that emphasize the preservation of the environment for the well-being of ecosystems and future generations. | (Mukherjee & Chandra, 2022) | 5 | "I am motivated by the desire to protect the planet" |
| Altruistic values | ALT | The likelihood that guests will choose eco-friendly accommodations based on their attitudes and values. | (Mukherjee & Chandra, 2022) | 5 | "I make environmentally friendly choices because they help others" |
| Intentions to stay | INT | The likelihood that guests will choose eco-friendly accommodations based on their attitudes and values. | (Wang, 2022) | 6 | "I would prefer to stay at a green hotel during my travels" |
| Final decision | DEC | The actual decision made by guests regarding their stay at green hotels, based on their intentions and other factors. | (Annamdevula et al., 2022) | 4 | "I stayed at a green hotel during my last trip" |

In the subsequent quantitative phase, a structured questionnaire is distributed to assess the theoretical model. The questionnaire consists of two sections: (1) personal information (age, gender, country of residence, and the hotel where the respondent is staying in Vietnam) and (2) measurement items. Survey respondents are international tourists staying at green hotels in Vietnam in 2024, including guests at renowned green accommodations such as The Anam Hotel, Six Senses Resort Con Dao, Hotel Nikko Saigon, InterContinental Danang Sun Peninsula Resort, Mia Resort Nha Trang, La Veranda Resort Phu Quoc, Rex Hotel, Vinpearl Resort & Spa Nha Trang, among others. The survey link is shared with hotel management, who are responsible for forwarding it to their international guests. The data collection process spans six months, and quantitative data is analyzed using SPSS and AMOS (Hair et al., 2013).

## III. RESULT AND DISCUSSION

### 3.1. Sample description

A total of 568 questionnaires were collected, and after data cleaning, 550 valid responses were retained, meeting the minimum sample size requirement. Regarding the demographics of the respondents, the majority belong to Generation Y (247, or 44.9%), followed by Generation X (202, or 36.7%) and Generation Z (101, or 18.4%). A larger proportion of male respondents (284, or 51.6%) compared to female respondents (217, or 39.5%) participated in the survey, with 49, or 8.9% of respondents not specifying their gender. Geographically, most respondents came from Europe (39.5%), followed by the USA (33.5%), and other regions (27.1%). The majority of international guests choose to stay at green hotels in the Central region (215, or 39.1%), followed by the North (206, or 37.5%), and lastly, Ho Chi Minh City and the Southern region (129, or 23.5%).

### 3.2. Scale verification

Testing the normal distribution of observed variables revealed that the absolute value of the largest deviation was 2.006 (<3), and the largest kurtosis value was 4.461 (<8). This indicates that the variables follow a normal distribution, and the dataset is suitable for statistical testing. Out of 39 variables, preliminary reliability testing using Cronbach's Alpha identified 3 variables (GRE2, CON3 and INT3) for elimination due to |variable-total correlation| < 0.3 and an increase in Cronbach's Alpha when removed. With the remaining 36 variables, exploratory factor analysis (EFA) with Promax rotation led to the elimination of 5 variables (CON2, BIO4, ALT1, MOR1, BIO2) due to a loading difference of |load difference| < 0.3 across two factors. The final scale includes 31 items, all with loading coefficients > 0.7. The Kaiser-Meyer-Olkin (KMO) coefficient was 0.825 ($p < 0.05$), forming 9 factors with Cronbach's Alpha coefficients all > 0.7. The total variance extracted was 80.012%, effectively explaining the data variation (Table 2).

**Table 2: Testing the reliability and convergent validity of the scales**

| No | Scale | EFA | | CFA | | |
|---|---|---|---|---|---|---|
| | | Factor loadings | Items | Standardized factor loadings | CR | AVE |
| 1 | GRE | 0.820 –> 0.831 | 4 | 0.800 –> 0.872 | 0.872 | 0.698 |
| 2 | MOR | 0.838 –> 0.865 | 3 | 0.794 –> 0.850 | 0.866 | 0.724 |
| 3 | CON | 0.853 –> 0.892 | 4 | 0.793 –> 0.835 | 0.882 | 0.603 |
| 4 | EGO | 0.887 –> 0.896 | 4 | 0.744 –> 0.788 | 0.806 | 0.783 |
| 5 | BIO | 0.831 –> 0.925 | 3 | 0.759 –> 0.821 | 0.841 | 0.620 |
| 6 | ALT | 0.827 –> 0.889 | 4 | 0.729 –> 0.801 | 0.802 | 0.610 |
| 7 | INT | 0.802 –> 0.869 | 5 | 0.800 –> 0.882 | 0.886 | 0.723 |
| 9 | DEC | 0.814 –> 0.860 | 4 | 0.836 –> 0.882 | 0.834 | 0.799 |

The measurement model was evaluated using CFA for the first-order scale, showing good fit: Chi-square ($\chi^2$)/dF = 1.868 (<3) ($p = 0.000 < 0.05$), GFI = 0.902 (>0.9), TLI = 0.903 (>0.9), CFI = 0.905 (>0.9), IFI = 0.903 (>0.9), and RMSEA = 0.028 (<0.06). All standardized loading factors for the 33 variables were > 0.5 ($p = 0.000 < 0.05$). The average variance extracted (AVE) for all factors was > 0.5, confirming convergent validity (Hair et al., 2013).

### 3.3 Testing structural model

SEM analysis using ML estimation indicated a good fit for the structural model, with indices showing: Chi-square ($\chi^2$)/dF = 2.048 (<3) ($p = 0.000 < 0.05$), GFI = 0.906 (>0.9), TLI = 0.904 (>0.9), CFI = 0.904 (>0.9), IFI = 0.905 (>0.9), and RMSEA = 0.022 (<0.06). The model explained 39.9% of the variance in final decision of staying at green hotel, supporting all seven hypotheses (from H1 to H7). Green attitudes, moral obligation, environmental concerns, egoistic values, biospheric values, and altruistic values are key factors influencing guests' intentions to stay at green hotels, and guests' intentions to stay at green hotels significantly impact their final decision (Table 3). These findings align with previous research and contributes significantly by addressing the limited quantitative research on the decision to stay at green hotels in Vietnam.

**Table 3: Testing the hypotheses of the structural model**

| Relationships | Hypotheses | Standardized regression | Estimate | S.E. | CR | p-value | Result |
|---|---|---|---|---|---|---|---|

| | | coefficient | | | | | |
|---|---|---|---|---|---|---|---|
| GRE -> INT | H1 | 0.488 | 0.286 | 0.045 | 6.411 | *** | Supported |
| MOR -> INT | H2 | 0.343 | 0.345 | 0.043 | 8.080 | *** | Supported |
| CON -> INT | H3 | 0.356 | 0.383 | 0.046 | 8.391 | *** | Supported |
| EGO -> INT | H4 | 0.328 | 0.294 | 0.033 | 8.903 | *** | Supported |
| BIO -> INT | H5 | 0.264 | 0.472 | 0.036 | 13.025 | *** | Supported |
| ALT -> INT | H6 | 0.138 | 0.128 | 0.035 | 3.524 | *** | Supported |
| INT -> DEC | H7 | 0.338 | 0.326 | 0.022 | 7.502 | *** | Supported |

Using Zhao et al. (2010) procedure for testing mediation effects, the analysis follows a two-step process: first, verifying the significance of the indirect effects, and second, determining the type of mediation, if any. In the case of the relationship between egoistic values and guests' intentions to stay, the indirect effect is significant (e.g., 0.112) as shown in Table 4, indicating that green attitudes play a mediating role as expected. With a significant direct effect (e.g., 0.328), a partial mediation role of green attitudes is observed. Moreover, since both the direct and indirect effects have the same positive sign, green attitudes serve as a complementary partial mediator in the relationship between egoistic values and guests' intentions to stay. The ratio of the indirect-to-total effect, or the VAF (variance accounted for) value, is 17.73% (e.g., 0.634), suggesting that the mediation process with green attitudes accounts for a small portion of the variance in customer readiness as the dependent variable <20%, a cut-off value recommended by Hair et al. (2021). In other words, green attitudes absorb a limited portion of the impact of egoistic values on guests' intentions to stay. Similarly, green attitudes mediate the relationship between biospheric values, altruistic values, and guests' intentions to stay at green hotels, providing full support for H8.

**Table 4. Result of mediation analysis**

| Relationships | Direct effects | Indirect effects | Total effects |
|---|---|---|---|
| EGO → INT | 0.328*** | 0.112*** | 0.634*** |
| BIO → INT | 0.442*** | 0.041*** | 0.483*** |
| ALT -> INT | 0.162*** | 0.129*** | 0.291*** |

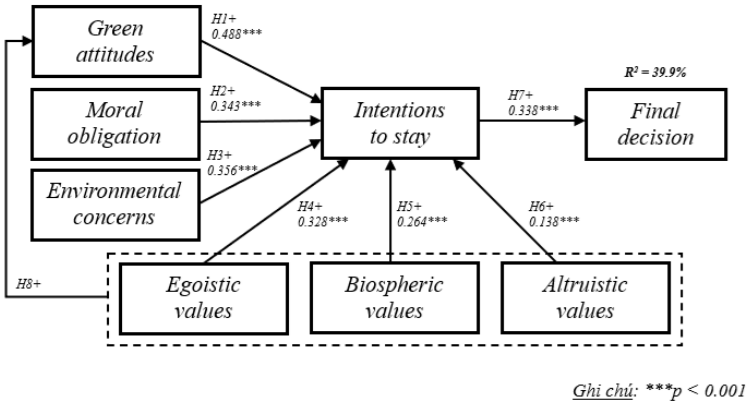



**Figure 1: Results of structural model testing**

## IV. CONCLUSION

### 4.1. Theoretical contributions

While tourism is widely regarded as a positive driver of economic development, conventional mass tourism is linked to negative impacts, such as ecosystem degradation and the loss of cultural heritage. In response to these challenges, sustainable tourism has gained considerable attention, with green hotels emerging as key players in this shift. Green hotels represent a sustainable approach to tourism, attracting guests who hold green attitudes, an intense sense of moral obligation, environmental concerns, and deep-rooted environmental values. This study contributes to the development of the green hotel theory by integrating the TPB with the VBN theory of environmentalism, thus providing a comprehensive framework for understanding the factors that influence guests' decisions to stay at green

hotels.

The proposed theoretical model identifies key factors—green attitudes, moral obligation, environmental concerns, egoistic values, biospheric values, and altruistic values—that significantly impact guests' intentions to choose green hotels, which, in turn, affect their final accommodation decisions. These findings highlight the importance of green attitudes as a pivotal determinant in the decision-making process. By linking TPB with the VBN theory, the study underscores the role of green attitudes as a mediator, amplifying the effect of guests' environmental values on their pro-environmental behavior. This integration of both theories advances our understanding of how environmental value systems shape guests' intentions and actions in the context of green hotel selection.

These results align with previous research, confirming that TPB's core antecedents continue to influence environmental intentions and behaviors. However, the study emphasizes the need for further exploration of the role of green attitudes and the other two TPB antecedents in the context of green hotels. This approach not only enriches the theoretical framework for green hotel research but also provides practical insights for hotel managers aiming to attract more eco-conscious guests and promote sustainable practices within the hospitality industry. Therefore, the study offers significant contributions to the growing body of literature on green hotels and the application of environmental behavior theories in tourism decision-making.

**4.2 Managerial implications**

From a management perspective, it can be observed that the decision to choose a green hotel for accommodation, particularly in this study focusing on international tourists visiting Vietnam, is strongly influenced by pre-existing intentions. These intentions are shaped by attitudes, perceptions, and the underlying norms and values within each guest. Therefore, to increase the likelihood of being chosen as the accommodation during a trip, extend guests' stay, and set higher service prices, green hotels need to develop strategies to promote these important antecedents.

Given that ethics and personal value systems are difficult to change, managers of green hotels should carefully design and implement tailored communication strategies. Guests who have a strong moral obligation towards the environment and hold sustainability-oriented values are more likely to be positive about eco-friendly products and services, such as green hotels. Additionally, addressing guests' concerns regarding the environmental impact of tourism by providing information and explaining the eco-friendly practices of green hotels can effectively encourage them to choose these hotels for their stay. Finally, because green attitudes play a crucial role, hotel managers should focus on promoting positive attitudes toward green hotels. This can be achieved through effective communication about the hotel's commitment to environmental protection, efforts to earn green certifications and awards, offering guests environmentally friendly experiences, and encouraging participation in environmental protection activities within the hotel.

More specifically, to attract international tourists, green hotels should develop targeted communication strategies emphasizing their eco-friendly practices. This can include promoting sustainability efforts through the hotel's website, in-room materials, and social media, as well as offering guests opportunities to engage in sustainability programs like eco-friendly activities and workshops. Hotels can also encourage positive green attitudes by offering experiences that highlight their commitment to environmental protection, such as "Green Stay" packages or exclusive discounts for eco-conscious choices. Clear communication about eco-certifications builds trust with environmentally minded guests. Additionally, pricing tiers for eco-friendly accommodations, partnerships with local eco-tourism operators, and leveraging positive reviews can further strengthen the hotel's reputation as a sustainable choice, attracting more eco-conscious travelers.

**4.3 Future research directions**

From this study, conducting multi-group analyses based on factors such as respondent age, gender, country of residence, and hotel location could provide valuable insights into how these demographic and contextual factors moderate the relationships within the proposed model. Understanding these moderating effects would not only enhance the application of both the TPB and the VBN theory but also help refine how these theories are applied in the context of green hotel decision-making. By examining how various groups, such as different age ranges or cultural backgrounds, perceive and respond to environmental cues, managers could tailor their strategies more effectively to target specific

market segments.

In addition, expanding the data collection to cover a broader range of locations across Vietnam, including both urban and rural settings, would improve the representativeness of the sample. This geographical diversification would help ensure that the findings are more generalizable, providing insights that are not only relevant to tourists staying at well-known green hotels but also applicable to a wider variety of green accommodations across the country. A more inclusive data set could reveal regional variations in environmental attitudes and behaviors, which would be crucial for both researchers and hotel managers aiming to attract international tourists with diverse preferences and values.

Looking forward, while the current model offers a strong explanation for the factors influencing guests' decisions to stay at green hotels, exploring additional theoretical perspectives could further enrich our understanding. For instance, incorporating elements from consumer behavior theory, decision-making processes in the hospitality industry, or even theories on sustainable consumption could provide a more holistic view of how guests' choices are shaped. Furthermore, integrating psychological, sociocultural, and behavioral dimensions could illuminate additional antecedents that play a role in guests' intentions, such as social norms, peer influence, or even emotional engagement with eco-friendly practices. By broadening the theoretical framework and continuing to explore new perspectives, future studies could more clearly highlight the complex and multi-faceted nature of the decision to stay at a green hotel, offering deeper insights for both academia and industry practice.

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# THE ALLURE OF RURAL LIVING: TOURISM WITH A LOCAL EMPHASIS FOR ECONOMIC SUSTAINABILITY - A CASE STUDY IN KEMIREN VILLAGE, INDONESIA

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**ABSTRACT**

This study explores the charm of rural life through a case study of Kemiren Village, Indonesia, focusing on the integration of local culture into tourism to promote sustainable economic growth. Kemiren, known for its "Osing" solid cultural heritage, has successfully blended traditions with tourism activities, offering visitors authentic experiences such as traditional dances, culinary delights, and local crafts. This research highlights how community-based tourism empowers residents by fostering economic resilience, preserving cultural identity, and enhancing social cohesion. Key findings reveal that active community participation, the promotion of cultural heritage, and sustainable practices are crucial to the success of rural tourism. Challenges such as balancing modernization with cultural preservation and ensuring equitable benefits are also discussed. The study concludes by emphasizing the potential of rural tourism to become a model for sustainable economic development while preserving the unique cultural fabric of Kemiren Village.

*Keywords*: Rural tourism, community-based tourism, economic sustainability, cultural preservation, Kemiren Village.

## I. INTRODUCTION

### 1.1. Background of the study

Indonesia is home to a rich diversity of traditions and cultures. This diversity presents significant potential for tourism activities. Tradition and culture are invaluable heritages that reflect the identity of a nation. While modernity often dominates various aspects of life, tradition and culture serve as unique attractions in the realm of tourism. Culturally-based tourism offers visitors a distinctive and authentic experience, while simultaneously serving as a medium to preserve local values (Cheteni & Umejesi, 2024; Lussetyowati, 2015; Putra et al., 2021). With their uniqueness and richness, traditions and culture possess the capacity to attract tourists from around the globe, creating economic opportunities and strengthening national identity. However, realizing traditions and culture as sustainable tourism assets requires prudent management, community awareness, and support from multiple stakeholders. Therefore, traditions and culture not only function as tourist attractions but also as enduring legacies for future generations (Lussetyowati, 2015; Putra et al., 2021).

Law Number 10 of 2009 on Tourism (Government Regulation of Indonesia, 2009) outlines three primary objectives for tourism development: fostering economic growth, improving public welfare, and advancing cultural heritage. Beyond contributing to national revenue, the tourism sector also serves as an industry that provides employment opportunities, promotes equitable income distribution, and supports cultural preservation (Dangi & Petrick, 2021; Dłużewska & Giampiccoli, 2020; Mtapuri et al., 2021). The tourism sector's capacity to generate employment ultimately strengthens the economy, making it a critical driver for sustainable development (Mtapuri et al., 2021; Nugroho & Numata, 2020). This rationale underpins the establishment of Kemiren Village as a tourist destination in 2012, known today as the Osing Kemiren Cultural Tourism Village.

The Osing Cultural Tourism Village of Kemiren is located in Glagah Subdistrict, Banyuwangi Regency, East Java Province, approximately 5 kilometers from the center of Banyuwangi city. Initially, Kemiren was an expanse of rice fields and community-owned forests. Over the past 167 years, it has gradually transitioned into a village and is now home to approximately 2,569 residents. Kemiren is unique as the only village predominantly inhabited by the

indigenous Osing people of Banyuwangi (Lubis, 2020; Oktawirani, 2023).

Kemiren Village is inhabited by the Osing community, who uphold their traditions and customs with great care. Most residents work as farmers, livestock breeders, or artisans, with tourism serving as an additional economic support. Recognized as a cultural village, Kemiren boasts a rich heritage. Many homes in the village retain the traditional Osing architecture, featuring distinctive roofs known as tikel balung. The design, resembling fish bones, symbolizes simplicity and harmony in the lives of the Osing people. Kemiren is renowned for its unique traditions, passed down as part of the Osing people's ancestral legacy (Lubis, 2020; Oktawirani, 2023). The community maintains its distinctive cultural practices in daily life, emphasizing hospitality, familial values, and mutual cooperation (gotong-royong). These attributes reflect the Osing people's commitment to preserving their cultural identity while adapting to contemporary opportunities such as tourism (Nuh et al., 2023).

Kemiren Village plays a vital role in preserving local traditions amidst the pressures of globalization (Lussetyowati, 2015; Nuh et al., 2023; Satiadji, 2017; Wu et al., 2022). The customs and culture of the Osing community exemplify the ethnic diversity in Indonesia that endures despite the tides of modernity. Through community-based tourism, Kemiren offers authentic experiences to visitors, including homestays, traditional cuisine, and participation in cultural activities. This model not only enhances the community's income but also strengthens their sense of ownership over their traditions (Dangi & Petrick, 2021; Dłużewska & Giampiccoli, 2020). Community-based tourism serves as an effective strategy to ensure equitable economic benefits while preserving cultural heritage. However, the greatest challenge lies in maintaining a balance between cultural preservation and commodification (Satiadji, 2017). Commodification risks diminishing the authenticity of cultural practices. In Kemiren, the active involvement of the local community in tourism management has been key to preventing excessive cultural exploitation, ensuring that traditions remain meaningful and sustainable.

Kemiren Village was selected for this study due to its distinctive cultural heritage and status as a well-established cultural tourism village. As the cultural center of the Osing community, the village has successfully integrated tourism with local traditions, offering valuable insights into the dynamics of community-based tourism. Moreover, the active participation of local residents in various tourism activities, including homestay management, traditional performances, and culinary experiences, provides an exemplary model for sustainable tourism development that prioritizes local empowerment and cultural preservation.

This study is expected to make significant contributions both academically and practically. By examining Kemiren Village as a case study, this research expands the literature on community-based tourism and its role in economic sustainability and cultural preservation in rural areas. The findings will provide a theoretical framework for future studies on sustainable tourism in developing regions. The study offers recommendations for policymakers, tourism practitioners, and local communities on implementing tourism strategies that balance economic growth with cultural sustainability. These insights can be applied to similar rural tourism destinations seeking to develop cultural tourism without undermining their heritage. The findings can serve as a reference for sustainable rural tourism development, ensuring that tourism remains a tool for cultural and economic resilience rather than a force of cultural erosion.

### 1.2. Research Problem

Despite the potential of community-based tourism to support local economies and cultural heritage, its implementation faces several challenges. One of the main concerns is ensuring that economic benefits from tourism are equitably distributed among community members without compromising the cultural values that define the destination's appeal. Additionally, excessive commercialization risks reducing cultural practices to staged performances, undermining their authenticity and significance (Satiadji, 2017). In the context of Kemiren Village, it is essential to explore how active community involvement in tourism management can help maintain a balance between economic sustainability and cultural integrity.

### 1.3. Research Objectives

The objective of this study is to analyze how community-based tourism empowers residents by fostering economic resilience, preserving cultural identity, and enhancing social cohesion. This study also identifies the role of tourism in preserving the Osing culture and the challenges faced in maintaining its authenticity amidst globalization. Kemiren

Village is recognized as the cultural hub of the indigenous Osing community in Banyuwangi, featuring traditional culture, customs, and cuisine. It is crucial to understand how Kemiren balances tourism appeal with cultural preservation, which helps mitigate the potential loss of authentic local traditions. Kemiren serves as a model for other rural areas seeking to develop culturally-based tourism without compromising traditional values.

## II. MATERIAL AND METHOD

### 2.1. Literature Review

Rural Tourism and Economic Sustainability

Amid the dynamics of global development, the establishment of rural tourism has emerged as a strategic solution to enhance the welfare of local communities, particularly in rural areas. Rural tourism not only serves as a platform to showcase local traditions and culture to the world but also acts as an economic driver that upholds sustainability principles (Cheteni & Umejesi, 2024; Garwi, 2024; Krasnokutska et al., 2024). By integrating cultural preservation, environmental management, and economic growth, village tourism holds significant potential to promote equitable and sustainable development. As a rural development strategy, village tourism aims to boost the local economy while preserving cultural traditions (Cheteni & Umejesi, 2024; Ivona, 2021). This concept places the local community at the heart of tourism activities, where the primary objectives include economic, social, and environmental sustainability. Literature on rural tourism underscores a strong link between its development and the achievement of sustainable economic growth, while also highlighting various challenges that need to be addressed.

A tourist village is characterized by its natural environment, reflecting the authenticity of rural life and offering a unique experience of the community's daily social and cultural practices (Dai et al., 2023). The potential of a tourist village can be observed through its architectural heritage and environmental setting (Putra et al., 2021; Zuo et al., 2022). The central focus of rural tourism development is the local community, whose way of life becomes the focal point for visitors seeking an authentic rural experience. Through direct interaction with local residents, tourists gain a deeper understanding of the community's way of life, actively participating in their daily activities (Priatmoko et al., 2021; Stylidis, 2020; Wu et al., 2022). This engagement provides added value through the appreciation of the region's cultural and traditional richness, making rural tourism a dynamic tool for promoting sustainable rural development while preserving the unique identity of local communities. In In Indonesia, villages such as Pentingsari (Yogyakarta), Nglanggeran (Gunung Kidul), and Kemiren (Banyuwangi) have emerged as successful examples of how rural communities can harness tourism for sustainable development (Lubis, 2020).

Community-Based Tourism

Community-based tourism (CBT) is a tourism approach that places local communities as the primary stakeholders in the planning, management, and benefits of the tourism sector (Dłużewska & Giampiccoli, 2020; Mtapuri et al., 2021). This model extends beyond economic profit, aiming to preserve environmental sustainability and local cultural heritage. Its core objective is to empower communities, provide equitable economic opportunities, and ensure that the positive impacts of tourism are experienced directly by local residents.

The development of CBT adheres to several key principles (Dangi & Petrick, 2021; Dłużewska & Giampiccoli, 2020; Nugroho & Numata, 2020), including Community Involvement, Equitable Benefit Distribution, and Tourism Education. The ultimate goal of CBT is to enhance community independence and empowerment, enabling local populations to take an active role in their own development while fostering sustainable tourism practices.

In Indonesia, CBT has been recognized as a tool for promoting rural economic resilience while safeguarding cultural heritage (Nugroho & Numata, 2020). Studies on CBT in Indonesia emphasize the importance of community involvement, governance, and economic impact. Nugroho & Numata (2020) found that in Gunung Ciremai National Park, residents' support for CBT initiatives was significantly influenced by their perceptions of economic benefits and cultural preservation. Similarly, Priatmoko et al. (2021) explored how local participation in Pampang Village, Indonesia, has led to more sustainable tourism practices by fostering a strong sense of ownership among villagers.

Governance plays a critical role in the success of CBT. Dangi & Petrick (2021) emphasize the need for collaborative participation, representation, and inclusion in tourism governance to ensure long-term sustainability. In the context of Kemiren Village, the presence of the Tourism Awareness Group (Pokdarwis) has facilitated structured

community involvement in managing tourism activities.

Cultural Preservation through Tourism

Cultural preservation through tourism involves efforts to safeguard and sustain cultural heritage (Lussetyowati, 2015), encompassing both tangible elements (such as historic buildings and archaeological sites) and intangible aspects (including traditional dances, languages, and customs). Cultural tourism attracts visitors eager to learn about and experience local cultures, providing financial and moral support for preservation efforts (Cheteni & Umejesi, 2024; Putra et al., 2021). By engaging tourists with cultural heritage, this approach not only raises awareness about the importance of safeguarding traditions but also generates resources for ongoing preservation initiatives. Lussetyowati (2015) examined cultural heritage tourism in Palembang, Indonesia, demonstrating how traditional performances and rituals can be integrated into tourism while maintaining authenticity. Cultural tourism serves as a bridge between development and conservation, ensuring that cultural heritage remains vibrant and accessible for future generations while supporting the socio-economic well-being of local communities (Dłużewska & Giampiccoli, 2020; Lussetyowati, 2015; Satiadji, 2017).

Preserving and safeguarding cultural heritage is essential for cultural heritage tourism, as the sustainability of the offered commodities must be ensured (Lussetyowati, 2015; Satiadji, 2017). A primary challenge in tourism programs is to ensure that the growth of tourism does not degrade the qualities that initially attract visitors. Issues such as increased visitor numbers and added pressure on infrastructure and heritage sites pose significant concerns for the tourism industry (Dłużewska & Giampiccoli, 2020). As a service-oriented industry, tourism programs rely heavily on the competence of individuals across various roles and locations. By adopting Quality Tourism, efforts are made to encourage tourists to better appreciate and understand local cultures (Wardana et al., 2020). Tourists who visit with the intent to learn about and value the local culture are more likely to respect local traditions and customs. This approach not only aids in cultural preservation but also reduces the risk of commercialization, which can undermine the authenticity of the culture (Lussetyowati, 2015; Satiadji, 2017).

### 2.2. Research Method

This study employs a qualitative research approach, utilizing field research as its primary methodology. Field research involves direct observation and interaction within the study's setting (Burgess, 2002). Field research included direct observation of Osing tourism activities, capturing non-verbal interactions, ritual performances, and community-tourist dynamics. Observation sites included Traditional ceremonies (Barong Ider Bumi, Tumpeng Sewu), Tourist interactions in homestays and Kampoeng Osing Market, and Cultural workshops (Gandrung dance performances, Osing language classes).

Interviews were conducted with local stakeholders directly involved in tourism activities, focusing on their experiences, challenges, and perspectives on CBT's impact. The semi-structured format allowed flexibility in exploring emerging themes while maintaining a core set of guiding questions. A purposive sampling technique was used to select informants who could provide relevant insights to achieve the research objectives. Key informants included the Head of Kemiren Village, the Chairman of the Kemiren Tourism Awareness Group (Pokdarwis), and 5 community members directly involved in the development of tourism in Kemiren Village. Fieldwork and interviews were conducted from July 2024 to September 2024.

In this study, qualitative data analysis was conducted following the framework proposed by Miles & Huberman (1994), which consists of three interconnected stages: data reduction, data presentation, and conclusion drawing. These steps ensure that the large volume of field data collected through interviews and observations is systematically processed, leading to valid and meaningful conclusions. As a complementary source of information, this study also utilized literature reviews to establish a theoretical foundation, drawing on a variety of credible references. This combination of field research and theoretical insights ensures a comprehensive understanding of community-based tourism in Kemiren Village.

## III. RESULT AND DISCUSSION

### 3.1. Tourism Development in Kemiren

Kemiren Tourism Village, located in Banyuwangi Regency, East Java, is a successful example of culturally-based

rural tourism development. The village is renowned for the rich culture of the Osing people, the indigenous population of Banyuwangi. The establishment of Kemiren Tourism Village was not only aimed at boosting the local economy but also at preserving its unique cultural heritage. Kemiren has a long history dating back to the Dutch colonial period. The village's early inhabitants originated from Cungking Village, approximately 4 kilometers east of Kemiren. Over time, Kemiren evolved into the cultural hub of the Osing people, celebrated for their traditions and customs.

The development of Kemiren as a tourism village began in the 1990s when researchers and academics showed increasing interest in studying the Osing culture. This heightened focus on local heritage motivated the community and local government to capitalize on the village's tourism potential, turning it into a destination that celebrates and preserves the cultural identity of the Osing people. The development of tourism in Kemiren has gained significant momentum since 2012, aligning with the Banyuwangi Regency Master Plan for Development implemented by the local government. The establishment of the Osing Traditional Tourism Village was driven by the village's unique potential, deeply rooted in long-standing traditions and culture integral to the community's daily life.

In Kemiren, the local population continues to use the Osing language in their everyday interactions, and many customs and traditions have been preserved and maintained over time. The Osing Traditional Tourism Village upholds local wisdom and environmental sustainability while providing educational opportunities for visitors to learn about the culture and interact directly with the local population.

The development and management of the Osing Traditional Tourism Village are handled by a youth organization called the Tourism Awareness Group (Pokdarwis), comprising 26 members. The Pokdarwis was established in 2017 in response to a regulation requiring all tourism destinations in Banyuwangi Regency to have an organized management group. This initiative reflects a collaborative effort to promote sustainable tourism while safeguarding cultural heritage and enhancing community involvement.

### 3.2. Community Involvement and Empowerment

The development of Kemiren Tourism Village actively involves local residents as key actors in tourism activities. This engagement aims to enhance the welfare of the village community by creating new job and business opportunities and improving pre-existing enterprises and services. Involving local communities in tourism activities is a strategic effort to achieve the objectives of the village tourism development program. This includes their participation in managing natural resources, cultural heritage, and traditions, which are the main attractions of Kemiren Village. By integrating community involvement in resource management and tourism initiatives, the development efforts not only support economic growth but also ensure the sustainability and preservation of the village's unique identity.

The communities of Kemiren Village actively participate in tourism activities as providers of accommodation and attractions. The tourism concept adopted in Kemiren aligns with the principles of Quality Tourism, which emphasizes offering high-quality experiences for tourists while ensuring positive impacts on the destination. Quality tourism prioritizes visitors who respect local culture, nature, and the environment. Tourists typically engage with the local community, appreciate traditions, and seek deeper, more meaningful travel experiences. This approach has indirectly benefited the local community by providing additional income and employment opportunities. The available jobs generated by tourism activities have been well-utilized by the locals to supplement their earnings and meet daily needs. For instance, the village youth now have opportunities to work as local guides or perform as traditional musicians. The community is also actively involved in various tourism-related activities, such as serving as local guides, performing arts practitioners, and establishing art studios to teach traditional dance and music to visitors. Additionally, they have opened restaurants offering Kemiren's traditional food and beverages, managed homestays, and provided unique cultural experiences for tourists. This collaborative effort highlights the integration of community development with sustainable tourism in Kemiren Village.

### 3.3. Cultural Preservation and Benefits

The cultural heritage of Kemiren Village is protected under Indonesian law, which formalizes the legal framework for cultural management across the nation, including in Kemiren. Key actions for advancing cultural objects include inventorying, safeguarding, maintaining, and preserving them. Every citizen has the right to actively participate in cultural promotion efforts, which encompass ten categories: oral traditions, manuscripts, customs, folk games,

traditional sports, traditional knowledge, traditional technology, arts, languages, and rituals.

For the community of Kemiren Village, culture serves as the foundation of development. Cultural values drive progress by shaping the mindset and awareness necessary for economic growth. Moreover, culture empowers development by fostering attitudes and perspectives that prioritize harmony between humanity and the environment.

Cultural preservation in Kemiren aims to raise local awareness of the value of cultural heritage while fostering openness to existing cultural expressions. Community-based tourism development must incorporate efforts to safeguard cultural heritage. This responsibility lies with the local community to ensure that their traditions and wisdom endure despite the passage of time. Cultural attractions, including daily customs, traditions, norms, and beliefs, serve as focal points for tourists, drawing them to visit the village. Culture-based tourism provides a unique and enriching experience for visitors, allowing them to learn about and participate in the lives of rural communities through direct interaction and engagement. The blend of tourism and cultural heritage creates a compelling appeal, offering distinctiveness, beauty, and values imbued with cultural dimensions. The successful preservation of culture is evident in the authenticity of local traditions, which serve as key tourism attractions such as arts and customary practices. The development of Kemiren Tourism Village in its cultural dimension is sustained through the commitment of the local community to maintain and preserve their culture and traditions as integral aspects of tourism activities. This ensures that cultural heritage remains the defining characteristic of their village.

Interactions between tourists and the local community foster the exchange of cultural elements, including ideas, norms, and daily practices. This cultural exchange enriches both parties, enhancing the value of tourism and strengthening the identity of Kemiren as a culturally significant tourism destination. Tourist attractions with a cultural background serve as a magnet for both domestic and international visitors.

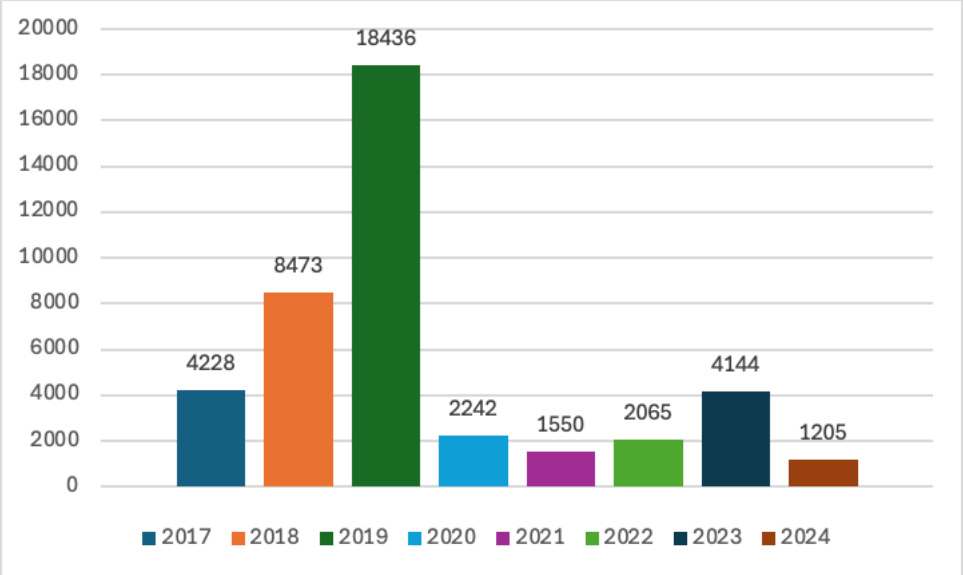



**Fig 1. Visitor Statistics of Kemiren Village (2017-2024)**

The growing number of festivals in Kemiren Village, such as Tumpeng Sewu, Barong Ider Bumi, and Ngopi Sepuluh Ewu drove the increase in visitor numbers from 2017 to 2019. The rise in tourism visits in 2019 was also influenced by improved visitor data collection by Pokdarwis. In previous years, Kemiren Village faced challenges in recording visitor numbers, as it did not charge entrance fees but operated through tour packages. In 2019, efforts to enhance visitor data collection were intensified to ensure all tourists were recorded, providing valuable insights for evaluation. However, a decline occurred in 2020 due to the impact of COVID-19. The chairman of Pokdarwis said that In 2021, Pokdarwis intensified its promotional efforts through social media and organized limited events to boost the number of tourists.

In 2024, tourist visits to Kemiren Village experienced a significant decline compared to the previous year. One of the primary contributing factors to this decrease is the weakening purchasing power of the public, influenced by a

nationwide rise in layoffs (PHK). According to an interview with the Head of Kemiren Village, the layoff rate in 2024 increased by 20.21%, directly impacting household budgets for leisure and travel. As household incomes declined, tourism—especially to cultural destinations like Kemiren—became a lower priority for many domestic travelers.

Additionally, according to the Chairman of Pokdarwis, this decline was also influenced by changing consumer behavior in tourism, where people increasingly prefer destinations that offer lower-cost experiences or recreational alternatives closer to their place of residence. The economic downturn's impact is evident in the reduced number of homestay reservations and declining tourist participation in cultural activities such as Gandrung performances and the Barong Ider Bumi ritual.

The culture of Kemiren Village represents a harmonious blend of traditions, arts, language, and cuisine, reflecting the unique identity of the Osing Tribe. With its diverse cultural attractions, Kemiren not only serves as a captivating tourism destination but also plays a vital role in preserving local cultural heritage. The community of Kemiren remains committed to safeguarding and perpetuating their cultural legacy, ensuring it remains an integral part of their daily lives. This dedication strengthens the village's identity as a cultural hub and contributes to the broader effort of maintaining Indonesia's rich and diverse heritage.

### 3.4. Local Economic Impacts

The development of tourism in Kemiren Village has indirectly provided economic benefits to the surrounding community. Prior to the emergence of tourism activities, the majority of Kemiren residents relied solely on farming and construction work as their primary sources of income. While a small number of residents traded coffee beans in nearby cities, this activity was limited and did not significantly contribute to the local economy.

The establishment of Kemiren as a tourist village has created new employment opportunities for the local population. Many residents are now involved in tourism activities, such as managing homestays, which utilize local homes and are directly operated by the homeowners. Others have opened food stalls or restaurants that offer traditional Kemiren dishes and beverages, providing both culinary experiences for visitors and additional income for the community. The impact of economic activities in Kemiren Village is reflected in the increase in the Village Revenue and Expenditure Budget (APBDes). APBDes is an integral part of village development policy and governance. It includes projections of village revenue and expenditures to support development programs. These programs fundamentally have clear objectives and positively impact the welfare of the village community. As a result of Kemiren Village's economic activities, the APBDes increased from USD $66,067.80 in 2016 to $114,029.66 in 2020.

Furthermore, the development of tourism has provided a platform for local artists to express and preserve the cultural heritage of Kemiren Village. Artists specializing in traditional performances such as gandrung dance, gedogan music, and dance workshops (sanggar tari) have found greater opportunities to showcase their talents and contribute to the village's cultural tourism. This economic transformation highlights the significant role of tourism in enhancing the livelihoods of Kemiren residents while preserving and promoting their cultural identity.

The development of Kemiren as a tourism village has created numerous new job opportunities for the local community. Beyond the tourism sector, many residents have also become involved in creative economic activities, such as crafting and performing arts. The influx of tourists to Kemiren has positively impacted the circulation of the local economy. Visitors spend money on various needs, including accommodation, food, and souvenirs, ultimately increasing the income of the local population. Alongside the growth of the tourism village, Kemiren has also experienced significant infrastructure improvements. Better road access, enhanced public facilities, and government support for tourism development have all contributed to fostering local economic growth. These advancements not only benefit tourism but also improve the overall quality of life for the residents, strengthening the village's position as a sustainable and vibrant destination. CBT in Kemiren promotes inclusive economic opportunities by providing stable employment and encouraging entrepreneurial activities, thereby reducing rural unemployment and poverty. This contributes to Indonesia's Sustainable Development Goal (SDG) 8: Decent Work and Economic Growth.

**Table 3.1 Core community members involved in tourism activities in Kemiren village**

| No | Group Name | Role | Number of People |
|---|---|---|---|
| 1 | Homestay Owner | Accommodation Providers | 43 |

| No | Group Name | Role | Number of People |
|---|---|---|---|
| 2 | Kampoeng Osing Market | Osing Culinary Specialties Provider | 40 |
| 3 | Cinde Sutro | Art Performances and Costume Rental | 25 |
| 4 | Tourism Awareness Group (Pokdarwis) | Event Organizers and Tour Guides | 23 |
| 5 | Barong Sapu Jagad | Art Performances | 20 |
| 6 | Kuntulan | Art Performances | 10 |
| 7 | Sukosari | Owner of Traditional House in Osing Cultural Heritage Area | 10 |
| 8 | Pemuda Karang Taruna | Tour Guides | 10 |
| 9 | Barong Tresno Budoyo | Art Performances | 9 |
| 10 | Barong Siswo Budoyo | Art Performances | 9 |
| 11 | Lesung/Gedogan | Art Performances | 5 |
| 12 | Customary Security | Customary Security | 5 |
| 13 | Customary Institutions | Resource Persons and Preservation of Osing Customs | 5 |
| 14 | SMEs Kopi Jaran Goyang | Souvenir and Coffee Education Provider | 5 |
| 15 | Angklung Paglak | Art Performances | 4 |
| **Total** | | | 223 |

*Source: Document on advancement of village culture of Kemiren Village 2023*

The development of tourism villages in Kemiren has had a significant economic impact by creating new job opportunities for the local community. Residents are actively involved in various tourism activities, such as providing homestays that utilize local houses and are managed directly by homeowners. Additionally, food stalls and restaurants serve traditional Kemiren cuisine, with eight food stalls frequently visited by tourists. Events and festivals such as Ngopi Sepuluh Ewu, Barong Ider Bumi, and Tumpeng Sewu engage around 80% of the local community as participants, hosts, and food providers for invited guests and pre-registered tourists through Pokdarwis (Tourism Awareness Group).

The development of the tourism village has also created job opportunities for local residents as tour guides. Kemiren Village has 10 local guides from the Karang Taruna youth organization. However, one challenge in developing tourism in Kemiren is the selection process for local tour guides. To qualify, individuals must meet certain criteria, including knowledge of Kemiren Village's history and strong proficiency in both English and Indonesian. Some tourism activities, such as the Pasar Kampoeng Osing, held every Sunday, actively involve women as vendors of traditional food and beverages. Approximately 50 stalls are directly managed by women from Kemiren Village. Additionally, women play a significant role in performing arts as dancers and gedogan musicians. Their involvement in tourism-related activities contributes to their family income, with earnings from playing lesung music every week reaching up to USD $10, as stated by the community member who was the interviewee.

## IV. CONCLUSION

Kemiren Village serves as a model for sustainable rural tourism, demonstrating how community-based tourism (CBT) can foster economic growth while preserving cultural heritage. By integrating tourism with Osing traditions, the village has created inclusive economic opportunities, ensuring that local residents remain the primary beneficiaries of tourism-related activities. Unlike mass tourism models, CBT in Kemiren promotes equitable income distribution, allowing small-scale entrepreneurs, artisans, and cultural performers to actively participate in and profit from the tourism sector.

One of the key strengths of CBT in Kemiren is its direct impact on local livelihoods. The development of homestays, traditional culinary businesses, and cultural performances has diversified the village's economy, reducing dependency on agriculture while increasing household incomes. Additionally, the role of Pokdarwis (Tourism Awareness Group) in managing tourism initiatives ensures that revenues from tourism are reinvested into community

development, supporting infrastructure improvements and local capacity-building. Beyond economic benefits, CBT reinforces cultural sustainability by preserving Osing customs, rituals, and traditional arts. Cultural events such as Gandrung Dance performances and Barong Ider Bumi rituals serve not only as tourism attractions but also as mechanisms for cultural transmission, engaging younger generations in heritage conservation. This ensures that tourism does not erode local identity but rather strengthens it as a source of economic resilience.

However, challenges remain, particularly in balancing tourism growth with cultural authenticity and ensuring long-term visitor interest. The recent decline in domestic tourist visits, linked to reduced consumer spending due to rising unemployment, highlights the vulnerability of CBT-dependent economies to external economic shifts. Addressing these challenges requires adaptive strategies, such as developing affordable tourism packages, enhancing digital marketing efforts, and promoting sustainable tourism policies that safeguard Kemiren's cultural and environmental integrity.

Ultimately, CBT in Kemiren exemplifies how tourism can serve as a catalyst for economic empowerment, cultural preservation, and social inclusion. Its success underscores the importance of community ownership in tourism management, positioning Kemiren as a replicable model for other rural villages seeking sustainable tourism development. By maintaining a balanced approach between economic progress and cultural sustainability, Kemiren can continue to thrive as a culturally rich and economically resilient rural destination. The study offers actionable insights into community-based tourism management, emphasizing the importance of local participation and equitable benefit-sharing in achieving sustainable rural development. By documenting Kemiren's traditions, such as the Gandrung Dance and Barong Ider Bumi ritual, the study helps preserve and promote intangible cultural heritage, serving as a resource for cultural conservation efforts.

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# EXPLORING EMOTIONAL ENGAGEMENT WITH CHATGPT AS A VIRTUAL TRAVEL AGENT: ANTECEDENTS AND OUTCOMES

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**ABSTRACT**

This study examines the factors that impact tourists' emotional involvement with ChatGPT, a virtual travel agent. Utilizing the Artificially Intelligent (AI) Device Use Acceptance (AIDUA) framework, the research model investigates the antecedents (Social Influence, Hedonic Motivation, Perceived Informativeness, and Perceived Humanness) and outcomes (ChatGPT acceptance and Willingness to Use) of emotional engagement. Data was gathered from 405 participants who have utilized ChatGPT in a travel context, and the results of hypothesis testing strongly support the proposed relationships. The findings indicate that the antecedents significantly influence emotional engagement, which subsequently predicts ChatGPT acceptance and the willingness to use ChatGPT as a virtual travel agent. The study provides valuable insights for tourism businesses seeking to enhance customer engagement and encourage the adoption of AI-powered chatbot services.

*Keywords*: ChatGPT, Virtual Travel Agent, tourism digital transformation, Chatbots, digital marketing

## I. INTRODUCTION

Artificial intelligence (AI) has emerged as a transformative force across diverse industries, driving innovation and operational efficiency (Ed-Douibi et al., 2021). This cutting-edge technology has significantly influenced consumer behavior and reshaped corporate strategies (Cheng & Jiang, 2020). AI-driven platforms like ChatGPT have been integrated into various applications, profoundly impacting customer decision-making processes (Flavián et al., 2021). By enabling businesses to analyze vast datasets and generate actionable insights, AI empowers organizations to make swift and informed decisions. In the rapidly evolving marketplace, adopting tools like ChatGPT enhances business performance and ensures competitiveness and sustainability (Mydyti & Kadriu, 2021). ChatGPT's capabilities allow businesses to adapt to market dynamics, address evolving consumer needs, and deliver innovative solutions effectively. In the tourism sector, ChatGPT represents a paradigm shift in digital transformation, offering unprecedented opportunities for enhancing customer interactions and service efficiency (Garcia et al., 2022). However, comprehensive studies exploring its impact on travelers' willingness to adopt this technology remain limited (Hu et al., 2023; Svenningsson & Faraon, 2019; Ukpabi et al., 2019). Addressing this gap, the present research examines international tourists' engagement with ChatGPT and their attitudes toward its adoption within the tourism industry. Specifically, the study aims to evaluate how ChatGPT can influence customer service strategies and the factors shaping tourists' adoption intentions.

Unlike other travel chatbots such as Google Assistant, Siri, and Expedia Assistant, ChatGPT stands out due to its advanced natural language processing capabilities, enabling more conversational, context-aware, and personalized interactions. While Google Assistant and Siri are general-purpose virtual assistants designed for broad functionality—ranging from setting reminders to providing basic travel information—ChatGPT excels in generating human-like responses and handling complex, open-ended queries specific to travel planning. For instance, Google Assistant relies heavily on structured data and web search integration, while Siri prioritizes quick, voice-activated responses tied to Apple ecosystems. In contrast, Expedia Assistant, tailored for travel-related tasks like booking flights or hotels, operates within a narrower scope and lacks the depth of conversational flexibility that ChatGPT offers. This distinction positions ChatGPT as a more adaptable tool for addressing nuanced traveler needs, such as crafting detailed itineraries or responding to subjective preferences, setting it apart in the tourism context.

This research contributes to the field by investigating tourists' willingness to use ChatGPT, emphasizing the

importance of personalized interactions, human-like chatbot qualities, and the capability to address complex inquiries. These insights provide actionable recommendations for travel agencies and industry stakeholders, enabling them to effectively integrate AI chatbots into their operations. Such strategies are expected to enhance customer satisfaction, foster loyalty, and strengthen the competitive positioning of businesses in the dynamic travel industry. To achieve these objectives, the study is guided by the following research questions:

***RQ1:*** *How does ChatGPT, as a Virtual Intelligent Agent, influence tourists' emotions in the travel industry?*

***RQ2:*** *What factors contribute to enhancing tourists' intention to use ChatGPT in a tourism context?*

This paper provides a comprehensive literature review on ChatGPT's role in the tourism industry and formulates hypotheses based on existing studies. The methodology outlines the research design, sampling techniques, and data collection methods. The findings and discussion section presents key insights and implications, followed by a conclusion offering practical recommendations for AI chatbot implementation and directions for future research.

## II. MATERIALS AND METHODOLOGY

### 2.1. Theoretical background

With the swift integration of ChatGPT in the travel sector, customer engagement has been significantly enhanced (Gursoy et al., 2023). Hence, the traditional technology acceptance models like the Technology Acceptance Model (TAM) by Davis (1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh, Thong, and Xu (2012) often fail to capture customer attitudes toward AI technology fully (Tan et al., 2015). To bridge this gap, Lu et al. (2019) introduced the AIDUA (AI Device Use Acceptance) framework, grounded in Cognitive Appraisal and Dissonance theories, to delve into customer willingness to adopt AI in service settings. This study employs the AIDUA model to assess frequent travellers' inclination to utilize AI-powered chatbots, particularly ChatGPT, as virtual travel agents in Vietnam. Customer engagement with AI devices is influenced by factors like hedonic motivation, social influence, and anthropomorphism, as delineated in the AIDUA model (Lu et al., 2019). The perceived informativeness and humanness of ChatGPT significantly impact user satisfaction and confidence in the technology (Ma & Huo, 2023; Rapp et al., 2021).

**Table 14. Comparison of AIDUA, TAM, and UTAUT**

| Feature | AIDUA | TAM | UTAUT |
|---|---|---|---|
| **Year Developed** | 2019 | 1989 | 2003 |
| **Primary Focus** | AI device acceptance in service contexts | General technology acceptance | Unified technology acceptance and use |
| **Process Structure** | Three-stage acceptance process (primary appraisal, secondary appraisal, outcome stage) | Direct relationships between perceptions and attitudes | Direct and indirect relationships with moderating variables |
| **Core Constructs** | Six antecedents: social influence, hedonic motivation, anthropomorphism, performance expectancy, effort expectancy, emotion | Two main constructs: perceived usefulness, perceived ease of use | Four main constructs: performance expectancy, effort expectancy, social influence, facilitating conditions |
| **Unique Elements** | Incorporates anthropomorphism and emotional factors specific to AI interaction | Parsimony and simplicity | Integration of eight previous theories; includes moderating variables (age, gender, experience, voluntariness) |
| **Theoretical Foundation** | Builds on UTAUT while adding AI-specific elements | Theory of Reasoned Action | Eight theories including TAM, IDT, TRA, TPB, and others |
| **Key** | Acceptance of AI device use | Behavioral intention and | Behavioral intention and use |

| Feature | AIDUA | TAM | UTAUT |
|---|---|---|---|
| **Outcome Variable** | | actual use | behavior |
| **Application Context** | Service encounters with AI devices | Various technology contexts | Broad range of information technology |

### 2.2. Hypothesis development

#### 2.2.1. Social Influence

Social influence, a significant concept in the UTAUT model, refers to how individuals perceive the beliefs of essential others regarding new technology adoption (Cioc, 2023; Andwika & Witjaksono, 2020). Prior research has highlighted that positive opinions within a customer's social network can enhance attitudes towards AI tools like ChatGPT (Gursoy et al., 2019; Tan, 2023; Astuti et al., 2023; Dwivedi et al., 2023). If a customer's social circle views ChatGPT positively and recommends its use, it fosters positive emotional associations with utilizing ChatGPT for travel. Thus, the following relationship is proposed:

H1: Social influence positively impacts the generation of positive emotions toward the acceptance of ChatGPT as a virtual travel agent.

#### 2.2.2. Hedonic Motivation

Hedonic motivation, derived from enjoying interactions with AI devices, significantly influences technology acceptance (Gursoy et al., 2019). It plays a crucial role in user behavior towards AI service robots and autonomous vehicles, enhancing pleasure and happiness in travel planning (Roy et al., 2020; Ribeiro et al., 2021). In this research, if travelers perceive ChatGPT as a virtual travel agent that enriches their journey by offering a joyful and pleasant experience, their evaluation and emotional response to the technology will likely be positive. Based on these insights, the following hypothesis is proposed:

*H2: Hedonic motivation positively impacts on positive emotions of ChatGPT as a virtual travel agent.*

#### 2.2.3. Perceived Informativeness

Informativeness refers to a chatbot's capacity to deliver timely, accurate, and relevant information, a critical factor in ensuring users feel supported and well-informed during travel planning (Ma & Huo, 2023). According to Cappelli et al. (2024), AI systems such as ChatGPT represent a viable alternative to traditional travel agency services, offering rapid response times, continuous availability, multilingual support, and reliable accuracy. These attributes enhance the acceptability of ChatGPT among users seeking travel advice by demonstrating its ability to meet and exceed informational requirements during the travel planning process. Based on these insights, the following hypothesis is proposed:

*Hypothesis 3 (H3): Perceived Informativeness positively impacts on positive emotions of ChatGPT as a virtual travel agent.*

#### 2.2.4. Perceived Humanness

Perceived Humanness, reflecting ChatGPT's human-like communication style, influences user acceptance of AI technologies, fostering personalized and satisfying user experiences (Han et al., 2018). Perceived Humanness is a critical factor in human-chatbot interaction, encompassing humanlike conversational features such as syntax and language, which foster a more personalized, comfortable, and satisfying user experience (Ma & Huo, 2023; Rapp et al., 2021). The considerate and kind nature of ChatGPT's humanlike interactions facilitates simple and pleasant communication, further enhancing user satisfaction. Based on this discussion, the following hypothesis is proposed:

*H4: Perceived Humanness positively impacts on positive emotions of ChatGPT as a virtual travel agent.*

#### 2.2.5. Customer’s emotions and outcomes

Customers' emotions during interactions with AI devices shape their intentions towards using ChatGPT as a virtual travel agent. Positive emotions are associated with higher acceptance rates of advanced technologies. Fan et al. (2022) emphasize that customers are increasingly predisposed to incorporating AI solutions into their daily lives when these technologies demonstrate personalization, accuracy, and responsiveness that meets or exceeds human advisors. Their

willingness to utilize such solutions correlates strongly with higher acceptance rates of advanced technologies. Based on these insights, the following hypothesis is proposed:

*H5: Emotions are positively related to customer's acceptance of using ChatGPT as virtual travel agent.*

*H6: Emotions are positively related to customer's willingness of using ChatGPT as virtual travel agent.*

*H7: Customer's acceptance is positively related to customer's willingness of using ChatGPT as virtual travel agent.*

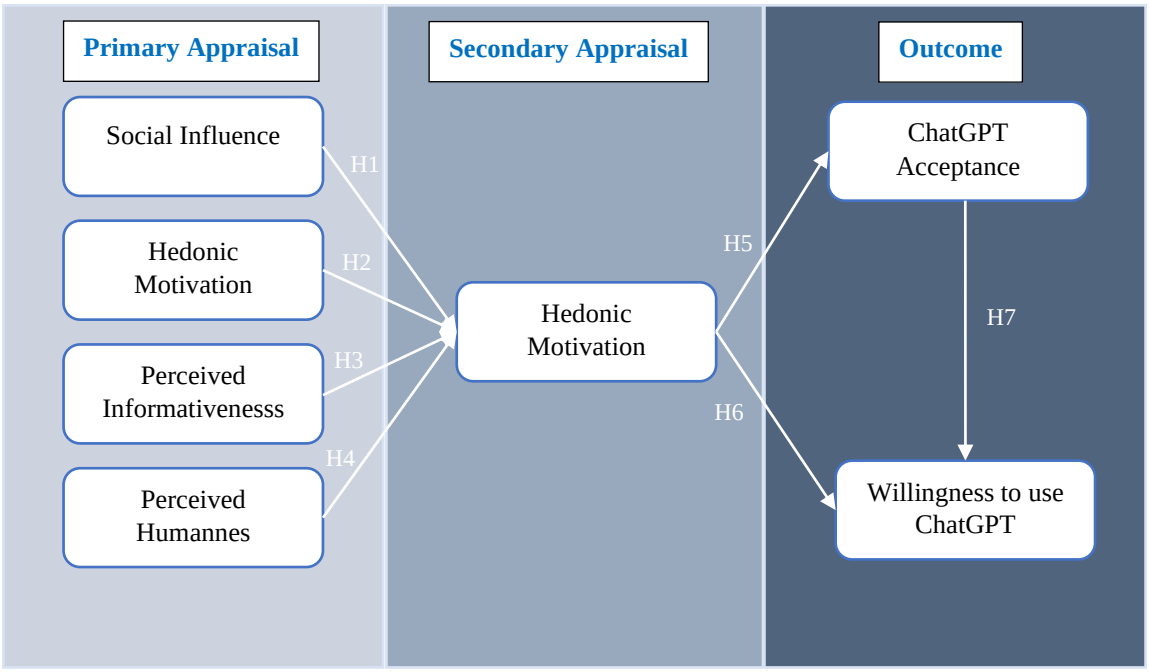



**Figure 10. Research Model**

## III. RESULT AND DISCUSSION

### 3.1. Measures

The survey questionnaire items were adapted from established studies and tailored for tourism services using AI to ensure credibility and reliability. A panel of five experts, including tourism managers and professors from Ho Chi Minh University, validated the content. Social Influence (SOI) was based on Grover et al. (2022), Hedonic Motivation (HEM) from Blümel et al. (2024), Perceived Informativeness (POI) from Vanjani et al. (2019), Perceived Humanness (POH) from Sophia et al. (2024), Emotion (EMO) from Ribeiro et al. (2021), ChatGPT Acceptance (CGA) from Goli et al. (2023), and Willingness to Use ChatGPT (WTU) from Fan et al. (2023). The questionnaire used a 5-point Likert scale from 1 ("Strongly Disagree") to 5 ("Strongly Agree"), and was translated into Vietnamese by bilingual lecturers for accuracy.

### 3.2. Data collection

Purposive sampling gathered data through an online questionnaire with two sections. The first section screened for experience with generative AI tools like ChatGPT and collected demographic information. Data collection occurred through survey links shared in public travel-focused Facebook groups and emails to customers of a travel company using AI services. Participation was voluntary, targeting tourists aged 18 and above familiar with AI applications. Purposive sampling was selected over random sampling methods due to the specific research objectives requiring participants with particular characteristics and experiences. This non-probability sampling technique allowed for intentional selection of participants based on their experience with generative AI tools in travel contexts, which was essential for addressing the research questions. Unlike random sampling, purposive sampling enabled targeting individuals who could provide valuable insights specific to AI adoption in tourism settings, creating a more relevant dataset for analysis. While this approach limits statistical generalizability to the broader population, it enhances the qualitative depth of insights from participants with the desired characteristics. 405 valid questionnaires were collected

after excluding incomplete responses, ensuring anonymity and privacy throughout the process. The sample comprises 45.19% male and 54.81% female respondents, indicating a slight overrepresentation of females. Most respondents are young adults, with 26% aged 18-20 years and 23% in the 21-30 and 31-40 age groups. Older age groups (41-50 and above 51 years) constitute 18% and 10%, respectively. The educational background is diverse, with 30% holding an undergraduate degree, 19% having completed high school, and 20% with postgraduate degrees. An additional 18% reported other qualifications. Regarding monthly earnings, 35% earn between 6 million and under 10 million, while 30% earn between 11 million and under 20 million. Only 15% report earnings above 21 million. Additionally, the sample includes 32% employed individuals, 31% entrepreneurs, 22% students, and 15% unemployed, reflecting a range of professional statuses. Regarding annual travel, 33% travel 3-4 times, 28% travel 1-2 times, and 17% prefer to stay at home. The duration of ChatGPT usage shows high engagement, with 35% using it for over a year, 33% for 6 months to 1 year, and 31.85% for less than six months. The detailed demographic profile is provided in Table 2.

**Table 2. Demographic characteristics (N = 405)**

| Variables | Frequencies | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 183 | 45.19 |
| Female | 222 | 54.81 |
| **Age Group** | | |
| Between 18 and 20 years | 105 | 26.00 |
| Between 21 and 30 years | 93 | 23.00 |
| Between 31 and 40 years | 93 | 23.00 |
| Between 41 and 50 years | 73 | 18.00 |
| Above 51 years | 41 | 10.00 |
| **Level of Education** | | |
| Less than High School | 53 | 13.00 |
| High School Graduate | 77 | 19.00 |
| Undergraduate Degree | 122 | 30.00 |
| Postgraduate Degree | 81 | 20.00 |
| Other | 73 | 18.00 |
| **Monthly Earnings** | | |
| Less than 5 million | 81 | 20.00 |
| Between 6 and under 10 million | 142 | 35.00 |
| Between 11 and under 20 million | 122 | 30.00 |
| Above 21 million | 61 | 15.00 |
| **Professional Status** | | |
| Student | 89 | 22.00 |
| Entrepreneur | 126 | 31.00 |
| Employed | 130 | 32.00 |
| Unemployed | 61 | 15.00 |
| **Number of Travels Annually** | | |
| 1-2 times | 113 | 28.00 |
| 3-4 times | 134 | 33.00 |
| More than 4 times | 89 | 22.00 |
| Prefer staying at home | 69 | 17.00 |
| **Duration of ChatGPT Usage** | | |
| Less than 6 months | 129 | 31.85 |
| Between 6 months and 1 year | 134 | 33.00 |
| More than 1 year | 142 | 35.00 |

**3.3. Measurement assessment**

The measurement model underwent evaluation using Smart-PLS to analyze outer loadings, reliability, and construct validity (see Table 1). Most item loadings exceeded the recommended threshold of 0.70 (Hair et al., 2014), ensuring strong indicator reliability. Two items, HEM4 (0.651) and SOI2 (0.693), below the standard, were excluded. Constructs exhibited high internal consistency, exceeding the minimum recommended values for Cronbach's Alpha and Composite Reliability (Nunnally, 1978). This affirms construct reliability and consistency within the study. Average Variance Extracted (AVE) values surpassed the 0.50 benchmark, confirming convergent validity. Discriminant validity was validated using the Heterotrait-Monotrait Ratio (HTMT), supporting the distinctiveness of constructs within the model.

**Table 3. Measurement and construct realiability**

| **Variables** | **Items** | **Outer Loadings** | **α** | **CR** | **AVE** |
|---|---|---|---|---|---|
| HEM | HEM1 | 0.802 | 0.761 | 0.764 | 0.676 |
| | HEM2 | 0.751 | | | |
| | HEM3 | 0.829 | | | |
| | HEM4 | 0.651 | | | |
| POH | POH1 | 0.835 | 0.848 | 0.854 | 0.685 |
| | POH2 | 0.845 | | | |
| | POH3 | 0.808 | | | |
| | POH4 | 0.824 | | | |
| POI | POI1 | 0.813 | 0.824 | 0.826 | 0.654 |
| | POI2 | 0.811 | | | |
| | POI3 | 0.795 | | | |
| | POI4 | 0.816 | | | |
| SOI | SOI1 | 0.754 | 0.738 | 0.739 | 0.657 |
| | SOI2 | 0.693 | | | |
| | SOI3 | 0.806 | | | |
| | SOI4 | 0.781 | | | |
| EMO | EMO1 | 0.763 | 0.788 | 0.789 | 0.611 |
| | EMO2 | 0.808 | | | |
| | EMO3 | 0.770 | | | |
| | EMO4 | 0.785 | | | |
| WTU | WTU1 | 0.856 | 0.829 | 0.846 | 0.745 |
| | WTU2 | 0.905 | | | |
| | WTU3 | 0.826 | | | |
| CGA | CGA1 | 0.874 | 0.850 | 0.851 | 0.769 |
| | CGA2 | 0.887 | | | |
| | CGA3 | 0.870 | | | |

*Note: α: Cronbach Alpha; CR: Composite Reliability; AVE: Average Variance Extract*

**Table 4. Constructs validity**

| Heterotrait - Monotrait Ratio (HTMT) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CGA** | **EMO** | **HEM** | **POH** | **POI** | **SOI** | **WTU** |
| **CGA** | | | | | | | |
| **EMO** | 0.699 | | | | | | |
| **HEM** | 0.577 | 0.718 | | | | | |
| **POH** | 0.548 | 0.497 | 0.512 | | | | |
| **POI** | 0.492 | 0.786 | 0.643 | 0.383 | | | |
| **SOI** | 0.618 | 0.83 | 0.697 | 0.512 | 0.677 | | |
| **WTU** | 0.814 | 0.67 | 0.592 | 0.594 | 0.488 | 0.619 | |

### 3.4. Common Method Bias

To address common method bias, rigorous techniques were applied. Harman's single-factor analysis assessed standard method variance, revealing no significant issue as no single factor explained over 50% of the variance (Podsakoff et al., 2003). Exploratory Factor Analysis (EFA) demonstrated adequacy for factor analysis with a high Kaiser-Meyer-Olkin (KMO) Index of 0.923 and significant Bartlett's test results (Chi-Square = 5234.060, df = 325, $p < 0.001$). Collinearity assessment, evaluating variance inflation factors (VIF), indicated no significant concerns, with VIF values below the recommended threshold of 3.30 (Kock, 2015). These measures confirm that common method bias did not impact the study's findings.

### 3.5. Results

#### 3.5.1. Hypothesis testing

Results strongly support the research model's proposed relationships (refer to Table 4). All seven hypotheses were statistically significant at the $p < 0.05$ level. Social Influence (SOI), Hedonic Motivation (HEM), Perceived Informativeness (POI), Perceived Humanness (POH), significantly and positively influenced Emotion (EMO), and Emotion (EMO) significantly and positively influenced ChatGPT Acceptance (CGA) and Willingness to Use ChatGPT (WTU). These findings align with prior studies and emphasize the importance of emotional engagement, perceived value, and trust in technology acceptance and continued usage behavior.

**Table 15. Hypotheses Testing**

| Hypotheses | Path | Original sample (O) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | Results |
|---|---|---|---|---|---|---|
| **H1** | SOI -> EMO | 0.322 | 0.067 | 4.788 | 0.000 | **Accepted** |
| **H2** | HEM -> EMO | 0.176 | 0.056 | 3.150 | 0.002 | **Accepted** |
| **H3** | POI -> EMO | 0.341 | 0.057 | 5.950 | 0.000 | **Accepted** |
| **H4** | POH -> EMO | 0.100 | 0.038 | 2.674 | 0.008 | **Accepted** |
| **H5** | EMO -> CGA | 0.574 | 0.045 | 12.723 | 0.000 | **Accepted** |
| **H6** | EMO -> WTU | 0.231 | 0.045 | 5.077 | 0.000 | **Accepted** |
| **H7** | CGA -> WTU | 0.557 | 0.050 | 11.210 | 0.000 | **Accepted** |

### 3.6. Discussion

This study investigated the factors influencing emotional engagement (EMO) with ChatGPT as a virtual travel agent and explores how this engagement influences user attitudes and behavioral intentions. The results shed light on user engagement dynamics with AI-driven technologies in virtual settings. The significant and positive relationship between social influence (SOI) and emotional engagement (EMO) supports H1, indicating that greater social pressure or endorsement enhances emotional involvement with ChatGPT. Hedonic motivation (HEM) positively influences emotional engagement (H2), emphasizing the role of pleasure in fostering attachment to technology. Perceived informativeness (POI) strongly impacts emotional engagement (H3), highlighting the importance of relevant information. While perceived humanness (POH) contributes to emotional engagement, its impact is less significant compared to social influence, hedonic motivation, and perceived informativeness. Emotional engagement is crucial in ChatGPT Acceptance (CGA), driving users' willingness to use the virtual agent (WTU). These findings align with existing research and reinforce the significance of emotional connections, perceived value, and trust in technology acceptance. The study underscores the pivotal role of emotional engagement in encouraging continued use of ChatGPT, emphasizing its utility, value, and relevance in travel-related tasks. Additionally, the study supports the notion that emotional engagement and trust are essential for AI acceptance, influencing users' willingness to adopt ChatGPT. Positive interactions with ChatGPT enhance acceptance and reliance in travel decision-making processes, reinforcing the link between ChatGPT Acceptance (CGA) and Willingness to Use ChatGPT (WTU). Users' favorable perceptions of ChatGPT's utility, ease of use, and personalized service contribute to increased confidence and satisfaction, driving

their willingness to integrate the technology into their travel-related decisions.

### 3.7 Implications and Future Research

The study's findings carry implications for AI-driven virtual agent design, especially in service sectors like travel. Social influence, hedonic motivation, perceived informativeness, and perceived humanness underscore the need for a holistic approach in virtual agent design to enhance user engagement. Features aligning with these factors, such as providing valuable information and creating enjoyable experiences, can deepen users' emotional connections with the technology. Emotional engagement's impact on attitudes (like gratitude) and behavioral intentions (like willingness to use) stresses the importance of cultivating positive user experiences for sustained engagement. Despite ChatGPT's potential benefits, several significant barriers impede its widespread implementation in tourism contexts. Research indicates that algorithmic errors pose a substantial challenge, with inaccurate information provided by ChatGPT significantly reducing users' reliance on its recommendations and diminishing their likelihood of visiting recommended destinations (Kim et al., 2023). The perceived accuracy and trustworthiness of information directly mediates user acceptance of AI recommendations, with the prominence of incorrect information serving as a critical moderating factor (Kim et al., 2023). Recent studies demonstrate that misleading responses stem from ChatGPT's lack of transparency regarding information sources, raising concerns about the authenticity and reliability of its outputs (Vu et al., 2024). Additionally, ChatGPT faces challenges in understanding complex or specialized domain questions relevant to tourism, limiting its utility for sophisticated travel planning. The system also struggles with maintaining updated knowledge in an industry where information changes frequently, requiring continuous knowledge base maintenance (Vu et al., 2024). Regarding personalization, ChatGPT must overcome the diversification of user needs, as travelers have highly individualized preferences requiring tailored recommendations. While ChatGPT can analyze dialogue data to provide personalized suggestions, its effectiveness varies across different user segments and cultural contexts. These implementation barriers necessitate strategic approaches, including rigorous data verification processes, specialized tourism knowledge integration, and advanced personalization algorithms to enhance user trust and engagement with AI-driven travel services. Future research avenues could explore variables like trust and personalization in emotional engagement, delve into cross-cultural differences in virtual agent engagement, and examine emotional engagement's link to satisfaction, loyalty, and advocacy for a more nuanced understanding of user behavior in tech-driven settings.

## IV. CONCLUSION

This study underscores the significant role of emotional engagement in shaping users' interactions with ChatGPT as a virtual travel agent. The findings provide valuable insights into how various factors—such as social influence, hedonic motivation, perceived informativeness, and perceived humanness—affect emotional engagement, which in turn influences users' attitudes and behavioral intentions. By enhancing emotional engagement, developers and organizations can foster greater user loyalty, satisfaction, and continued usage of AI-driven technologies.

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# THE POTENTIAL FOR DEVELOPING AGRICULTURAL TOURISM LINKED TO GEOGRAPHICAL INDICATION AGRICULTURAL PRODUCTS IN TIEN GIANG PROVINCE

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**ABSTRACT**

Tien Giang province, with its rich and diverse tropical fruit orchards, holds great potential in attracting tourists. Notably, two types of fruit have been granted Geographical Indication (GI) certification, not only well-known domestically but also recognized internationally, contributing to the influx of visitors. Agricultural products with GI not only enhance the diversity of goods and increase economic value but also open up new opportunities for local tourism development, with products closely tied to the unique characteristics of the region. Tourists visiting here can enjoy not only the natural beauty and cultural experiences along rural waterways but also local specialty products, prepared with the distinctive flavors of the area, making them an ideal choice for both consumption and souvenirs. This not only contributes to the sustainable economic development of the local area but also helps promote local tourism products and Vietnamese tourism to domestic and international visitors. Therefore, the article analyzes the potential for community-based tourism development linked to GI agricultural products and evaluates the strengths, weaknesses, opportunities, and challenges of this development. Based on this analysis, the article proposes several solutions to support the development of agricultural tourism linked with GI agricultural products, contributing to the growth and sustainable economic development of the local area through agricultural tourism activities.

*Key words:* “Agricultural Tourism”, “Geographical Indication”, “Tien Giang province”, “Agricultural Products”

## I. INTRODUCTION

Tien Giang is a province in the Mekong Delta region, known for its distinctive characteristics of the waterway region. It has an area of 2,510.5 square kilometers (as of 2023) and consists of 11 administrative units, including 2 cities (My Tho and Go Cong), 1 town (Cai Lay), and 8 districts (Cai Be, Tan Phuoc, Cai Lay, Chau Thanh, Cho Gao, Go Cong Tay, Go Cong Dong, and Tan Phu Dong). The province is renowned for its rich natural environment, with fruit orchards bearing fruit all year round, offering over 20 types of seasonal fruit. Additionally, Tien Giang attracts many tourists annually, especially international visitors, who come to experience community-based eco-tourism, agricultural tourism, visiting fruit orchards, and rowing traditional boats. This helps Tien Giang's tourism sector to grow steadily and is recognized as a key economic sector that brings in significant revenue.

Thanks to its natural resources, Tien Giang attracts many tourists, with international visitors making up the largest portion. This is a competitive advantage for the province's tourism development. With its unique features of the Mekong Delta and favorable conditions for tourism growth, combined with its advantageous geographical location about 70 km from Ho Chi Minh City, Tien Giang offers a convenient destination for tourists. One of the most popular types of tourism is community-based eco-tourism, particularly eco-tourism experiences in fruit orchards, which are highly preferred, especially in orchards with fruits typical of the province.

Tien Giang is home to two internationally recognized GI agricultural products: the Vinh Kim Lo Ren star apple and Hoa Loc mango. These products have high economic value, with a variety of offerings such as fresh fruits and processed products. GI agricultural products not only serve as the province's unique trademark but also offer high quality and significant economic value. These two tropical fruit species are grown throughout the Mekong Delta and neighboring areas. However, Tien Giang stands out as both the "birthplace" of these agricultural products and the region with a unique quality that cannot be found elsewhere. It is also designated as a specialized production zone with GI.

A typical example of combining agricultural tourism with GI agricultural products that has been successful in

several countries around the world is New Zealand, which is famous for its GI agricultural product: the kiwi fruit. In New Zealand, tourism has been developed around this GI agricultural product by creating tours that include visits to kiwi orchards, where visitors can learn about the cultivation and harvesting of Kiwi. In addition, tourists can also experience and purchase kiwi-based products such as juice, jam, and ice cream as souvenirs. Similarly, in Greece, the thyme honey from Crete Island is a GI product that has been successfully developed for tourism. Tourists visiting Crete can join tours to visit beekeeping farms on the island, where they can learn about bee farming, honey production, and the health benefits of thyme honey. Moreover, visitors can also enjoy tasting various types of honey and honey-based products.

With the rapid development of agricultural tourism, especially community-based agricultural tourism tied to fruit orchards with GI, Tien Giang's tourism sector is seeing considerable growth. The development of GI agricultural products brings high economic efficiency, and the integration of tourism with these products in the designated GI areas is a promising direction for further growth.

## II. MATERIAL AND METHOD

### 2.1. Material

#### Conceptual Foundation

The article has used secondary data from statistics in localities that are producing and have been certified for GI, sourced from the Department of Agriculture and Rural Development of Tien Giang Province, as well as relevant departments such as the Agriculture and Rural Development Divisions of Cai Be, Cai Lay, and Chau Thanh districts, and the Economic Division of My Tho City, Tien Giang Province.

In addition, the author has also used data collected from surveys and interviews with local farmers who produce GI agricultural products, as well as feedback from both domestic and international tourists, to compile the statistical data.

#### Research focus

The article focuses on researching agricultural tourism in Tien Giang province, with an emphasis on the potential for developing agricultural tourism in combination with the province's GI agricultural products. From this, the article provides orientations and solutions to help develop GI agricultural products alongside tourism, aiming to generate additional income for residents in the regions where these GI agricultural products are produced.

### 2.2. Method

*Field survey method:* Throughout the research process, the author spent time visiting localities in the GI areas to conduct field surveys in 16 specialized communes growing Vinh Kim Lo Ren star apples in the districts of Chau Thanh, Cai Lay, and My Tho City, and 13 communes growing Hoa Loc mangoes in Cai Be district, Tien Giang province. The survey focused on locations where local people actively participate in agricultural tourism. Through these field visits, the author gained a more practical understanding, allowing for objective observations about agricultural products from theoretical concepts to real production processes.

*Data Collection and Processing Methods:* During the research process, the author visited various government departments to collect relevant information and statistical data related to the study, such as data on the area and yield of GI agricultural products, tourist numbers, and agricultural tourism sites within the study area. This data was then compiled and processed for use as illustrative figures, ensuring the research was more scientifically grounded. By utilizing official data sources, the author was able to propose solutions based on solid evidence to further develop the subject.

*Sociological Survey Method:* This method was chosen by the author for statistical purposes, using questionnaires to collect primary data that reflects the reality in the study area. The survey targets were tourists, owners of agricultural tourism sites growing GI crops, and establishments involved in processing GI agricultural products. The survey focused on the production status of GI agricultural products, tourist arrival figures, accommodation facilities, and agricultural tourism activities. The geographical area for the interviews was concentrated on the agricultural regions in four districts: Chau Thanh, Cai Lay, My Tho City, and Cai Be. The sample selection formula was based on Cochran's formula (Cochran, W.G, 1977), considering the number of households growing GI agricultural products and those

participating in tourism services. A total of 84 questionnaires were distributed in the area producing Vinh Kim Lo Ren star apple, 95 in the area producing Hoa Loc Mango, and 35 surveys were conducted with tourists. This primary data provided the author with a realistic foundation for the study, ensuring its relevance and practical application.

*Mapping method:* The author created maps to visually represent the distribution areas and factors affecting the production of GI agricultural products in the geographical areas for both types of agricultural products, helping to illustrate spatial distribution more clearly.

*SWOT analysis method:* The author analyzed the strengths, weaknesses, opportunities, and challenges of factors influencing the production of GI agricultural products in Tien Giang province. Based on this analysis, the author offered objective recommendations and solutions to help develop GI agricultural products in the province.

## III. RESULT AND DISCUSSION

### 3.1. Result

**– Factors Affecting the Development of Agricultural Tourism Linked with GI-certified Agricultural Products in Tien Giang Province:**

*Geographical Location:*

The Vinh Kim Lo Ren star apple is grown in the geographical area corresponding to the GI certification in Chau Thanh district, including 12 communes: Nhi Binh, Duong Diem, Dong Hoa, Huu Dao, Long Hung, Binh Trung, Thanh Phu, Ban Long, Vinh Kim, Song Thuan, Kim Son, Phu Phong (Department of Agriculture and Rural Development of Chau Thanh District, 2023); Phuoc Thach commune in My Tho City (Economic Department of My Tho City, Tien Giang Province, 2023); and Cai Lay district with three communes: My Long, Long Tien, Tam Binh (Department of Agriculture and Rural Development of Cai Lay District, 2023).

The Hoa Loc mango is grown and certified in 13 communes in Cai Be district, including Hoa Hung, An Huu, An Thai Trung, Tan Hung, Tan Thanh, My Luong, An Thai Dong, My Duc Tay, My Duc Dong, Thien Tri, Hoa Khanh, Hau Thanh, My Loi A.

*Natural Tourism Resources:*

Topography: The area has easy drainage and high, flat land that is ideal for growing a variety of tropical fruits, including the Vinh Kim Lo Ren star apple and Hoa Loc mango, which are well-known for their unique quality in the market. These fruits are grown in areas with elevated soil ridges and annually receive rich alluvial deposits.

Climate: The Vinh Kim Lo Ren star apple and Hoa Loc mango thrive in temperatures around 27,9°C, with humidity at 79,2% and annual rainfall between 1200 - 1450mm. From June to November, these plants require large amounts of water as this is a critical period for accumulating nutrients such as acids, sugar, and vitamin C. From December to May of the following year, the trees need less water to preserve the fruit quality as they approach harvest, which coincides with the dry season. Additionally, the southwest monsoon winds from May to October align with the flowering and pollination periods, facilitating fruit development.

Water Resources: Consistent irrigation is vital for the growth of Vinh Kim Lo Ren star apple, which require abundant water while also needing good drainage to prevent root rot.

*Tourism Resources:*

Tien Giang is known for its diverse fruit orchards, offering different fruits each season. The Vinh Kim Lo Ren star apple is harvested around November to January, and the Hoa Loc mango is harvested around February to March. However, thanks to advancements in science and technology, farmers have learned to manage off-season flowering and fruiting, providing additional opportunities for economic growth, including tourism. The province also boasts over 20 different types of fruits, ensuring that tourists can visit frequently to experience new products.

With the development of the "One Commune, One Product" (OCOP) program, many local products, including GI agricultural products, have been further promoted. By 2022, the program had expanded to 174 products in the province, with 94 products achieving a 4-star OCOP certification.

*Cultural Tourism Resources:*

Tien Giang has a long history of cultivating Vinh Kim Lo Ren star apple and Hoa Loc mango. The area has extensive cultivation and a wealth of local expertise in producing high-quality fruits.

In addition to natural tourism attractions, there are several cultural landmarks in the GI regions. For the Vinh Kim Lo Ren star apple, the key cultural tourism sites include Vinh Trang Pagoda, the Rach Gam – Xoai Mut historical site, Ap Bac historical site, the Four Heroes Memorial, and the memorial of writer Son Nam. These sites are also well-connected to famous tourist routes, such as the Tu Linh islets on the Tien River (MeKong River), enhancing tourism development in the area through agricultural activities.

The area growing Hoa Loc mango in Cai Be is also home to fertile fruit orchards with opportunities for eco-tourism. Additionally, Cai Be boasts cultural landmarks like the Cai Be Floating Market and the Dong Hoa Hiep ancient village. These locations can be integrated into a diverse tourism offering, attracting visitors and encouraging them to stay overnight.

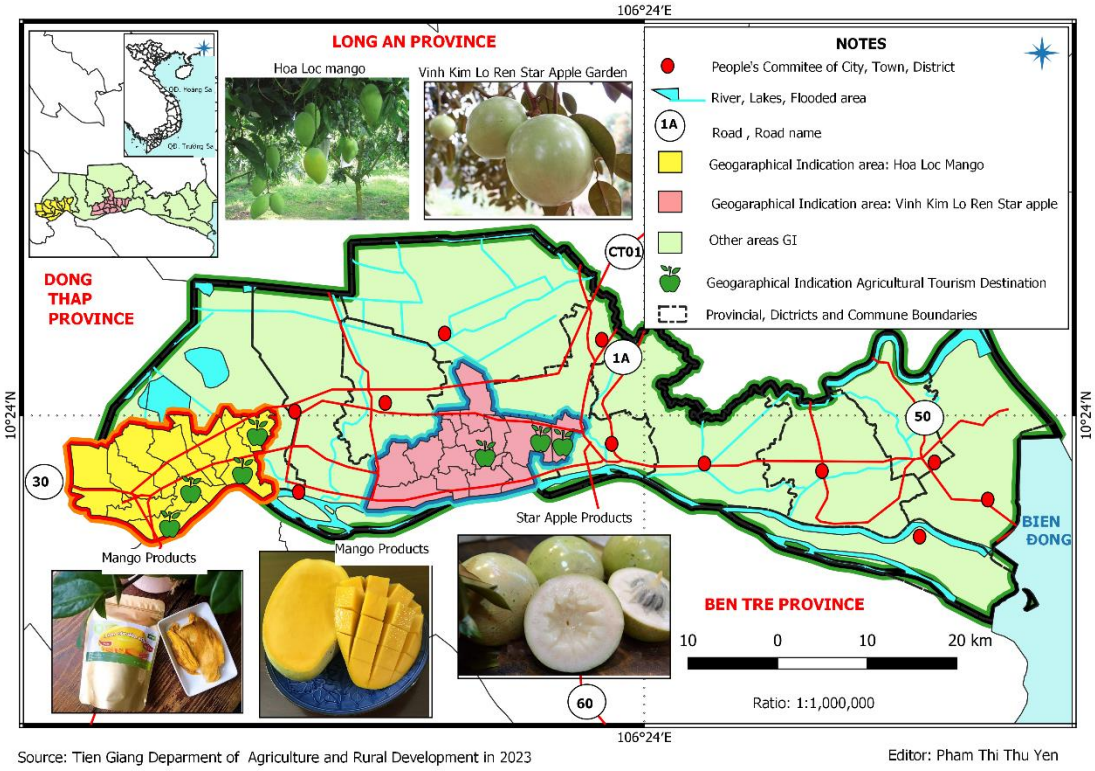



**Figure 2.1: Map of Potential for Developing Agricultural Tourism Linked with GI-certified Agricultural Products in Tien Giang Province in 2023**

The geographical areas where GI agricultural products are distributed in Tien Giang province are strategically located along the main stretch of National Highway 1A, providing convenient access for tourism development. Additionally, the GI products offer a unique advantage in terms of branding and product quality, which draws visitors seeking to experience local "specialties." Beyond the orchards of these two GI agricultural products, the area also offers a variety of crops, adding diversity to the range of products for tourists. Furthermore, local farmers and cooperatives have developed strongly in processing fresh GI agricultural products, allowing visitors to sample and purchase these items as souvenirs, thus enhancing the promotion of the product's brand.

– **Current Status of Agricultural Tourism Linked with GI Agricultural Products in Tien Giang Province**

Evaluation of the potential of agricultural tourism activities associated with GI agricultural products in Tien Giang province shows that localities in the GI area have a lot of development potential. It shows that the 5 criteria that the author gave for the survey all received positive feedback, in which the factor of local community achieved a perfect score, followed by the criteria of location and accessibility. Ranked 3rd is attractive tourism products, 4th is tourism safety and the final factor is infrastructure.

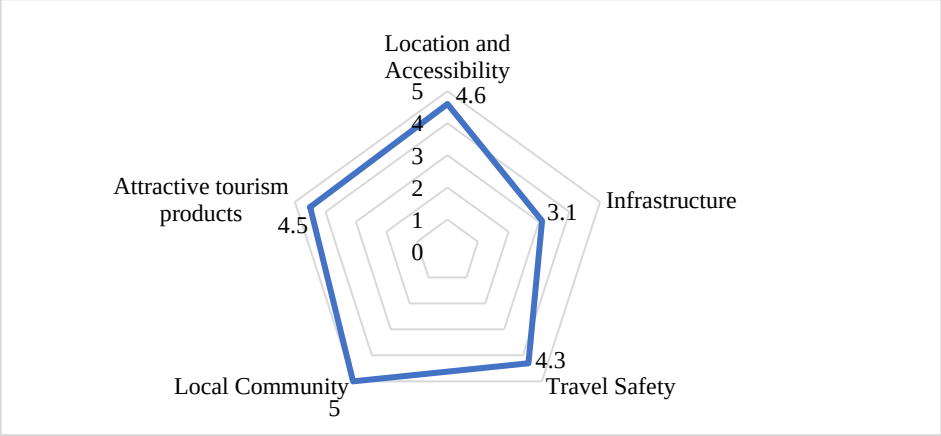



**Chart 2.1: Tourist Evaluation of the Appeal of Tourism Resources in the GI Areas of Two Agricultural Products**

*Source: Analysis from the author's survey*

The distinctive tourism products exclusive to the GI regions have made it a popular destination for tourists who come mainly to enjoy the local specialties. Many visitors also choose this area for relaxation, seeking harmony with nature after a period of work or study. Additionally, numerous tourists are drawn to the opportunity to explore the pristine landscapes while engaging in hands-on experiences with local farmers, participating in agricultural activities. This form of experiential tourism is particularly favored by international visitors.

This highlights the strong appeal of the area, driven by its unique tourism offerings, the ability to connect with nature, and opportunities for interactive learning experiences that attract both local and international tourists.

| Tourist Activity | Frequency | Percentage (%) |
|---|---|---|
| Exploring natural landscapes | 4 | 11.4 |
| Tasting local specialties | 13 | 37.1 |
| Experiencing activities with farmers | 5 | 14.3 |
| Relaxation activities | 7 | 20.0 |
| Other activities | 6 | 17.1 |

*Source: Analysis from the author's survey, N=35*

**Table 2.1: Tourist Activities When Visiting the GI Agricultural Product Areas**

**– SWOT Analysis on the Potential for Developing Agricultural Tourism Linked with GI Agricultural Products in Tien Giang Province**

| | Strengths (S) | Weaknesses (W) |
|---|---|---|
| **SWOT** | -Natural conditions and socio-economic conditions are favorable for the development of many types of tourism<br>- Hoa Loc mango and Vinh Kim Lo Ren star apple are of high quality, certified for international GI in the GI area<br>- Long-standing growing area, specialized farming area, with unique local characteristics<br>- Meets Global Gap standards, famous product brands, diverse processed products, 4-star OCOP<br>- Close to other tourist destinations<br>- Flowers and fruits have been processed out of season, so they will be available to | -Weather and climate affect quality and productivity, especially during the flowering and pollination stages<br>- There are not many standard accommodation facilities to serve tourists<br>- The route has not yet exploited its full tourism potential in the geographical indication area<br>- People mainly work in agriculture and have no experience in the tourism field<br>- Depends on the geographical indication agricultural product |

| | | |
|---|---|---|
| | serve customers all year round<br>- Diverse agricultural products in designated areas | harvest time |
| | **Opportunities (O)** | **Threats (T)** |
| | -Agricultural policy on developing Hoa Loc mango and Vinh Kim Lo Ren star apple varieties<br>-OCOP program aims to diversify products made from Hoa Loc mango and Vinh Kim Lo Ren star apple to serve the product shopping needs of tourists.<br>- Large international visitors, demand for eco-tourism and experiences<br>- There are other seasonal agricultural products year-round to help diversify products<br>- Highly competitive, with unique characteristics only in geographical areas | - Customer demand for accommodation is still limited<br>- There are not many standard storage facilities to serve customers<br>- Not enough conditions to meet the requirements regularly, still depends a lot on the service season |
| **SO** | **ST** | **SW** |
| -Promoting the strengths of growing Hoa Loc mango and Vinh Kim Lo Ren star apple in specialized farming areas in geographical areas<br>- Maintain brand value, expand markets, especially international markets<br>- Brand promotion, Distinctive characteristics of local agricultural products<br>-Create opportunities to develop more products processed from Hoa Loc mango and Vinh Kim Lo Ren star apple achieving OCOP standards. | -Prevent pests and diseases, handle out-of-season flowering and fruiting with the application of science and technology"<br>- Maintain quality and brand<br>-Diversity of processed products Processed from agricultural products GI<br>-Combining other local agricultural products<br>- Invest in accommodation facilities, build more combined tourist routes in the province and region | -Promoting the brand of Hoa Loc mango, Vinh Kim Lo Ren star apple and products achieving OCOP<br>-Increase planting area in geographical areas<br>-Construction of equipment and accommodation facilities<br>- Training for farmers in implementing agricultural tourism<br>- Combine with localities to develop tourism inside and outside the province, and travel companies |
| **WO** | **WT** | **OT** |
| -Regularly use measures to improve the garden, cover fruit, treat flowers, and create off-season fruit for visitors to experience.<br>-Establish a large model garden, combining with surrounding households that have other types of agricultural products<br>-Build accommodation facilities in the garden for guests to experience | -Apply techniques, food safety and hygiene, Gap standards<br>-Invest in equipment to serve tourists<br>-Diverse agricultural tourism models | - Maintain the quality of Hoa Loc mango and Vinh Kim Lo Ren star apple products<br>- Identify customers to build models that suit customer needs<br>-Application of science and technology to increase product preservation time |

*Source: Analysis by Author*

**Table 2.2: SWOT Analysis on the Potential for Developing Agricultural Tourism Linked with GI Agricultural Products in Tien Giang Province**

– **Evaluate factors affecting the development of agricultural tourism associated with geographically indicated agricultural products**

*Favorable:*

Agricultural tourism associated with the geographical indications of agricultural products in Tien Giang province has great development potential. With its favorable geographic location, it offers advantages for development, being situated at the gateway to the Mekong Delta, which attracts tourists and facilitates tourism links with other provinces in the region, as well as with the Southeast region.

The transportation system is convenient, with both GI products located along National Highway 1A. Additionally, there are new expressways running north-south, such as the Ho Chi Minh City – Trung Luong expressway, Trung Luong – My Thuan expressway, and the My Tho port, which welcomes a large number of international visitors.

Tien Giang boasts a rich and diverse range of tourist resources. The region's flat terrain offers distinctive local features, with a relatively pristine and clean natural environment that is ideal for tourists seeking relaxation and experiencing the simple life of the local people.

Tien Giang is the birthplace of many historical and cultural sites, traditional craft villages, and various unique festivals, which create distinctive tourism products to attract visitors, especially international tourists. The province's cuisine is diverse, with specialties such as My Tho noodle soup, Vietnamese pancakes, fish hotpot, and a variety of tropical fruits, drawing tourists eager to explore. The local community is friendly, hospitable, and generous, with a high sense of community, solidarity, and a willingness to assist visitors.

*Hard:*

The human resources for the development of agricultural tourism in the GI areas are lacking in both quantity and quality. Most people involved in tourism have not received formal training or professional development in skills, expertise, or foreign languages, and lack experience.

The promotion and advertising of tourism spots related to GI agricultural products in the local area have not been adequately focused on. There have been no programs introducing the development of tourism linked to the province's GI agricultural products through media channels, leading to limited awareness among tourists, especially international visitors.

Tourism products in the GI areas lack diversity and are still largely spontaneous. The tourism offerings are too monotonous and lack a long-term strategic development plan. The integration of tourism development in these areas with more developed tourist routes has not been effective. The potential to combine these routes with GI agricultural tourist spots has not been fully exploited.

In terms of infrastructure, the technical facilities serving tourism in GI agricultural areas do not meet the required standards to accommodate the increasing demands of tourists.

The planning for tourism development in GI areas is slow, leading to spontaneous development. There is a lack of connection between the managing authorities, businesses, and the community, preventing effective collaboration in tourism development.

**3.2. Discussion**

Through the research process, the author has recognized that Tien Giang possesses many conditions for developing tourism based on GI agricultural products. However, the development has not yet been effective. Therefore, the author offers several recommendations regarding the potential for developing agricultural tourism linked to GI products in Tien Giang to highlight the importance of GI products in tourism development, aiming for more effective strategies. Specifically, the following points are made:

***Distinctive Features of Tourism Resources in GI Areas:*** Tien Giang is home to two agricultural products - Vinh Kim Lo Ren star apple, which was granted international GI certification in 2014, and Hoa Loc mango, which was certified in 2009. These certifications create a unique identity for Vietnamese agricultural brands on the global market. To earn GI certification, these products undergo a thorough evaluation process and must meet international criteria, particularly being certified within a specific geographical area where quality assessments are conducted. This

distinctive feature provides advantages for the products' development in both domestic and international markets. Additionally, Tien Giang has various opportunities to further enhance local tourism development.

***Natural Tourism Resources:*** The region is well-equipped to develop agricultural tourism, especially in combination with GI agricultural products. Its geographic location is extremely advantageous for developing tourism routes, particularly linking with other provinces in the Mekong Delta. The area embodies the unique characteristics of the Mekong Delta, with its flat terrain, dense river systems, and numerous winding canals, offering visitors a rich, immersive experience. The equatorial monsoon climate makes it suitable for year-round tourism, with a diverse array of tropical and equatorial agricultural products, in which the two GI products stand out.

***Cultural Tourism Resources:*** In addition to GI resources based on natural conditions, Tien Giang has maintained the reputation of its agricultural products through the traditional farming techniques of local people, with long-standing knowledge and experience. Moreover, the region features several cultural tourism sites that contribute to diversifying the range of attractions and experiences for visitors.

*Development Strategy:* The local area possesses the conditions necessary for tourism development, with a distinctive feature being GI agricultural products that are unique to specific regions within Tien Giang province. Therefore, government departments need to capitalize on these advantages to fully unleash the local potential. This can be done by building infrastructure to support tourism, designing specialized tourism programs such as visiting GI agricultural product orchards, experiencing farming practices for GI agricultural products, organizing agricultural festivals, and holding agricultural product fairs with OCOP products. Furthermore, community-based tourism in the GI regions should be developed, and additional GI certifications for other local agricultural products should be pursued. However, it is also crucial to identify potential risks to address them promptly and find solutions to maximize effectiveness. These risks may include the seasonality of agricultural products, pest and disease outbreaks during production, and the preservation of agricultural products, among others.

### 3.3. Solution

Based on the recommendations, the author proposes several solutions to contribute to the development of tourism from GI agricultural products in Tien Giang Province, specifically as follows:

*Policies*

This is the most important solution for developing tourism, including agricultural tourism. When local authorities implement timely and appropriate policies, the execution and development of tourism can be more effective. Issuing mechanisms and policies that encourage socialized investment in building tourism sites within GI regions, linked to sustainable livelihoods, is crucial. The continuation of the development project for key fruit trees initiated by the Tien Giang provincial government, in collaboration with the Department of Tourism, is essential for local tourism development. It is also necessary to organize workshops on agricultural promotion and tourism linked to local products, to guide and support farmers in applying modern scientific and technological techniques in cultivating GI agricultural products, ensuring a sufficient supply of tourism products. Furthermore, there should be close coordination between various departments, especially the Department of Culture, Sports, and Tourism, the Department of Agriculture and Rural Development, and local agricultural offices that manage GI agricultural products, to integrate tourism development with GI agricultural products. Moreover, it is essential to have supportive policies regarding capital, seedlings, local enterprises, and promoting local tourism products. Specific policies and regulations are needed to protect farmers in their production activities, ensure stability in the area cultivated, create conditions for enterprises to diversify processed products, and allow farmers to confidently expand production and business activities. These policies will also help in marketing and promoting local tourism products to attract both domestic and international tourists.

*Capital*

Financial support is an urgent solution for local people to invest in accommodation facilities and entertainment spots to attract tourists and encourage overnight stays, contributing to increasing local tourism revenue. Encouraging and supporting local people to participate in tourism development from agricultural activities. It is necessary to encourage people to invest in tourism development, such as establishing homestays, fruit orchards combined with tourism, product processing, and souvenirs, through specific regulations on financial support and preferential loans for

agricultural development investment.

*Human resources*

Training human resources to serve local tourism, especially in mountainous communes and districts of the province. Open tourism training classes for local people to participate and learn how to do tourism, especially in geographically designated areas. Strengthen propaganda work to raise awareness about tourism for leaders, managers and people at all levels to help officials and people be properly aware of the potential and advantages of local tourism and its role. its responsibility for tourism development.

*Infrastructure, cooperation and linkages*

Increase investment in developing infrastructure and technical facilities to serve tourism: take advantage of central and provincial resources to focus on investing in perfecting infrastructure, especially infrastructure. Accommodation, restaurants, entertainment facilities, resorts... in accordance with local needs and development orientation.

*Promotion and development of tourism markets and products*

Create and enhance the province's tourism image through professional and diversified promotion and advertising programs. Information is promoted in locations with a large number of tourists such as Cu Lao Thoi Son tourist destination, My Tho city, Dong Hoa Hiep ancient village,...

## IV.CONCLUSION

The research results show that agricultural tourism associated with GI agricultural products has significant development potential. However, the development of tourism linked to these two agricultural products has not been adequately prioritized for effective growth. Among the factors influencing tourism development, both natural elements and socio-economic factors, combined with the distinct quality of the GI products, provide advantages for development. In addition to promoting the main agricultural products of the two GI, integrating tourism development is also an opportunity for the local area to further grow and contribute to diversifying the province's tourism offerings, while meeting the demand of tourists interested in exploring the concept of "geographical indications" in agricultural products.

The two agricultural products, Vinh Kim Lo Ren star apple and Hoa Loc mango, have great potential for development because they are the "birthplaces" of these products, with large cultivation areas, supplying seeds to other regions, producing the highest quality products, and being key agricultural products in the provincial reorganization plan. These areas possess all the elements needed to develop tourism. However, tourism development in the GI areas of these two agricultural products has not yet been sufficiently addressed. Therefore, the author has chosen to research these areas to identify their development potential and propose solutions for advancing tourism in the GI regions, contributing to sustainable local economic growth.

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# THE IMPACT OF ARTIFICIAL INTELLIGENCE ON PERSONALIZED SUSTAINABLE TOURISM EXPERIENCE: THE MEDIATING ROLE OF REALIZING THE SUSTAINABILITY OF TRAVELERS

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**ABSTRACT**

This study analyses the impact of artificial intelligence (AI) on personalized and realizing the sustainability of travelers (PDE), as well as the mediating role of realizing the sustainability of travelers (RST). Using the least squares structure equation model (PLS-SEM), this study analyzed data from 436 travelers who employed AI technology in tourism. The findings indicate that AI not only directly positively influences PDE, STB, and STE but also indirectly through RST. RST plays a significant role in promoting the personalization of sustainable experiences and environmentally responsible behaviors. The research findings provide valuable implications for managers and businesses in leveraging AI to enhance sustainable travel experiences while promoting responsible behavior among travelers.

*Key words:*Artificial Intelligence (AI), Realizing the Sustainability of Travelers (RST), Sustainable Travel Experience Personalization (PDE), Sustainable Travel Behavior (STB), Travel Experience Satisfaction (STE)

## I. INTRODUCTION

The tourism industry is undergoing a significant transformation owing to advancements in AI technology. AI applications, such as chatbots, intelligent recommendation systems, and big data analytics, not only enhance service efficiency, but also provide personalized experiences for visitors (Yang, Zhang, & Feng, 2024). Concurrently, within the context of increasing emphasis on sustainable development, AI plays a crucial role in promoting sustainable awareness and behavior among travelers, thereby contributing to environmental conservation and supporting local communities (Zheng & Wu, 2023; Koo et al., 2024).

Although AI has demonstrated its efficacy as an advanced tool for optimizing services and encouraging sustainable behavior (Koo et al., 2024; Zheng & Wu, 2023), the tourism industry continues to face numerous challenges related to minimizing the negative environmental impacts and developing local communities. In this context, AI can play a significant role in personalizing travel experiences, enhancing travellers' awareness of sustainable values, and encouraging engagement in eco-friendly activities (Majid et al. 2024; Yang et al. 2024).

Previous research has indicated that personalizing the travel experience through AI recommendations not only enhances engagement but also creates a more relevant connection for travelers with sustainable journeys (Yang, Zhang, & Feng, 2024). RST is considered a critical factor influencing satisfaction (STE) and sustainable tourism behavior (STB) (Xu et al., 2024; Pai et al., 2020). Furthermore, smart travel technologies not only enhance the convenience and quality of the experience but also create long-term value for both visitors and destinations (Srivastava & Shandilya, 2024). Although numerous studies have demonstrated AI's capacity to raise awareness and promote sustainable behavior (Majid, Tussyadiah, & Kim, 2024), there remains a gap in understanding how cognitive factors such as RST function as intermediaries in the relationship between AI and sustainable tourism outcomes. Zheng and Wu (2023) also emphasized that, while AI technologies have driven the perception of sustainable value, the specific impact of this perception on the personalization of the experience and sustainable behavior of travelers has not yet been elucidated.

This study aims to address these gaps by examining the mediating role of RST in the relationship between AI and sustainable tourism-related outcomes, including PDE, STB, and STE. Additionally, this study expands the understanding of the synergy between AI technology and personal awareness in achieving sustainability goals, thereby

providing important implications for the tourism industry. With a novel approach and rigorous theoretical framework, this research not only contributes to filling academic gaps, but also provides significant practical recommendations for sustainable tourism development based on the integration of technology and visitor awareness.

## II. MATERIAL AND METHODOLOGY

### 2.1. Related concepts

**Artificial Intelligence (AI):** Artificial Intelligence (AI) is a field of computer science dedicated to developing systems capable of simulating human intelligence, including learning, reasoning, pattern recognition, natural language processing, and decision-making (Russell & Norvig, 2021). AI can be classified into two main categories: narrow and general AI. Narrow AI consists of systems designed to perform specific tasks, such as travel chatbots, personalized recommendation systems, or voice recognition technologies (Zheng & Wu, 2023). In contrast, General AI has the potential to learn and perform multiple complex tasks like humans but has not yet been fully developed (Ku & Chen, 2024). In the tourism sector, AI plays a crucial role in optimizing services, personalizing customer experiences, and fostering awareness and sustainable travel behavior through tools such as chatbots, big data analytics, and intelligent recommendation systems (Majid, Tussyadiah, & Kim, 2024). One of AI's most significant contributions to tourism is its ability to personalize the traveler's experience. By analyzing user data, AI can provide recommendations tailored to individual preferences, thereby enhancing overall travel experience. For instance, AI-powered systems can suggest eco-friendly destinations based on travelers' search histories and preferences (Yang, Zhang, & Feng, 2024). Additionally, AI provides detailed insights into sustainable tourism activities, contributing to the enhancement of travelers' awareness of environmental protection and local cultural preservation (Suanpang and Pothipassa, 2024). Beyond personalization, AI also enhances traveler satisfaction by creating seamless experiences, optimizing services, and improving the operational efficiency of destinations (Srivastava and Shandilya 2024). Furthermore, AI contributes to smart tourism management by forecasting travel trends, optimizing visitor flows, and supporting sustainable destination management strategies (Koo et al., 2024).

**Personal travel experience:** Personal travel experiences encompass the activities and perceptions an individual experiences when engaging in trips for leisure, exploration, or relaxation. According to the Vietnam Tourism Law of 2005, a tourist is defined as 'a person who travels or combines travel, except in cases of study, work, or practicing a profession for income at the destination' (Vietnam Tourism Law, 2005). This definition emphasizes that personal travel experience not only involves geographical relocation, but also encompasses the interactions, emotions, and perceptions that an individual acquires throughout the journey. Furthermore, the Vietnamese Encyclopedia (1995) defines tourism as "a form of human recreation and active sightseeing outside the place of residence with the purpose of resting, entertaining, and visiting scenic spots, historical sites, and cultural and artistic works." This definition indicates that personal travel experiences involve participation in activities aimed at relaxation, entertainment, and the expansion of cultural knowledge. Consequently, personal travel experiences can be conceptualized as a combination of activities, emotions, and perceptions that an individual experiences when departing from their usual place of residence to engage in tourism activities for purposes unrelated to work or study.

### 2.2. The impact of artificial intelligence on personalized sustainable tourism experience

Artificial Intelligence (AI) has transformed the tourism industry by enhancing personalization and promoting sustainable travel experiences. Through AI-driven technologies, such as chatbots, big data analytics, and recommendation systems, tourism enterprises can provide tailored experiences that align with both traveler preferences and sustainability objectives. This section analyzes the impact of AI on personalized sustainable tourism experiences by examining its role in enhancing personalization, influencing sustainable tourism behavior, and improving traveler satisfaction.

AI and Personalization in Sustainable Tourism: AI significantly enhances the personalization of sustainable tourism experiences by leveraging data analytics and machine learning to understand traveler preferences. AI-driven recommendation systems analyze user behavior, past travel history, and environmental preferences to suggest eco-friendly accommodations, sustainable travel routes, and cultural activities that align with responsible tourism practices (Yang, Zhang, & Feng, 2024). The capacity to provide personalized recommendations enhances traveler engagement

and increases the likelihood of adopting sustainable tourism behaviors (Majid, Tussyadiah, & Kim, 2024). Furthermore, AI-powered chatbots and virtual assistants offer real-time support, assisting travelers in making informed decisions regarding sustainable tourism options (Srivastava & Shandilya, 2024). These systems improve the efficiency of service delivery, while promoting sustainability awareness. AI also optimizes travel itineraries by suggesting routes with lower carbon footprints, reducing inefficient travel, and encouraging the use of public transportation or eco-friendly travel options (Koo et al., 2024).

AI's influence on sustainable tourism behavior: Artificial Intelligence (AI) promotes sustainable tourism behavior by increasing awareness and guiding travelers towards responsible choices. Through AI-powered platforms, travelers receive personalized recommendations that encourage eco-friendly accommodations, ethical tourism activities, and low-emission transportation alternatives (Zheng & Wu, 2023). AI systems also educate tourists on the environmental impact of their travel decisions, encourage behaviors that minimize carbon footprints, and support local communities (Xu et al., 2024). A significant contribution of AI in sustainable tourism is its role in predictive analytics. By analyzing patterns in tourism demand, AI assists businesses in optimizing resources, reducing overtourism, and implementing sustainable strategies (Ku & Chen, 2024). For instance, smart tourism technologies can distribute visitors across multiple locations to prevent congestion at popular sites, ensuring a more sustainable travel experience (Ghesh, Alexander, & Davis, 2024). Additionally, AI contributes to sustainable tourism marketing by targeting eco-conscious travelers and promoting sustainable tourism products. AI-powered platforms can tailor advertisements to travelers interested in sustainability, increasing their engagement with green tourism initiatives (Bedu et al., 2024).

AI and Traveler Satisfaction in Sustainable Tourism: AI enhances traveler satisfaction by improving the efficiency and quality of sustainable tourism experience. Smart AI-driven systems provide seamless booking experiences, instant travel assistance, and tailored recommendations, leading to higher satisfaction levels among eco-conscious tourists (Torabi et al. 2024). AI also improves the accessibility of sustainable tourism by offering multilanguage support, real-time updates, and customized itineraries that cater to diverse traveler needs (Suanpang & Pothipassa, 2024). Furthermore, AI-powered customer feedback systems can assist tourism providers in enhancing service quality. By analyzing traveler reviews and sentiment analysis, AI identifies areas for improvement, ensuring that sustainable tourism services meet travelers' expectations (Xu et al., 2024). This real-time adaptability strengthens the relationship between travelers and sustainable tourism businesses, fostering long-term engagement and repeat visits. Studies indicate that AI contributes to a more memorable tourism experience by providing interactive and immersive travel services such as augmented reality (AR) and virtual reality (VR) experiences that highlight cultural and environmental conservation efforts (Khan, 2024). This technology-driven approach increases travelers' engagement with sustainability initiatives while enriching their overall travel experience.

Challenges and Future Prospects of AI in Sustainable Tourism: Despite its advantages, AI in sustainable tourism faces challenges including ethical concerns, data privacy issues, and the digital divide between technologically advanced and developing tourism markets (Al-Romeedy & Alharethi, 2024). There is a need for responsible AI governance to ensure transparency in AI recommendations and to prevent biases that may favor commercial interests over genuine sustainability efforts (Tavitiyaman et al., 2021). The integration of AI with emerging technologies such as the Internet of Things (IoT) and blockchain can further enhance the personalization of sustainable tourism experiences. IoT-enabled smart destinations can provide real-time sustainability insights, whereas blockchain can enhance transparency in eco-tourism practices (Suanpang & Pothipassa, 2024). Continued research is essential to optimize AI's role of AI in promoting responsible tourism while addressing ethical and technological challenges.

### 2.3. Research hypothesis

#### 2.3.1. Artificial Intelligence - AI

AI has emerged as a crucial tool in the travel industry, offering the capability to personalize experiences, optimize services, and promote sustainable travel behavior through systems such as chatbots, data analytics, and other intelligent solutions (Zheng & Wu, 2023; Yang et al., 2024). AI can be categorized into various forms, including narrow AI designed to perform specific tasks, and strong AI (general AI), which is capable of learning and multitasking in a manner analogous to human cognition (Russell & Norvig, 2021). AI is defined as the field of research and application

of technologies that simulate human cognitive abilities, including learning, thinking, and decision making through computer systems.

In economic sectors, particularly the tourism industry, AI plays a significant role in disseminating information related to sustainable practices, thereby enhancing tourist awareness of the importance of sustainable tourism behavior. According to Koo et al. (2024), transparency in how AI technologies deliver sustainable value is a critical factor in shaping customer perception. Similarly, Zheng and Wu (2023) assert that AI-based smart travel technologies not only provide convenience, but also promote awareness of sustainable values through effective solutions. AI facilitates the personalization of travel experiences by analyzing individual preferences and optimizing suggestions based on user behavior (Yang et al., 2024). This enhances the interaction and sense of relevance of visitors for sustainable journeys. Concurrently, the integration of AI with IoT has created a more sustainable travel experience environment, particularly for smart destinations (Suanpang and Pothipassa, 2024). AI promotes sustainable behavior among tourists through applications that suggest eco-friendly activities. Majid et al. (2024) emphasize that AI chatbots have the potential to motivate customers to adopt sustainable travel habits by providing clear information and encouraging specific actions. Khan (2024) notes that AI increases travelers' engagement and sense of responsibility in sustainable religious practices. AI contributes to improving traveler satisfaction through service optimization and timely information provision. Srivastava and Shandilya (2024) posit that intelligent AI technologies enhance the convenience and overall quality of the traveler experience. Similarly, Torabi et al. (2024) demonstrated that AI could enhance memorable experiences and customer satisfaction, particularly in the context of rural tourism. AI is a powerful tool that not only raises awareness and promotes sustainable behavior but also significantly improves the quality of experience and satisfaction of travelers, contributing to the development of sustainable tourism. Based on relevant studies, the following hypotheses are proposed:

*H1: AI has a positive impact on Realizing the Sustainability of Travelers (RST)*

*H2: AI has a positive impact on Personalized and durable travel experience (PDE)*

*H3: AI has a positive impact on Sustainable Tourism Behaviour (STB)*

*H4: AI has a positive impact on Satisfaction with the travel experience (STE)*

**2.3.2. Realizing the Sustainability of Travelers (RST)**

The RST is a crucial factor in promoting the personalization of travel experiences. According to a study by Koo et al. (2024), RST enables travelers to comprehend their role in minimizing environmental impact and utilizing resources efficiently, thereby enhancing the personalization of experiences in accordance with sustainability principles. Travelers with high awareness of sustainability also tend to exhibit behaviors that are more aligned with these goals, such as selecting eco-friendly services, prioritizing local products, and engaging in community support activities (Majid et al., 2024). Furthermore, this perception enhances travellers' perceptions of the value of the experience, thereby improving their overall satisfaction. RST not only achieves personal goals, but also contributes to enhancing destination image, leading to higher levels of satisfaction (Xu et al., 2024). Research by Yang, Zhang, and Feng (2024) has demonstrated that personalizing the travel experience through intelligent suggestions from AI not only enhances engagement but also creates a more relevant experience for travelers with sustainable journeys. These findings indicate that when travelers possess a clear awareness of sustainability, they tend to prioritize personalized experiences in this direction. Similarly, Majid et al. (2024) demonstrated that AI chatbots have the potential to motivate travelers to adopt sustainable travel habits, suggesting that high awareness of the importance of sustainability encourages more responsible travel behavior. Additionally, Srivastava and Shandilya (2024) emphasized that smart tourism technology plays a significant role in enhancing traveler satisfaction by providing reliable and seamless services. As travelers become cognizant of the importance of sustainability and experience sustainability-oriented services, their satisfaction with trips increases significantly. Based on related theories, this study hypothesizes H4, H5, and H6:

*H4: RST has a positive impact on Visitor Sustainable Travel Experience Personalization (PDE)*

*H5: RST has a positive impact on Sustainable Tourism Behaviour (STB)*

*H6: RST has a positive impact on Travel Experience Satisfaction (STE)*

### 2.3.3. Personalized and durable travel experience (PDE)

The personalization of sustainable travel experiences (PDE) plays a significant role in promoting sustainable tourism behavior. Yang, Zhang and Feng (2024) assert that personalized suggestions from smart travel technologies are not only tailored to individual preferences but also guide users towards environmentally and socially responsible behaviors. Personalizing recommendations, such as selecting eco-friendly services or community-oriented tourism activities, enhances visitors' awareness of their personal responsibility towards sustainability goals. This creates a substantial incentive for them to engage in behaviors that closely align with sustainability principles. Majid et al. (2024) further emphasize that smart platforms, including AI chatbots, can guide and motivate travelers to adopt sustainable practices through personalized suggestions. Moreover, personalizing the experience not only addresses the needs of travelers, but also enhances their satisfaction with the trip. Srivastava and Shandilya (2024) posit that smart travel technology facilitates the provision of seamless, accurate, and reliable services, thereby enhancing overall visitor satisfaction. When personalized suggestions and experiences align with sustainable values, visitors experience increased satisfaction upon realizing that they not only achieve their personal goals but also contribute to environmental protection and social development. Research findings by Xu et al. (2024) demonstrated that integrating sustainable elements into personalized experiences promotes heightened feelings of satisfaction, attributed to the strong correlation between expectations and actual outcomes. Therefore, we propose the following hypotheses:

*H7: PDE has a positive impact on Sustainable Tourism Behaviour (STB)*

*H8: PDE has a positive impact on Travel Experience Satisfaction (STE)*

### 2.3.4. Sustainable Tourism Behavior (STB)

Sustainable tourism behavior (STB) positively influences visitor satisfaction (STE) by creating highly meaningful travel experiences and a sense of contribution to social and environmental benefits. Research conducted by Zheng and Wu (2023) indicate that travelers tend to report higher satisfaction with their trip when they engage in sustainable tourism practices, such as utilizing eco-friendly services or participating in community support programs. These behaviors not only engender a sense of personal value but also reinforce visitors' sense of social responsibility. Furthermore, Pai et al. (2020) assert that sustainable experiences can enhance traveler satisfaction by providing meaningful activities and creating a balance between personal and community benefits. This is particularly salient when visitors perceive that their behavior contributes to the sustainable development of the destination, thereby increasing their satisfaction with their trip. Xu et al. (2024) also emphasized the role of sustainability factors in the travel experience, arguing that traveler satisfaction is driven by an emotional connection to the destination's sustainability goals, thus increasing feelings of pride and contentment post-journey. Therefore, we propose the following hypotheses:

*H9: STB has a positive impact on Travel Experience Satisfaction (STE)*

### 2.3.5. The Mediating Role of Realizing the Sustainability of Travelers (RST)

RST was a significant mediating factor in the relationship between AI and PDE. Research conducted by Yang, Zhang and Feng (2024) indicates that AI technologies, such as recommendation systems and chatbots, not only facilitate the personalization of experiences but also contribute to enhancing travelers' awareness of sustainable values. As this awareness increases, travelers tend to seek experiences designed to support sustainability objectives. Koo et al. (2024) demonstrated that AI can influence travelers' perceptions by providing information about sustainable options, including green hotels or eco-friendly tourism activities. These perceptions motivate visitors to pursue personalized experiences that align with their individual needs and sustainability goals. This study emphasizes that this perception functions as a mediating factor in effectively linking AI technology and personalized travel behavior. Furthermore, Srivastava and Shandilya (2024) asserted that AI technology can facilitate reliable and seamless interactions, thereby contributing to an increased awareness of sustainable value among travelers. This heightened awareness leads to the personalization of experiences in accordance with sustainability principles, enabling visitors to engage in experiences that are not only satisfying but also engender a positive sense of contribution to the environment and community. Consequently, this study proposes the following hypotheses:

*H10. RST Plays an intermediary Role Between AI and PDE*

## 2.4. Proposed research model

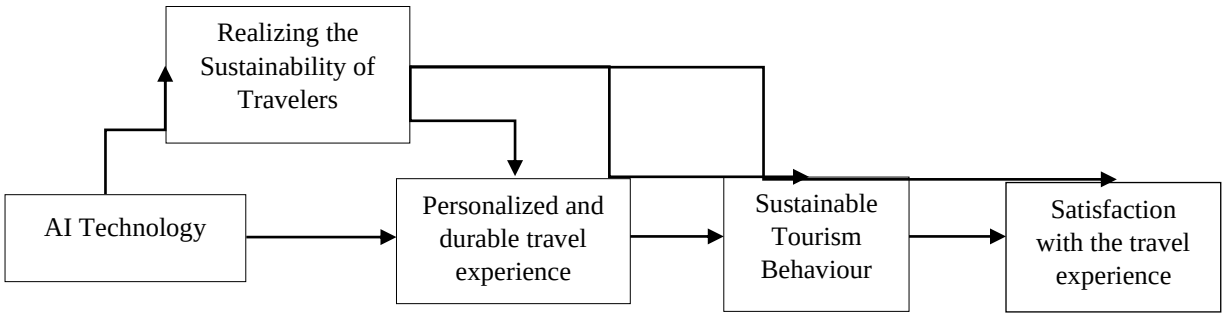



**Fig.1. Proposed research model**

*Source: Recommended author*

## III. RESEARCH METHODS

### 3.1. Approach

This study employs quantitative research methods that focus on measuring and testing the relationships between the variables in the research model. The research model is grounded in previous theories and research and encompasses the concepts of AI, RST, PDE, STB, and STE.

### 3.2. Survey subjects

The research sample was drawn from a population of travelers who had utilized services related to AI technology in the tourism sector and possessed an awareness or experience of sustainability in their travel journey in Vietnam. The survey subjects were both domestic and international students. Data collection occurred from August to October 2024 at prominent tourist destinations in Da Nang, Ho Chi Minh City, Hanoi, Phu Quoc, Nha Trang, and Can Tho. The study gathered data from 436 randomly selected participants using convenience sampling from online platforms and smart travel destinations. The sample size was determined in accordance with the recommendations of Hair et al. (2019), ensuring its suitability for PLS-SEM analysis (PLS-SEM).

### 3.3. Data collection tools

Data were collected through questionnaires, using scales developed in previous studies. The scales utilized a 5-point Likert scale, which measures participants' agreement with assertions related to the study variables. The questionnaire consisted of the following main sections: demographic information (age, gender, occupation, nationality) and scale of study variables (AI, RST, PDE, STB, and STE).

### 3.4. Data analysis

The data were analyzed using PLS-SEM software to validate the relationships in the study model. The analysis included an evaluation of the reliability and validity of the scale. Cronbach's Alpha, Composite Reliability (CR), and Average Extract Variance (AVE) were used to ensure that the scale was reliable and demonstrated good convergence. Structural model analysis: Relationships between variables were examined using factor load values, t-statistics, and p-values. Intermediary role validation: The intermediary role of the RST between the AI and PDE was tested using bootstrapping with 2000 samples, as recommended by Kumar et al. (2022).

## IV. RESEARCH RESULTS

### 4.1. Common Method Variance Bias Test (CMB)

The author examines the variance inflation coefficient (VIF) values, as recommended by Kock (2015). The VIF values reported for the structures ranged from 1 to 1,661 (Table 4.1), which is well below the recommended limit of 5, confirming the absence of CMB.

**Table 4.1 - Inner VIF Value**

| | AI | PDE | RST | STB | STE |
|---|---|---|---|---|---|
| **AI** | | 1.316 | 1.000 | | |
| **PDE** | | | | 1.395 | |
| **RST** | | 1.316 | | 1.395 | |

| | |
|---|---|
| **STB** | 1.000 |
| **STE** | |

**Notes:** *Artificial intelligence = AI; Realizing the Sustainability of Travelers = RST; Personalized and durable travel experience = PDE; Sustainable tourism behavior = STB; Satisfaction with the travel experience =STE*

*Source: Extracted from PLS*

### 4.2. Completion of scale evaluation

A partial least squares structure equation model (PLSSEM) was used to analyze the data. The factor load values (Table 2) were examined to evaluate the convergence reliability. All factor load values exceeded the recommended threshold of 0.7 (Hair et al. 2019). Furthermore, the Cronbach Alpha values were all above the minimum threshold of 0.7 and · 0.95 (Hair et al., 2019), confirming the internal consistency reliability of the structures (Table 3). These findings indicate that the model demonstrates high reliability and can be applied to subsequent analyses.

**Table 4.2 - Factor Load Factor**

| Element | Question | Source | Factor loading | VIF |
|---|---|---|---|---|
| **Artificial intelligence (AI)** | AI1: This study suggests that AI systems in the travel industry enhance the efficiency of identifying services aligned with individual preferences.. | Yang el at., 2024 | **0.828** | **1.935** |
| | AI2: AI gives me clear information about sustainable travel options. | Koo, el at., 2024 | **0.778** | **1.737** |
| | AI3: Recommendations generated by AI systems assist in optimizing decision-making processes regarding travel itinerary selection. | Zheng & Wu, 2023 | **0.821** | **2.529** |
| | AI4: This study posits the efficacy and utility of AI technologies in the travel industry. | Ku & Chen, 2024 | **0.768** | **2.236** |
| **Realizing the Sustainability of Travelers (RST)** | RST1: This individual is cognizant that their behavior can influence the sustainability of a travel destination. | Xu el at., 2024 | **0.811** | **1.701** |
| | RST2: It is recognized that the utilization of environmentally sustainable tourism services is of significant importance. | Majid el at., 2024 | **0.839** | **1.888** |
| | RST3: This study recognizes the importance of supporting local communities in their tourism development endeavors. | Srivastava & Shandilya, 2024 | **0.787** | **1.690** |
| | RST4: This individual is cognizant of their obligation to ameliorate the adverse effects of tourism. | Bedu el at., 2024 | **0.808** | **1.823** |
| **Personalized and durable travel experience (PDE)** | PDE1: Customized recommendations from travel-oriented technological systems tailored to individual preferences and requirements. | Yang el at., 2024 | **0.818** | **1.561** |
| | PDE2: This study has observed an enhancement in travel experiences through the utilization of personalized services.. | Ghesh el at., 2024 | **0.846** | **1.800** |
| | PDE3: Personalized experiences contribute to an individual's inclination to select more sustainable travel services. | Tavitiyaman, el at., 2021 | **0.861** | **1.756** |
| **Sustainable tourism behavior (STB)** | STB1: I prioritize using eco-friendly travel services. | Pai **el at.,** 2020 | **0.782** | **1.784** |
| | STB2: This individual engages in community service activities during travel experiences. | Torabi el at., 2024 | **0.831** | **1.970** |
| | STB3: This study aims to minimize unnecessary resource consumption during the research process.. | Suanpang & Pothipassa, 2024 | **0.852** | **2.038** |
| | STB4: This individual selects vehicles that are less | Zheng & Wu, | **0.842** | **1.944** |

| | | | | |
|---|---|---|---|---|
| | detrimental to the environment.. | 2023 | | |
| **Satisfaction with the travel experience (STE)** | STE1: The services provided in my travel itinerary have met my expectations satisfactorily.. | Xu el at., 2024 | **0.798** | **1.873** |
| | STE2: Sustainable travel experiences make me feel happier and prouder. | Majid el at., 2024 | **0.802** | **1.981** |
| | STE3: This study posits that the incorporation of sustainability principles enhances the value of travel experiences.. | Khan, 2024 | **0.871** | **2.071** |
| | STE4: The utilization of sustainable tourism services has contributed to an enhancement in my overall travel experience.. | Al-Romeedy & Alharethi, 2024 | **0.837** | **1.982** |

*Source: Extracted from PLS*

The scale test table indicates that all loading factors exceeded 0.7, demonstrating a strong correlation between the observed and latent variables. Cronbach's Alpha and the Composite Reliability (CR) of the scales both surpassed 0.7, confirming high scale reliability. The median extracted variance (AVE) exceeded the threshold of 0.5, suggesting good convergence of the scales and effective interpretation of potential variables. The results of the confirmatory factor analysis demonstrated that the scales possessed high reliability and good convergence, meeting the requirements for quantitative research and enabling further research.

**Table 4.3 - Reliability and value**

| | CA | CR | AVE | AI | PDE | RST | STB | STE |
|---|---|---|---|---|---|---|---|---|
| **AI** | 0.812 | 0.876 | 0.638 | 0.799 | | | | |
| **PDE** | 0.795 | 0.879 | 0.709 | 0.505 | 0.842 | | | |
| **RST** | 0.828 | 0.885 | 0.659 | 0.490 | 0.532 | 0.812 | | |
| **STB** | 0.847 | 0.896 | 0.684 | 0.592 | 0.698 | 0.692 | 0.827 | |
| **STE** | 0.848 | 0.897 | 0.685 | 0.193 | 0.153 | 0.162 | 0.201 | 0.828 |

Note: *CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted*

*Source: Extracted from PLS*

**4.3. Structural model**

**Table 4.5 - Impact Relationship Assessment**

| Hypothesis | Relationship | Original Sample (O) | STDEV | t Statistics | P- Values | Result |
|---|---|---|---|---|---|---|
| H1 | **AI → PDE** | 0.505 | 0.050 | 10.176 | 0,000 | **Yes** |
| H2 | **AI → RST** | 0.490 | 0.052 | 9.347 | 0,000 | **Yes** |
| H3 | **AI → STB** | 0.451 | 0.040 | 11.251 | 0,000 | **Yes** |
| H4 | **AI → STE** | 0.091 | 0.024 | 3.804 | 0,000 | **Yes** |
| H5 | **RST → PDE** | 0.375 | 0.054 | 6.945 | 0,000 | **Yes** |
| H6 | **RST → STB** | 0.620 | 0.036 | 17.234 | 0,000 | **Yes** |
| H7 | **RST → STE** | 0.125 | 0.031 | 4.058 | 0,000 | **Yes** |
| H8 | **PDE → STB** | 0.460 | 0.042 | 11.038 | 0,000 | **Yes** |
| H9 | **PDE → STE** | 0.093 | 0.024 | 3.788 | 0,000 | **Yes** |
| H10 | **STB → STE** | 0.201 | 0.049 | 4.145 | 0,000 | **Yes** |

*Source: Extracted from PLS*

The findings presented in Table 4.4 show that all hypotheses (H1 – H5) are accepted with a high level of significance (p = 0.000), indicating a positive and significant relationship between the study variables.

**4.4. Analysis of the role of intermediate variables**

**Table 4.5 - Results of intermediate variable analysis**

| Relationship | Original Sample (O) | STDEV | t Statistics | P-Values |
|---|---|---|---|---|
| **AI → PDE** | 0.321 | 0.061 | 5.256 | 0.000 |
| **AI → RST** | 0.490 | 0.052 | 9.374 | 0.000 |
| **PDE → STB** | 0.460 | 0.042 | 11.038 | 0.000 |
| **RST → PDE** | 0.375 | 0.054 | 6.945 | 0.000 |
| **RST → STB** | 0.448 | 0.040 | 11.134 | 0.000 |
| **STB → STE** | 0.201 | 0.049 | 4.145 | 0.000 |
| **AI → RST → PDE** | 0.184 | 0.035 | 5.221 | 0.000 |

*Source: Extracted from PLS*

Based on the content of Table 4.5 on intermediary role analysis, the authors examined the mediating role of tourist sustainability perception (RST) in the relationship between AI and PDE. The bootstrapping method with 2000 resamples and a 95% confidence interval, as recommended by Kumar et al. (2022), was employed to test the intermediate effect. The results indicate that RST plays a significant role in mediating the impact of AI on outcomes related to sustainable travel experiences.The t-values and p-values both demonstrate clear statistical significance, supporting the hypothesis that sustainability perceptions not only directly influence traveler behavior and satisfaction but also mediate the relationship between AI and these factors. This finding underscores that travelers' sustainability awareness serves as a conduit for AI to promote eco-friendly travel behaviors and enhance personalized experiences in a sustainable manner. Furthermore, the study demonstrates that RST enhances the personalization of the travel experience by increasing travelers' awareness of the value of sustainable actions, thereby encouraging them to engage in environmentally and socially responsible behaviors and experience increased satisfaction with their experience.

## IV. CONCLUSION

### 4.1. Conclusion

This study examines the role of tourist RST in mediating the relationship between AI and PDE. Additionally, this study elucidated the impact of PDE on STB and STE. The results indicate: AI positively influences sustainability perception (RST): This finding aligns with previous studies by Zheng and Wu (2023) as well as Koo et al. (2024), which assert that AI technology not only optimizes services but also enhances travelers' awareness of sustainability values; The mediating role of RST: RST plays a crucial role in connecting AI to personalizing sustainable travel experiences. This result complements and extends the conclusions of Yang, Zhang, and Feng (2024), who focused on the direct impact of AI on the travel experience. The current research further demonstrates that RST is essential to maximizing the effectiveness of AI in personalizing travel experiences; PDE promotes sustainable travel behavior (STB) and satisfaction with travel experiences (STE): Consistent with the findings of Majid, Tussyadiah and Kim (2024), this study confirms that personalizing experiences not only facilitates travelers' sustainable behavior choices but also increases their satisfaction with the journey. A notable distinction is that the current study focuses on the sustainability aspect of personalization, which has not been fully explored in previous studies. Sustainable Tourism Behavior (STB) Enhances Satisfaction with Travel Experience (STE), which is consistent with the research by Pai et al. (2020), which emphasizes that sustainable behavior not only contributes positively to the environment but also brings higher emotional value and satisfaction to travelers. Compared to previous studies, this research not only corroborates the role of AI in the travel industry, but also expands our understanding of how RST mediates the impacts of AI. Furthermore, the integration of PDE, STB, and STE into a comprehensive model introduced a novel perspective, facilitating a better understanding of the connection between technology, perception, and travel experience.

### 4.2. Administrative implications

First, integrating AI technology to raise awareness of sustainability: Tourism managers should implement AI technologies such as chatbots, intelligent suggestion systems, and data analytics platforms to provide comprehensive and detailed information about sustainable travel options, including eco-friendly accommodations, community outreach activities, and environmental impact reduction services. This implementation will enhance visitors' awareness of the importance of sustainable behaviors, thereby promoting their active participation in environmental protection and community support activities.

Second, Personalize the experience to meet the sustainable needs of travelers: Travel businesses need to utilize AI to personalize travelers' experiences, from making service recommendations tailored to individual preferences to integrating sustainability elements into their experiences, such as low-emission sightseeing route recommendations or tourism programs that engage with local communities.

Third, to encourage sustainable tourism behavior through AI: Businesses need to employ AI applications to promote sustainable tourism behavior, such as providing information about the environmental impact of each activity and offering alternative suggestions, such as less polluting transportation or eco-friendly products. This approach not only assists businesses in achieving sustainable development goals but also builds a positive brand image, fostering trust among tourists.

Fourth, enhancing visitor satisfaction through sustainable services: Managers should focus on improving services by incorporating sustainability factors such as ensuring transparency in the provision of information, supporting visitors to participate in environmental protection activities, and providing high-quality services with sustainable value. This approach will create more meaningful experiences for travelers, enhance their satisfaction, and promote their likelihood of returning to service in the future.

Fifth, investment in sustainability training and education programs: Destination managers and businesses should implement educational programs or communication campaigns to raise awareness of sustainable tourism among both employees and visitors. Staff will develop a clear understanding of how to integrate sustainability elements into the service, while visitors will have the opportunity to become more aware of the responsibilities and benefits of choosing sustainable tourism behaviors.

Sixth, strengthening cooperation between stakeholders: Tourism businesses, governments, and local communities must collaborate to create a sustainable tourism ecosystem, in which AI technology plays a central role in connecting stakeholders. Effective collaboration ensures that sustainable solutions are implemented synchronously, thereby creating a consistent and positive experience for travelers.

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# TOURISM IN SINGAPORE'S CULTURAL DIPLOMACY AND LESSONS FOR VIETNAM

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**ABSTRACT**

In the context of globalization and the rapid development of technology, cultural diplomacy has become an important tool for countries to enhance their soft power and expand their international influence. Since 2014, Singapore, with its Smart Nation strategy, has pioneered the integration of smart technology into socio-economic fields, in which tourism has emerged as a key sector. Singapore not only develops tourism as an important economic sector but also integrates cultural and technological values to strengthen the country's position on the world map. Over the past decade, Singapore has built iconic structures such as Marina Bay Sands, Gardens by the Bay, and organized international events. These are not only tourist attractions but also a foundation for implementing cultural diplomacy through promoting the image of a modern, diverse and dynamic country. This article not only analyzes Singapore's strategy but also suggests important lessons for other countries in developing tourism and conduct effective cultural diplomacy.

*Keywords:* "*Cultural diplomacy", "Tourism", "Singapore".*

## I. INTRODUCTION

Tourism and cultural diplomacy are two fields that have a mutual relationship, together promoting economic and social development and enhancing the national position in the international arena. Cultural diplomacy is a set of activities, carried out directly by or in cooperation with the diplomatic agencies of a country, to promote the foreign interests of that country in the field of cultural policy, mainly through promoting cultural exchanges with other countries (Pajtinka. E, 2014). Meanwhile, "Tourism is a soft power tool, contributing to strengthening the reputation and image of a country by winning hearts and minds. Since soft power is conveyed through a country's culture, values, political ideals, and foreign policies, it can promote a more effective and capable national position, thereby contributing to attracting tourism to destinations" (Claro et al, 2023)

Singapore is a multicultural country with a blend of many identities, and has developed and implemented many policies to promote tourism and cultural diplomacy. These policies not only focus on promoting the country's image but also focus on sustainable development, preserving cultural heritage, and promoting people-to-people exchanges. These policies have been implemented synchronously and effectively, contributing to enhancing Singapore's image in the international arena, promoting tourism, and creating a foundation for sustainable development in the future.

Singapore's proactive approach to tourism-based cultural diplomacy from 2019 to 2024 demonstrates how a systematically coordinated strategy integrating domestic policy frameworks and international cooperation can establish a competitive edge in regional and global diplomacy. This study evaluates these policies through a qualitative analysis, comparative policy analysis of Singapore's major tourism events and international collaboration mechanisms, providing lessons applicable to Vietnam's evolving foreign policy agenda. The paper also applies a systems approach, because Singapore is a part of the Southeast Asian regional system in particular and the Asia-Pacific region in general.

## II. RESEARCH OVERVIEW

Research on the role of tourism in Singapore's cultural diplomacy is a topic that has attracted the attention of many scholars in the field of international relations and tourism development.

The theoretical foundation of this study lies in Joseph Nye's soft power theory (2004), which emphasizes influence through culture, values, and policies. The concept of "soft power" mentioned by Joseph Nye in the book "Soft Power: The Means to Success in World Politics" in 2004 has become an important theoretical foundation for studying the role of cultural diplomacy in the context of globalization. Soft power refers to a country's ability to create influence through the attraction of culture, values and policies, instead of relying on military or economic power. According to the study

"Nation Branding: Concepts, Issues, Practice. Butterworth-Heinemann" by Dinnie (2008), building a national brand through cultural and tourism promotion is an important factor in creating soft power. Singapore has been very aware of this and quickly applied it to its cultural diplomacy strategy.

This issue began to be studied in depth in the early 2000s, especially when Singapore emerged as an international hub for trade, finance, and tourism under the leadership of Prime Minister Lee Hsien Loong (Ministry of Trade and Industry Singapore, 2021). Singapore has long focused on tourism—the smokeless industry—as part of its national development strategy. Throughout its economic development since the 1960s, tourism has been used by Singapore as an important factor in promoting the image of a modern and progressive nation (Teo, 2002). However, under Prime Minister Lee Hsien Loong, tourism has been promoted to a new level as a key tool in building national branding and cultural diplomacy (Hall & Page, 2017). In the article "Tourism in Singapore: A review of tourism policies 1960-2005" (published in Tourism and Hospitality Research, 2007), Joan C. Henderson discussed in detail the development of Singapore's tourism industry from an economic tool to a strategy for building soft power and promoting international cultural exchanges. Henderson analyzed that the Singapore government not only focused on economic growth through tourism, but also utilized this industry as a way to promote the national image and enhance Singapore's position in the international arena. The development of large projects such as Marina Bay Sands and Gardens by the Bay was not only aimed at attracting tourists, but also acted as cultural icons, contributing to building the image of Singapore as an innovative and advanced destination. In her study "The Rise of Singapore: From British Colony to Global City" (2014), Lay Hwee Yeo - an expert on international relations and has done many research works related to cultural diplomacy and soft power of Southeast Asian countries, especially Singapore - analyzed how Singapore has skillfully combined modernity and tradition in tourism development and national image building. She argued that major tourism projects such as Marina Bay Sands and Gardens by the Bay have helped Singapore become a bridge between the East and the West, both maintaining its East Asian cultural identity and demonstrating modernity and advanced creativity.

Another important element in Singapore's cultural diplomacy is the organization of large-scale international events such as the Formula 1 Singapore Grand Prix and the Singapore Arts Festival. These events not only attract international visitors but also provide an opportunity for Singapore to showcase its diverse culture. Tan (2018) argues that by hosting these events, Singapore has created a global cultural exchange platform, helping the country to further consolidate its position as an international cultural hub.

The Singapore Tourism Board (2020) reports that international events have contributed greatly to the increase in tourist arrivals and promote mutual understanding between countries. Attracting international events also helps Singapore expand its diplomatic influence and strengthen relations with important partners in the ASEAN region and Western countries.

Singapore not only uses tourism and cultural diplomacy to build its national image, but also to promote regional diplomatic relations. Wang (2021) points out that Singapore has leveraged tourism events and cooperation within the ASEAN region to consolidate its leadership role in the region. Cultural relations through tourism not only help promote the economy but also strengthen diplomatic relations with neighboring countries, creating a sustainable cooperation network.

Recently, Singapore has also pioneered the development of smart tourism, combining technology and cultural preservation. Nguyen Ngoc Anh (2015) commented that Singapore has actively invested in smart tourism projects, with the goal of not only attracting tourists but also enhancing cultural interaction and learning through digital platforms. This not only contributes to the sustainable development of tourism but also enhances the ability to promote Singaporean culture to the world in a more effective and modern way.

Singapore has successfully used tourism development policies to promote cultural diplomacy, through the development of tourism infrastructure and the organization of international events. Henderson (2011) stated that the combination of tourism development policies with cultural diplomacy has created a breakthrough in the way Singapore builds its national image. Projects such as Gardens by the Bay and Marina Bay Sands have become symbols not only of tourism, but also highlights of the cultural diplomacy strategy, helping Singapore continue to affirm its position in the international arena.

## III. ANALYSIS OF TOURISM POLICIES IN SINGAPORE'S CULTURAL DIPLOMACY FROM 2019 TO 2024

The analysis uses a multi-level framework, examining policy implications at the individual, national, and international systemic levels. These are also the three levels of policy analysis commonly used in the study of international relations today. Data sources include official government reports, event records, and secondary academic analysis. A particular focus is placed on Prime Minister Lee Hsien Loong's leadership in shaping tourism as a diplomatic tool, as well as Singapore's participation in ASEAN-led initiatives.

### 3.1. Analysis at the Individual Level

Prime Minister Lee Hsien Loong has strategically positioned Singapore as a "regional hub of communication and innovation" (Ministry of Foreign Affairs Singapore, 2022), leveraging its cultural and tourism diplomacy to enhance its global influence. His vision of building Singapore into a "regional globalist" reflects a deliberate integration of ASEAN cooperation with a focus on maintaining a distinct national identity (Tan, 2021). By embedding soft power strategies into Singapore's foreign policy, Lee recognizes that culture and tourism are not merely economic tools but powerful mediums to project national prestige and influence regional narratives. (Nye, 2004; Heng, 2020).

Critically, Lee's approach transcends traditional notions of tourism as a commercial sector, reframing it as a core component of Singapore's soft power arsenal. His leadership highlights the application of Nye's soft power theory by prioritizing cultural engagement and sustainability as vehicles for influence. For instance, through the Singapore Green Plan 2030, Lee has not only emphasized eco-tourism (Chong, 2022) but also redefined Singapore as a model of sustainable innovation, appealing to environmentally conscious travelers and reinforcing Singapore's leadership in the region (UNWTO, 2023; Tan, 2022). This demonstrates how tourism strategies can simultaneously serve economic, environmental, and diplomatic objectives.

Moreover, Lee's focus on initiatives like the "Southeast Asia Travel Collective" and "ImaginASEAN" exemplifies Singapore's efforts to position itself as a cultural bridge within ASEAN, fostering deeper regional cooperation. These campaigns are not merely promotional activities but deliberate soft power maneuvers to showcase Singapore as a curator of Southeast Asian heritage and identity. His support for ASEAN heritage preservation, alongside active involvement in international forums such as the COP26 Climate Change Conference, underscores a nuanced strategy: combining environmental diplomacy with cultural tourism to shape global perceptions of Singapore as a progressive and responsible nation.

Lee's speeches, often highlighting that "Singapore may be small, but we have a big responsibility for sustainable development and cultural diplomacy" (Lee, 2021), reflect a personal commitment to aligning Singapore's tourism diplomacy with broader international norms (ASEAN Secretariat, 2022). This not only builds trust with ASEAN and European partners but also positions Singapore as a thought leader in sustainable cultural tourism. By moving beyond generic promotional campaigns and adopting a values-driven approach, Lee has effectively linked Singapore's tourism initiatives to a broader narrative of regional leadership and innovation (Tan, 2023).

Through coordinated efforts, Lee has transformed Singapore into a cultural hub that balances modernity with tradition, enabling it to act as a bridge between East and West. Initiatives like hosting ASEAN conferences and collaborating with regional artists and cultural organizations exemplify Singapore's commitment to creating a unified Southeast Asian identity. These efforts, underpinned by soft power strategies, elevate Singapore's position not just as a tourist destination but as a strategic cultural influencer within ASEAN and beyond.

### 3.2. Analysis at the National Level

At the national level, Singapore has strategically crafted its tourism policies as a deliberate instrument of soft power, rather than merely an economic or cultural initiative. The government's approach from 2019 to 2024 underscores a calculated effort to enhance Singapore's global influence through a sophisticated blend of sustainable tourism, high-profile cultural events, and heritage preservation. This is not simply about increasing visitor numbers; rather, it is an intentional exercise in nation branding and geopolitical positioning within ASEAN and beyond.

A critical example of this approach is the Singapore Green Plan 2030, which goes beyond a standard sustainability policy to function as a diplomatic statement on Singapore's leadership in climate-conscious tourism (Tan, 2022). By

integrating tourism with environmental diplomacy, Singapore not only appeals to eco-conscious travelers from Europe and North America but also positions itself as a regional norm-setter in sustainable urban development (ASEAN Centre for Sustainable Development, 2022). Unlike traditional tourism-dependent economies, which often struggle with balancing development and conservation, Singapore has weaponized sustainability as a form of competitive advantage in soft power projection. This aligns with Joseph Nye's theory of "soft power through values", demonstrating that a nation's ability to influence is not merely rooted in cultural assets but also in the ethical and policy-driven narratives it successfully exports.

Furthermore, the deliberate hosting of international cultural mega-events, such as the Formula One Singapore Grand Prix, Singapore Art Week, and Singapore Design Week, is not just a cultural engagement strategy but a means of embedding Singapore into global networks of influence. These events attract elite stakeholders—including investors, policymakers, and global influencers—who in turn reinforce Singapore's brand as a cosmopolitan, innovative, and strategically indispensable nation ((UNWTO, 2022). This reflects Nye's notion of soft power as "the ability to shape preferences through attraction rather than coercion," where Singapore creates an aspirational image that other nations and regional actors seek to emulate.

Heritage preservation efforts, particularly in districts like Chinatown, Kampong Glam, and Little India, also serve a dual function. On the surface, these efforts maintain Singapore's multicultural authenticity for tourism purposes. However, at a deeper level, they recontextualize Singapore's identity within the broader Southeast Asian cultural sphere, subtly reinforcing its position as the region's de facto cultural and diplomatic bridge (ASEAN Cultural Heritage Report, 2022*)*. Unlike other ASEAN nations that emphasize their indigenous or nationalistic historical narratives, Singapore has adopted a curatorial approach to cultural heritage, incorporating regional influences to position itself as both a preserver and a modern interpreter of Southeast Asian identity. This further strengthens Singapore's diplomatic role as a crossroads of Eastern and Western cultural currents, amplifying its appeal as a regional thought leader in cultural diplomacy.

The cumulative effect of these policies is a highly intentional soft power strategy that extends beyond tourism promotion to geopolitical influence. By embedding sustainability, cultural diplomacy, and heritage preservation within its tourism framework, Singapore moves beyond being a mere destination to becoming a soft power hub that dictates regional cultural and sustainability norms. This demonstrates a sophisticated application of Nye's soft power framework, where Singapore leverages tourism not only to attract visitors but also to shape global discourses on sustainable urban living and regional cultural leadership.

### 3.3. Analysis at the International System Level

At the international system level, Singapore's cultural diplomacy through tourism is not merely a response to globalization but a strategic maneuver within the intensifying competition for cultural and economic influence in Southeast Asia. The post-pandemic global tourism recovery has prompted a power recalibration in the region, with Thailand, Malaysia, and Indonesia aggressively expanding their soft power through tourism-driven diplomacy. However, Singapore distinguishes itself by not merely competing in tourism volume but by asserting control over regional cultural narratives.

Unlike its regional counterparts, which primarily emphasize heritage-driven tourism to attract visitors, Singapore has adopted a meta-strategic approach—shaping not just its own brand, but ASEAN's collective identity on the world stage. The "ImaginASEAN" campaign, developed in collaboration with global industry players like Agoda and AirAsia, is more than a promotional effort—it reflects Singapore's orchestration of ASEAN's cultural diplomacy, consolidating its role of Southeast Asian tourism narratives. This approach aligns with Nye's soft power mechanisms, wherein influence is exerted not by dominance but by setting the frameworks through which others operate. By leading regional branding efforts, Singapore ensures that ASEAN's cultural tourism is understood through a Singapore-centric lens, reinforcing its authority over the region's soft power agenda.

In addition to branding leadership, Singapore has systematically deployed bilateral and multilateral tourism agreements as diplomatic leverage. For example, the Tourism and People-to-People Exchange Cooperation Agreement with Vietnam is not just a tourism initiative but a deliberate effort to integrate Vietnam into a Singapore-led cultural

ecosystem within ASEAN (Singapore Ministry of Trade and Industry, 2021). Such agreements do not merely foster mutual trust but also align the soft power strategies of ASEAN nations with Singapore's overarching diplomatic framework, ensuring that Singapore remains central to intra-regional cultural diplomacy.

Beyond ASEAN, Singapore's deep integration into global cultural governance further amplifies its influence. Unlike other regional tourism hubs that focus primarily on attracting visitors, Singapore actively participates in agenda-setting within organizations such as UNESCO and the ASEAN Tourism Forum (ATF). Its role in these multilateral institutions allows it to shape sustainability and tourism policies at a structural level, positioning Singapore as not just a practitioner but a policymaker in global cultural diplomacy (UNWTO, 2023*)*. This strategic engagement is a direct application of Nye's concept of soft power through institutional influence, wherein Singapore's presence in decision-making bodies enables it to steer global tourism norms in ways that align with its long-term diplomatic interests.

Perhaps the most sophisticated dimension of Singapore's international tourism diplomacy is its synthesis of environmental responsibility with cultural diplomacy. By embedding sustainability principles into its tourism initiatives—particularly through the Singapore Green Plan 2030—the nation has transcended the traditional role of a tourism hub and repositioned itself as a global thought leader in sustainable cultural tourism. This shift is significant because it allows Singapore to engage with Western nations and international institutions not just as a participant, but as a model and influencer in sustainability discourse. It also serves as a strategic counterweight to regional competitors like Thailand, which, despite its strong tourism sector, lacks a comparable global leadership position in sustainable tourism governance.

In sum, Singapore's cultural diplomacy through tourism is not merely an economic endeavor but a calculated soft power initiative that intertwines regional leadership, global influence, and sustainability-driven diplomatic positioning. Rather than competing in sheer tourist numbers, Singapore has strategically ensured that it dictates the cultural and policy frameworks within which Southeast Asian tourism is understood and promoted internationally. This approach transforms Singapore from a participant in ASEAN tourism into the architect of ASEAN's cultural soft power, reinforcing its geopolitical influence far beyond its geographic size.

## IV. LESSONS FOR VIETNAM

Vietnam can learn valuable lessons from Singapore's success in using tourism as an effective cultural diplomacy tool. To apply this model, Vietnam needs to focus on building a long-term cultural diplomacy strategy, investing in green and sustainable tourism initiatives, developing international cultural events, and building a people-centered cultural diplomacy policy.

First, the Vietnamese government needs to institutionalize a long-term cultural diplomacy strategy that explicitly integrates tourism as a key instrument of soft power. This strategy must be aligned with Vietnam's Master Plan for Tourism Development until 2030, ensuring that cultural diplomacy is not an isolated effort but a systematic component of national foreign policy. Cultural diplomacy should be considered a core part of the overall foreign policy, in parallel with economic and security goals. A well-defined strategy should include clear vision, mission, and specific quantifiable objectives. For instance, Vietnam has actively promoted bilateral cultural exchanges within ASEAN, evident in initiatives such as the Vietnam-Laos Cultural Exchange Program (2023) and the Vietnam-Singapore Tourism Cooperation Agreement (2022-2025) (Vietnam Ministry of Culture, Sports and Tourism, 2023; ASEAN Secretariat, 2023). However, these programs must be expanded beyond diplomatic circles to grassroots participation, ensuring that cultural interactions go beyond official delegations to include artists, local communities, and young entrepreneurs engaged in tourism innovation. Vietnam possesses a wealth of cultural assets that remain underutilized in its international branding efforts. While traditional values like Dong Son culture, Tuong, Cheo, and Quan Ho folk music have been promoted in academic and artistic circles, they have yet to be systematically embedded into Vietnam's tourism and cultural diplomacy framework. The country should develop cultural tourism clusters—such as the "Ancient Capital Heritage Corridor" linking Ha Noi, Hue, and Ninh Binh—to create immersive experiences for international visitors (Vietnam National Administration of Tourism, 2023). Similarly, modern cultural soft power assets, such as Vietnamese cuisine, contemporary visual arts, and indie music, have gained organic international recognition (e.g., Pho and Banh Mi being ranked among the world's best street foods by CNN in 2023). These elements should be formally

incorporated into diplomatic initiatives, such as the "Vietnam Culinary Diplomacy Program" launched in 2021, to ensure their strategic leverage in national branding efforts. Beyond cultural content, the success of cultural diplomacy lies in its execution and measurement. Vietnam should establish concrete performance indicators such as: the number of annual international cultural exchange events, the level of participation of the international community in activities promoting Vietnamese culture. To ensure effective execution, cross-ministerial coordination must be reinforced. The Ministry of Culture, Sports and Tourism (MCST) should lead strategic planning, while the Ministry of Foreign Affairs (MOFA) incorporates cultural diplomacy within broader foreign policy dialogues. The Vietnam National Administration of Tourism (VNAT) should integrate cultural diplomacy into destination marketing strategies, and the Ministry of Industry and Trade (MOIT) should facilitate cultural exports (e.g., leveraging Vietnamese handicrafts in UNESCO Creative Cities Network partnerships).

The Singaporean Prime Minister has successfully leveraged international platforms to shape public perception of Singapore as a pioneer in sustainable and green tourism diplomacy. Singapore is a leader in eco-friendly urban tourism and responsible environmental stewardship. Vietnam must adopt a similarly proactive approach, ensuring that cultural and sustainable tourism are fully embedded within its national foreign policy agenda rather than being treated as isolated industry initiatives. Vietnam already has a strong foundation for sustainable tourism but needs to institutionalize it as a diplomatic strategy. In 2022, Vietnam ranked sixth in Asia on the Global Sustainable Tourism Index, driven by its successful eco-tourism models in Phong Nha - Ke Bang and Trang An Scenic Landscape Complex. However, these successes remain fragmented and lack a coordinated national strategy to integrate green tourism into Vietnam's international branding efforts (ASEAN Centre for Sustainable Development, 2023). A structured framework should be built around three key pillars: green infrastructure, community-based conservation tourism, and policy-driven incentives for sustainable tourism investments. This can be done through developing Green Infrastructure as a Core Soft Power Tool. Vietnam must prioritize large-scale green investments in its most visited cultural and ecological heritage sites. This includes: Expanding electric transportation networks; Implementing zero-waste tourism zones; Encouraging the adoption of "carbon-neutral" hotel certifications. Vietnam can further leverage its rural and ethnic tourism potential, ensuring that cultural tourism is driven by local communities rather than corporate enterprises. Cat Ba Biosphere Reserve, a UNESCO-listed site, has seen a rise in visitor interest due to its sustainable fishing and tourism integration model. Expanding such initiatives strengthens Vietnam's global reputation as a protector of indigenous ecosystems and heritage. To ensure long-term success, Vietnam must embed sustainable tourism policies within its broader cultural diplomacy agenda. Vietnam must actively advocate for ASEAN-wide sustainable tourism frameworks at the ASEAN Tourism Forum (ATF) and UNWTO summits, positioning itself as a regional thought leader on balancing tourism growth with environmental protection. By executing a structured and measurable green tourism diplomacy strategy, Vietnam can move beyond merely attracting tourists to actively shaping global tourism policies.

Vietnam must prioritize the strategic development of international cultural events as a pivotal instrument of cultural diplomacy. Singapore has successfully leveraged tourism to enhance regional and global influence through high-profile forums such as the ASEAN Tourism Forum and UNESCO partnerships, effectively positioning itself as a cultural and diplomatic hub. Vietnam can adopt a similar approach by institutionalizing large-scale cultural events that not only showcase national identity but also foster deeper diplomatic engagement. A prime example would be the establishment of signature events like the "ASEAN Arts Festival" or "Indochina Cultural Week" in Hanoi, where artists from Vietnam, Laos, and Cambodia present both traditional and contemporary performances, reinforcing regional solidarity and cultural integration. These events do not merely serve as artistic showcases but function as diplomatic platforms that cultivate people-to-people connections, strengthening regional ties and enhancing Vietnam's image as a cultural leader in ASEAN. Furthermore, Vietnam can integrate cultural events with economic and commercial diplomacy. Singapore has demonstrated the effectiveness of combining cultural promotion with trade and sports diplomacy, a model that Vietnam can replicate through initiatives like the "Vietnam Culture and Cuisine Week" in key partner nations such as France, Japan, and Singapore. By merging cultural exhibitions with culinary showcases and trade fairs, Vietnam can elevate its agricultural exports and artisan industries while simultaneously reinforcing its soft power through the global appeal of Vietnamese culture. The success of such initiatives, however, necessitating strategic collaboration with international event organizers, partnerships with renowned cultural institutions, and the engagement

of globally recognized artists to amplify media reach and international impact. To further institutionalize cultural diplomacy, Vietnam must embed cultural narratives into its participation in major international forums such as APEC, ASEAN, and the United Nations. Singapore has effectively woven its cultural identity into global discourse by consistently highlighting its multicultural heritage and sustainable development initiatives. Vietnam should take a proactive stance by strategically incorporating references to "Dong Son culture, Cham heritage, and Vietnam's ethnic diversity" into its diplomatic engagements, reinforcing its distinct cultural legacy while shaping regional narratives. This should be complemented by the expansion of "bilateral and multilateral cultural agreements" that facilitate the preservation of both tangible and intangible cultural heritage, drive sustainable tourism development, and institutionalize Vietnam's leadership role in ASEAN's cultural exchange frameworks.

Vietnam must prioritize a people-centered approach to cultural diplomacy, ensuring that its initiatives foster long-term. Effective cultural diplomacy should emphasize sustained people-to-people exchanges, educational collaborations, and heritage conservation partnerships, creating deeper international bonds that extend beyond formal diplomatic interactions. One of the most impactful ways to achieve this is through academic and artistic exchange programs between Vietnam and leading cultural institutions in Japan and South Korea. These initiatives not only facilitate knowledge transfer but also cultivate a new generation of cultural ambassadors who strengthen diplomatic ties through shared artistic and scholarly endeavors. Vietnam must expand its cross-border heritage conservation efforts, using cultural preservation as a foundation for long-term diplomatic relationships. The "My Son Sanctuary and Champa heritage conservation project with India" exemplifies how cultural diplomacy can transcend traditional state interactions and build deeper historical and strategic partnerships (Vietnam Ministry of Culture, Sports and Tourism, 2023). Such collaborations ensure that heritage sites are not merely national treasures but also shared cultural legacies that bind nations together. A truly inclusive cultural diplomacy policy must also engage NGOs, youth organizations, and local communities, recognizing that grassroots cultural initiatives have the potential to generate the most authentic and sustainable diplomatic outcomes. The "Cultural Village – Community Tourism" model in Sa Pa and Ha Giang has proven that when local communities are empowered to preserve and showcase their own cultural traditions, it leads to mutual respect, economic sustainability, and increased international cultural engagement (Vietnam National Administration of Tourism, 2023). Expanding such community-driven cultural tourism initiatives will not only enhance Vietnam's global image but also demonstrate how cultural diplomacy can be an instrument of both national development and international influence.

## V. CONCLUSION

Singapore's tourism policies in cultural diplomacy from 2019-2024 have brought great success in both economic and international status. From the individual level with the role of Prime Minister Lee Hsien Loong, to national level policies and participation in the international system, Singapore has demonstrated a synchronous and effective strategy. Singapore's strategy is a typical model of using tourism as an effective cultural diplomacy tool, contributing to enhancing the national position in the international arena.

From Singapore's success in combining tourism with cultural diplomacy, Vietnam can learn to develop sustainable tourism, enhance the national position, contributing to building a national image rich in identity and responsibility in the international system. To successfully apply lessons from Singapore, Vietnam needs a comprehensive and sustainable approach in building a cultural diplomacy policy through tourism. Focusing on a long-term strategy, investing in green tourism, developing international cultural events and building people-centered policies will help Vietnam not only strengthen its national position in the international arena but also contribute to sustainable development, preserve cultural identity and enhance regional peace and cooperation. This strategy requires synchronous coordination between state agencies, the business community and the people to achieve the highest efficiency.

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# ROLE OF TEACHER'S ETHICAL LEADERSHIP IN SHAPING HOSPITALITY STUDENTS' GREEN VOICE BEHAVIOR: THE MEDIATING EFFECT OF UNIVERSITY SOCIAL RESPONSIBILITY AND GREEN WORK CLIMATE

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**ABSTRACT**

This study used a quantitative research design to explore how Ethical Leadership (EL) demonstrated by teachers influences the Green Voice Behavior (GVB) of students within the hospitality management faculty in Ho Chi Minh City. Perceived Universities' Social Responsibility (USR) and the University's Green Work Climate (GWC) were considered mediators. Data were collected from 253 students using a systematic, self-administered questionnaire over two weeks with a one-day time lag, ensuring response clarity through direct assistance. Structural Equation Modeling was employed for analysis. The results provide useful insights into promoting sustainable behaviors among students while contributing to the theoretical advancement of green behavior in ACADEMIC contexts. Additionally, the findings reveal that students' Green Voice Behavior is positively influenced by their perception of universities' social responsibility and the presence of a green work climate at their institution. Teacher's Ethical Leadership influences Green Voice Behavior indirectly by shaping students' perceptions of the university's social responsibility and fostering a Green Work Climate. Enhancing Teachers' Ethical Leadership can promote students' Green Voice Behavior through these mechanisms. The study suggests measures for universities to encourage responsible practices and a green climate among students.

*Keywords*: "Environmental Sustainability", "University Social Responsibility", "Teacher Ethical Leadership", "Green Climate", "University"

## I. INTRODUCTION

With the growing focus on sustainability, higher education institutions are increasingly responsible for developing future leaders who can address societal needs, advance sustainability, and foster sustainable behaviors (Ali et al., 2021). Green behaviors remain a key topic, with growing research on Green Voice Behavior (GVB). While work-related EGB, pro-environmental citizenship behaviors, and counterproductive sustainability behaviors have been widely studied, other dimensions remain underexplored. One such dimension is GVB, which involves advocating for sustainability and challenging traditional norms (Zacher et al., 2023). Aboramadan et al. (2024) emphasize the importance of engaging university stakeholders in the "green voice," noting that students, as the majority, deserve greater attention. Similarly, Piramanayagam, Mallya, and Payini (2023) highlight the growing focus on sustainability education in hospitality, stressing its role in addressing social needs in human resources and preparing future generations for challenges. Research on green voice behavior among hotel and restaurant students underscores the need for green practices to protect the environment and sustain resources. However, a gap remains in sustainability education research within this industry in developing countries. Thus, studying green voice behavior among Vietnamese students is both timely and essential.

Leadership fosters environmentally sustainable behaviors, influencing employees (Tuan, 2022) and positioning teachers as role models for students. Further research is needed on how teachers shape students' sustainable behaviors, particularly green voice behavior, which raises awareness and promotes eco-friendly practices. Cultivating this behavior early is crucial for workforce readiness. Le et al. (2018) highlight that overemphasizing theory in hotel education can hinder students' practical and sustainable development skills. Ethical leadership, rooted in social learning theory (Bandura, 1977, 1986), promotes appropriate conduct (Brown et al., 2005) and positively shapes subordinates' ethical perceptions (Khan et al., 2019). Social responsibility, essential for organizational sustainability, is now a formalized subject in universities. Organizations integrate economic, social, and environmental well-being into their operations (Du et al., 2015). Universities must align programs with labor market demands while engaging in social and environmental

initiatives, known as university social responsibility (Shek et al., 2017). While USR holds political and strategic value, students' perceptions remain underexplored (Coelho & Menezes, 2022). This study argues that, as per social learning theory, USR positively influences students' green voice behavior and mediates the impact of teachers' ethical leadership in promoting sustainability. The green work climate mediates the impact of sustainability-focused organizational elements on green behavior. Murillo-Ramos et al. (2024) highlighted its role in hospitality, emphasizing organizational green mindfulness. It shapes perceptions of pro-environmental opportunities, moderates pro-environmental attitudes and motivation (Tian et al., 2020), and partially mediates the link between green HRM and behavior in sustainable fashion (Rubel et al., 2021). Norton et al. (2014) also linked it to sustainability policies and employee green behavior.

Advancing towards a sustainable educational environment in Vietnam, particularly within the hospitality industry, necessitates focused attention from educators, active promotion by institutions through social responsibility initiatives, and the establishment of a supportive climate that fosters and encourages green voice behavior. This study examines how students' perceptions of the green work climate, social responsibility, and teachers' ethical leadership influence their green voice behavior. It also explores the mediating roles of social responsibility and the green work climate. Research was conducted at five hospitality institutions in Ho Chi Minh City, with data collected in March 2024.

## II. MATERIAL AND METHODOLOGY

### 2.1. Conceptual Foundation

#### 2.1.1. Social Learning Theory and Stakeholder Theory

The Social Learning Theory, first proposed by Bandura in 1977, has been extensively applied in research within the hospitality sector to examine employee behaviors. According to Bandura, followers adopt appropriate behaviors by observing the attitudes, values, and actions of their models (Aftab et al., 2023). Furthermore, this study highlights research by Bakker et al. (2011) and Sarwar et al. (2020), demonstrating how leaders can foster a positive work environment to enhance employee engagement and achieve improved outcomes through their attitudes and behaviors.

Stakeholder Theory provides a framework for understanding an organization's role and responsibilities towards various groups in society. Since its initial introduction in Freeman's *Strategic Management* book in 1984, the term "stakeholder" has become strongly associated with business research (Mitchell et al., 1997). Stakeholder Theory systematically clarifies which parties with an interest in the organization's activities qualify as stakeholders. Identifying roles, evaluating interests, categorizing types, and assessing power are some of the approaches discussed in this field. According to research on branding, quality, and customization of educational offerings (Foroudi et al., 2020), universities regard students as their end users. This indicates that students are stakeholders akin to relatively unique customers for educational institutions.

#### 2.1.2. Teachers' Ethical Leadership

Leaders who demonstrate integrity, honesty, and reliability toward their followers are considered ethical. Ethical leadership, as defined by Brown et al. (2005, p. 120), refers to "the demonstration of normatively suitable behavior through personal acts and interpersonal interactions, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making." Hsieh et al. (2023) reviewed this topic, which has garnered significant attention from scholars since the early 2000s, and concluded that, in addition to the fact that an ethical leader is also an ethical person, the demonstration of normative appropriateness depends on the context. Furthermore, although studies on ethical leadership in education have been conducted, they continue to be predominantly approached from an organizational standpoint (Hsieh et al., 2023). Teachers' decision-making, communication, and reinforcement shape students' behaviors when perceived as moral leaders. Research shows that teachers and students share knowledge and communication skills in higher education (Franke & Arvidsson, 2011, cited by Nejati & Shafaei, 2017). Ethical teaching, including fair discipline, ethics discussions, and role modeling, also influences students' thoughts and behaviors (Arain et al., 2016; Nejati & Shafaei, 2017).

#### 2.1.3. Universities' Social Responsibility

Colleges and universities have always had a social responsibility to advance society as part of their mission (Derrida, 1992). However, a study by Menezes et al. (2018) found that it was not until the 2000s that this responsibility began to receive greater emphasis from their leaders and researchers. If we consider the origins of University Social

Responsibility (USR), corporate strategies were the source of USR's creation, according to the theoretical review of USR by Larran Jorge et al. (2011), and research on strategic management and the conceptualization of universities as corporate entities by Ramos-Monge et al. (2017) (Coelho & Menezes, 2022). Recently, as higher education has become more commercialized and internationalized, USR offers a way to help institutions fulfill their objectives, maintain financial stability, engage students, and—most importantly—adapt to a changing society (Shek and Hollister, 2017).

#### 2.1.4. Green Work climate

How socially acceptable behavior is perceived is a key factor in how employees evaluate the work climate. There are two categories of norms: injunctive norms, which are expectations about what people should do and are generally agreed upon by the majority, and descriptive norms, which represent what people commonly observe or consider typical in society. Individual behavior in society is shaped and reinforced by social punishments that people may face for violating norms (Tian et al., 2019).

Employees internalize organizational policies into tacit understandings of expectations, rewards, and support, which they share with others (Schneider et al., 2013). Their value-based schema shapes perceptions of workplace norms, influencing how they interpret the green working climate (Norton et al., 2014).

#### 2.1.5. Green Voice Behavior

Voice behavior, first defined by Van Dyne and Lepine in 1998, has been a prominent subject of research since the 1990s. To investigate green voice behavior—the behavior of employees providing feedback on environmental issues and proposing ideas for organizational improvements within the framework of green human resource management—this definition was later adapted to an environmental context (Murillo-Ramos et al., 2024). It is also significant to note that employees generate novel ideas for green initiatives even when others disagree with them (Ari et al., 2020). Both required and voluntary green behaviors are possible for employees; however, green voice behavior is distinct from voluntary green behavior, as it involves speaking up independently without external pressure (Robertson and Barling, 2013).

### 2.2. Conceptual Framework and Hypotheses Development

Bandura's Social Learning Theory (1977, 1986) explains how teachers' ethical leadership, university social responsibility, and a green work environment influence students' green voice behavior by shaping a green workplace through ethical leadership. As stated by Shore et al. (2011), leaders play a crucial role in establishing and fostering the work unit climate because they are key stakeholders in organizations and are responsible for translating policies into actionable practices. Teachers can do this by acting as behavioral role models, enabling learners to observe what is considered proper and valued and to learn how to behave appropriately. As leaders, they must also communicate policy guidelines, set clear behavioral expectations, reward, and discipline actions, and consistently serve as role models (Brown et al., 2005).

Studies on organizational context have shown that climate is a highly significant and influential factor (Kuenzi and Schminke, 2009), and as such, it also impacts green behaviors (Norton et al., 2014). The effects of green work climate on pro-environmental behavior have been the subject of relatively few studies. However, some authors, including Norton et al. (2014), Dahiya (2020), and Hicklenton et al. (2019), have examined its relationship with the predictor variable and green work climate (GWC) perception (Rubel et al., 2021). The university's green policies and initiatives help create a green working climate in the classroom. When students witness others around them engaging with green issues and receiving attention and recognition for their contributions, they are motivated to take similar actions. This aligns with Norton et al. (2015)'s reasoning that a green workplace can encourage environmentally friendly behavior among employees.

As a result, the author proposes the following hypotheses (H1, H2, H3):

H1: Teachers' Ethical Leadership (EL) positively influences student's Green Work Climate (GWC).

H2: Student's Green Work Climate (GWC) positively influences their green voice behaviors (GVB).

H3: Student's Green Work Climate (GWC) mediates the relationship between Teachers' Ethical Leadership (EL) and students' green voice behavior (GVB).

Research has demonstrated that ethical leadership has a favorable impact on voice behavior as well as on extra-role behaviors among workers (Zeng & Xu, 2020). Furthermore, encouragement from both sides motivates employees to participate in the leader's decision-making process. When working with ethical leaders, managers encourage employees to do so, creating an environment where employees feel comfortable expressing their thoughts (Ahmad & Gao, 2018). It can be argued that when teachers exhibit an ethical leadership style, they are more likely to engage in green behaviors, set an example for their students, and encourage them to act similarly. Teachers can inspire students to engage in "green voice" behavior, which involves continuously discussing ideas and suggestions for improvement with others around them. As a result, the author proposes the following hypothesis (H4):

H4: Teachers' Ethical Leadership (EL) positively influences students' Green Voice Behavior (GVB).

Stakeholder Theory explains teachers' awareness of stakeholder demands, including schools, communities, and students. Classroom leaders must serve stakeholder interests to enhance organizational performance (Zhu et al., 2014). Ethical leaders promote cooperation and responsible commitment for sustainability (Maak & Pless, 2006) while improving environmental, social, and ethical performance in response to stakeholder perceptions of CSR (Morsing & Schultz, 2006).

Ethical leaders shape followers' perceptions of CSR, extending beyond employees (Groves & LaRocca, 2011). Institutional sustainability relies on ethical educators who engage in social responsibility initiatives and communicate this commitment to students. Social responsibility includes legal, ethical, and environmental stewardship (Zhu et al., 2014). Organizations prioritizing CSR recognize and encourage environmentally responsible behaviors like the "green voice." Thus, USR can positively influence students' green behaviors. Ethical leaders implementing CSR initiatives and communicating CSR values influence subordinates' actions, with CSR mediating the impact of EL on-employee's behavior (Wood et al., 2021). Since teachers influence all students in the classroom, when they demonstrate ethical leadership and encourage social responsibility, students are more likely to adopt environmentally responsible behaviors. Consequently, the author proposes hypotheses H5, H6, and H7:

H5: Teachers' Ethical Leadership (EL) positively influences their perception of the university's social responsibility.

H6: Students' perception of the university's social responsibility positively influences their Green Voice Behaviors (GVB).

H7: Students' perception of university social responsibility mediates the relationship between Teachers' Ethical Leadership (EL) and student's Green Voice Behaviors (GVB).

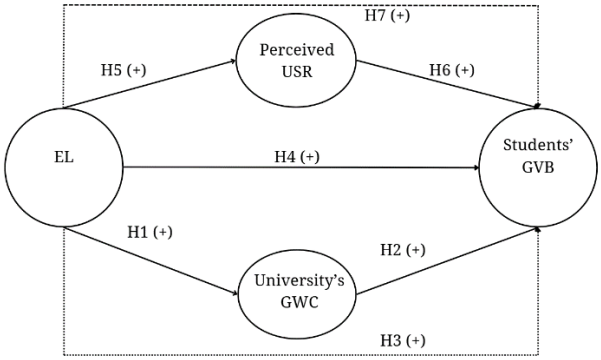



**Figure 2.2 - Proposed Conceptual Model**

## 2.3. Research Methodology

### 2.3.1. Measurement instruments

Ethical leadership emerges from the combination of traits and behaviors that demonstrate integrity and high ethical standards, treat others fairly, and hold subordinates accountable for unethical behavior. The scale developed by Brown et al. (2005) is used because it shows significant agreement among group members regarding their supervisor's ethical leadership. Considering that teachers are closely involved with students the study has adopted this scale with adjustments in terminology and context to ensure its relevance. One item in this scale is "Listens to what employees

have to say". The 6-item green voice behavior (GVB) scale, originally developed by Van Dyne and LePine (1998), served as the basis for Murillo-Ramos et al.'s (2024) use in measuring green voice among hospitality workers. “This particular co-worker develops and makes recommendations concerning issues that affect this work group” was one of the six items on the scale. Since students frequently work in study groups, the author adopted this scale to assess students' contributions to group discussions. Using various platforms, including websites, social media fan pages, extracurricular activities, seminars, and competitions, students can observe how they are responsible towards both social and non-social stakeholders. These platforms also help create a positive image of universities among stakeholders. There are several advantages to using the scale from Duygu Turker's (2009) research in a higher education setting to examine how students perceive university social responsibility (USR). One of the items on the scale is as follows: "Our company participates in the activities which aim to protect and improve the quality of the natural environment". An eight-item scale is used to assess students'GWC. Norton's (2014) green work climate perception scale forms the basis of this scale. “Our company is worried about its environmental impact” is one of the items. Four items gauge how students perceive the school, while the other four measure how they perceive their peers.

The study adopted hospitality sector scales for specialized education, with thorough translations and reviews by lecturers and students in Ho Chi Minh City confirming no significant cultural or linguistic differences. This confirmed the widespread applicability and generalizability of the selected scales. Through the previous steps, the author appropriately replaced certain terms, including “teacher” for “manager”, “student” for “employee”, “teaching approach”' for “working approach”, “my institution” for “my company”, and “the students in my group” for “my colleagues”. The scales were then finalized and sent students for verification and identification of spelling issues. Afterwards, the author proceeded to develop the questionnaire and conduct the official survey.

### 2.3.2. Questionnaire design and sample

To test the study hypotheses, a survey was reviewed by instructors, students, and industry professionals. A pilot survey with 50 students ensured clarity. Participation was voluntary, with questionnaires distributed directly and via messaging platforms. EL, GWC, and USR were surveyed first, followed by the GVB section, sent via email 24 hours later with a follow-up reminder. Initially, 500 students were invited, but only 253 completed part two. Using convenience sampling across five major hospitality colleges in Ho Chi Minh City, the sample size ensures research validity and generalizability.

The questionnaire has four sections. The first introduces the study to encourage participation. The second collects demographic data (gender, age, year, university) to manage variables affecting green voice behavior. The third includes scales for EL, USR, and GWC, while the final GVB scale is sent later. Each scale has 6–10 items, rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

## III. RESULT AND DISCUSSION

### 3.1 Research subjects

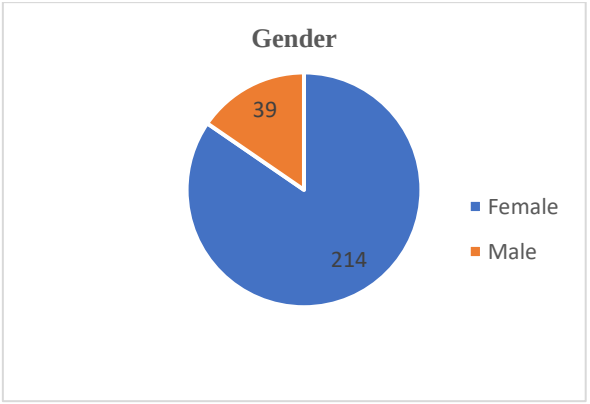



**Figure 3.1a - Survey results by gender**

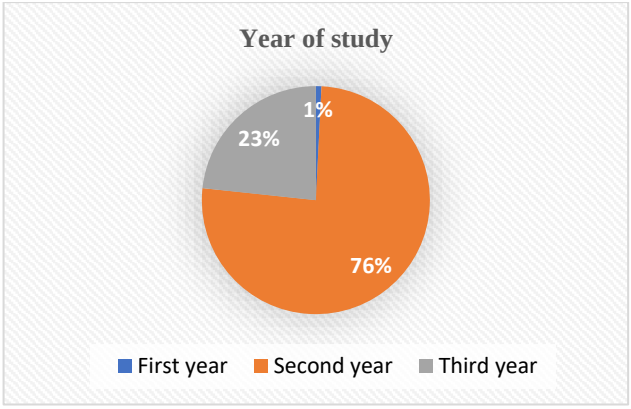



**Figure 3.1 - Survey results by year of study**

The study sampled 253 hospitality and tourism students from top institutions in Ho Chi Minh City, predominantly female (84.5%). Most participants were second-year (75.8%) and third-year students (23.3%), as first-year students focus on general courses and fourth-year students are engaged in internships.

### 3.2. Data Analysis and result

The author utilized SmartPLS 3 for data analysis, as this software allows for simultaneous modeling of relationships, yielding more accurate estimates than evaluating models individually. The author acknowledged that the sample size of 253 observations was limited compared to ideal standards but noted that the model, which included four latent variables, was relatively straightforward. To ensure rigor, the author performed statistical checks to verify data quality and confirmed that collinearity among the observed indicators remained within acceptable limits. The author employed a combination of descriptive statistics and structural equation modeling (SEM) to test hypotheses concerning the influence of the independent variable EL, USR and GWC on other variables, as well as the mediating roles of USR and GWC. Additionally, the author examined the effects of control variables on the green voice behavior (GVB).

An evaluation using SMARTPLS 3 identified low outer loadings (<0.708) for EL2, EL4, EL6, and GVB5, leading to their removal (Hair et al., 2016). The remaining items showed acceptable loadings: EL (0.713–0.833), USR (0.820–0.886), GWC (0.762–0.820), and GVB (0.763–0.864). All scales achieved Cronbach's Alpha and Composite Reliability (CR) above 0.7, ensuring high reliability, while AVE values exceeded 0.5, confirming convergent validity (see Table 3.2a).

**Table 3.2a - Reliability and validity of variables**

Construct Reliability and Validity

| | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|---|
| EL | 0.893 | 0.895 | 0.917 | 0.611 |
| GVB | 0.899 | 0.899 | 0.925 | 0.712 |
| GWC | 0.914 | 0.915 | 0.930 | 0.626 |
| USR | 0.899 | 0.901 | 0.923 | 0.666 |

**Table 3.2b - The discrimination of the variables**

Fornell-Larcker Criterion

| | EL | GVB | GWC | USR |
|---|---|---|---|---|
| EL | 0.782 | | | |
| GVB | 0.600 | 0.844 | | |
| GWC | 0.731 | 0.731 | 0.791 | |
| USR | 0.778 | 0.727 | 0.810 | 0.816 |

Heterotrait-Monotrait Ratio (HTMT)

| | EL | GVB | GWC | USR |
|---|---|---|---|---|
| EL | | | | |
| GVB | 0.669 | | | |
| GWC | 0.802 | 0.806 | | |
| USR | 0.864 | 0.809 | 0.890 | |

The square root of the Average Variance Extracted (AVE), indicated by the first value in each column, exceeds the correlations among the latent variables, as shown by the correlation coefficients positioned below these values. This confirms discriminant validity. Additionally, all HTMT values are below 0.9, further supporting the differentiation among the constructs (see Table 3.2b).

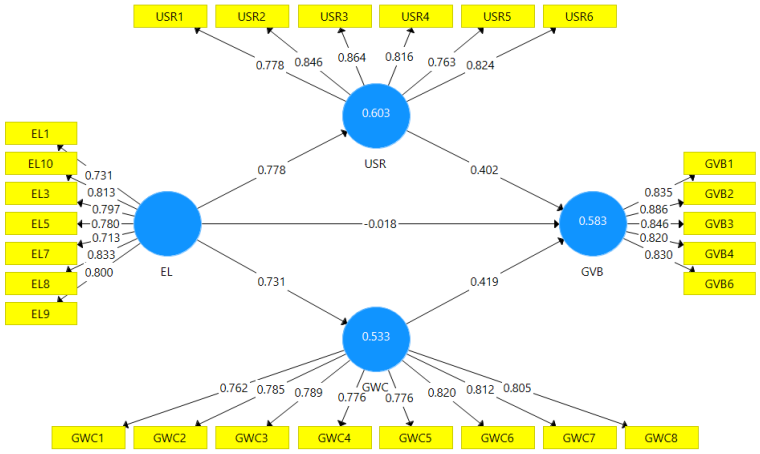



**Figure 3.2 - Revised SEM Using SmartPLS 3**

Students' perceptions of university social responsibility (USR) and green work climate (GWC) significantly impact green voice behavior (GVB) (P < 0.05) with standardized regression coefficients of 0.402 and 0.419. Teachers' ethical

leadership also strongly influences GWC (0.731) and USR (0.778) ($P < 0.05$). However, students' perceptions of teacher ethical leadership had no direct effect on GVB ($P = 0.785$). Instead, its impact on GVB occurs indirectly through the mediating roles of GWC and USR (see Table 3.2c).

**Table 3.2c - Direct effects of Ethical Leadership on University Social Responsibility, Green Work Climate, Green Voice Behaviors**

Mean, STDEV, T-Values, P-Values

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values | |
|---|---|---|---|---|---|---|
| **EL -> GWC** | 0.731 | 0.731 | 0.041 | 17.828 | **0.000** | **H1 Support** |
| **GWC -> GVB** | 0.419 | 0.424 | 0.074 | 5.652 | **0.000** | **H2 Support** |
| **EL -> GVB** | -0.018 | -0.020 | 0.067 | 0.273 | **0.785** | **H4 Not support** |
| **EL -> USR** | 0.778 | 0.776 | 0.039 | 19.739 | **0.000** | **H5 Support** |
| **USR -> GVB** | 0.402 | 0.401 | 0.078 | 5.177 | **0.000** | **H6 Support** |

**Table 3.2d - Mediation Effects of Ethical Leadership via University Social Responsibility and Green Work Climate on Green Voice Behaviors (Bootstrap 5000 Samples)**

Mean, STDEV, T-Values, P-Values

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values | |
|---|---|---|---|---|---|---|
| **EL -> GWC -> GVB** | 0.306 | 0.310 | 0.060 | 5.129 | **0.000** | **H3 Support** |
| **EL -> USR -> GVB** | 0.312 | 0.312 | 0.066 | 4.732 | **0.000** | **H7 Support** |

The mediating effects of university social responsibility (USR) and green work climate (GWC) are significant ($P < 0.01$), with standardized regression coefficients of 0.312 and 0.306, respectively (see Table 3b). Bootstrap analysis (5,000 samples) confirms mediation, as confidence intervals exclude 0 (see Table 3.2d). Thus, GWC and USR fully mediate the impact of teachers' ethical leadership on students' green voice behavior. All Inner Variance Inflation Factor (VIF) values are below 5, indicating no multicollinearity: EL to GVB (2.743), EL to USR (1.000), EL to GWC (1.000), GWC to GVB (3.150), and USR to GVB (3.709) (Hair et al., 2011).

**Table 3.2e - Confidence Intervals of Mediation Effects for Ethical Leadership on Green Voice Behavior via Green Work Climate and University Social Responsibility**

Confidence Intervals

| | Original Sample (O) | Sample Mean (M) | 2.5% | 97.5% |
|---|---|---|---|---|
| **EL -> GWC -> GVB** | 0.306 | 0.309 | 0.201 | 0.432 |
| **EL -> USR -> GVB** | 0.312 | 0.311 | 0.184 | 0.442 |

The model's explanatory power is reflected in the adjusted R-squared values: 0.603 for university social responsibility (USR) and 0.533 for green work climate (GWC) based on perceptions of ethical leadership, while it accounts for 58.3% of the variance in students' green voice behavior (GVB). Effect size ($f^2$) analysis shows that GWC (0.135) and USR (0.105) have a small impact on GVB ($\geq 0.02$) (Cohen, 1988). However, ethical leadership (EL) significantly impacts GWC (1.148) and USR (1.529), indicating a substantial effect ($\geq 0.35$).

**Table 3.2f - R Squared Value for Measuring the Impact on the Dependent Variable**

R Square

| | R Square | R Square Adjusted |
|---|---|---|
| **GVB** | 0.588 | 0.583 |
| **GWC** | 0.534 | 0.533 |
| **USR** | 0.605 | 0.603 |

**Table 3.2g - effect size**

f Square

| | EL | GVB | GWC | USR |
|---|---|---|---|---|
| **EL** | | **0.000** | **1.148** | **1.529** |
| **GVB** | | | | |
| **GWC** | | 0.135 | | |
| **USR** | | 0.105 | | |

The model explains 58.3% of the variance in green voice behavior (GVB) (Table 3.2f), though the effect size ($f^2$) of independent variables on GVB is small (≥ 0.02 but < 0.15) (Cohen, 1988). The mediated path from ethical leadership (EL) to GVB via green work climate (GWC) and university social responsibility (USR) is highly significant (Table 3.2g). Hair et al. (2019) classifies the model as having medium predictive power ($Q^2$ = 0.25–0.5), with out-of-sample predictive power values of 0.410 for GVB, 0.327 for GWC, and 0.395 for USR (Stone, 1974).

**Table 3.2h - Predictive Power of the Model (Q-Squared)**

Total

| | SSO | SSE | $Q^2$ (=1-SSE/SSO) |
|---|---|---|---|
| **EL** | 1771.000 | 1771.000 | |
| **GVB** | 1265.000 | 745.748 | 0.410 |
| **GWC** | 2024.000 | 1362.931 | 0.327 |
| **USR** | 1518.000 | 917.767 | 0.395 |

The author also examined the impact of control variables, including gender, age, and student year (first, second, third, and final years). The results indicated that these variables did not have a significant influence on the dependent variable, green voice behavior (GVB). Specifically, the P-values for gender, age, and student year were 0.270, 0.133, and 0.243, respectively. This suggests that these student demographic differences do not significantly affect their green voice behavior, and other factors within the model may better explain this aspect of student conduct.

### 3.3. Discussion

While Ethical Leadership is recognized for its significant role in promoting employee voice behaviors both directly and indirectly (Zeng & Xu, 2020), this study finds no direct influence of Teacher's EL on students' Green Voice Behaviors. Nevertheless, the analysis confirms that Teacher's EL positively impacts students' Green Work Climate and the USR toward both social and non-social stakeholders. This study clearly demonstrates that teachers who exhibit ethical leadership play a crucial role in fostering a positive climate and act as a bridge to communicate the university's social responsibility initiatives to students. Teachers' EL shapes students' perceptions of social responsibility and the green climate, influencing their green voice behavior. It fosters a positive environment and motivates sustainable actions. However, while student's GWC and USR impact student's GVB, their effect remains modest.

Regarding the mediating role hypothesis, this study highlights the importance of considering the combined pathways to understand how Teacher's EL specifically influences these variables. The results indicate that teachers' EL, as perceived by students, significantly impacts behavior through the full mediation of university social responsibility (USR) and green work climate (GWC). Wood et al. (2021) also supports this mediating effect based on their research in the hospitality industry. This finding aligns with AMO theory, which suggests that green behaviors are inherently voluntary and conscious, indicating that opportunity and motivation are essential factors in fostering such behaviors. Additionally, there are no differences in green voice behavior based on variations in student gender, age, or year of study. This finding suggests the potential to generalize these results across demographic differences and to formulate related recommendations.

## IV. CONCLUSION

### 4.1. Managerial Implications

The study's findings suggest that promoting ethical leadership among teachers is crucial for fostering green behaviors in students. While teachers' ethical leadership does not have a direct impact on students' Green Voice Behavior, it influences them indirectly by cultivating a sense of university social responsibility and creating a green

work climate. To promote teachers' ethical leadership, it is essential to invest in professional development initiatives, such as workshops or seminars on ethical leadership, which can inspire teachers to become trusted role models and instill a strong ethical framework within the institution.

Meaningful social responsibility initiatives, such as committing to energy-saving regulations, effective waste management, and the promotion of recyclable materials on campus, can enhance students' awareness of the university's environmental efforts. These initiatives also encourage their participation in eco-friendly activities. Furthermore, university social responsibility efforts, including charitable work, environmental volunteering opportunities, and sustainability-focused events, help students recognize the institution's commitment to social responsibility. Additionally, requiring or recommending university social responsibility reporting, in collaboration with hospitality education stakeholders, is essential for assessing performance and reinforcing the institution's social responsibility.

For students to effectively contribute to green initiatives, institutional support and faculty guidance are essential. Educators can integrate social responsibility education into their curricula, fostering an academic environment where students are encouraged to present and develop their ideas within the classroom setting. University-affiliated organizations and administrative bodies can facilitate this process by organizing thematic seminars, academic conferences, and competitions focused on environmental sustainability. Additionally, implementing structured programs that promote eco-friendly behaviors within the academic community and beyond can further reinforce these efforts. Through experiential learning and active engagement, coupled with mentorship from faculty and institutional support, students can emerge as key agents of change, driving the dissemination of sustainable initiatives and fostering a culture of environmental consciousness.

Universities can develop an evaluation system to assess the effectiveness of faculty ethical leadership in fostering students' environmentally responsible behavior and social responsibility. To further encourage faculty engagement, institutions may implement reward mechanisms and strict regulations that cultivate a supportive environment for sustainability initiatives. The adoption of such an evaluation framework will not only motivate faculty members to uphold ethical leadership but also create a positive institutional culture that inspires students to adopt sustainable practices.

For ethical leadership to have a lasting and widespread impact, it must be implemented in a comprehensive and coordinated manner, involving both faculty and administrative departments. Establishing collaborative programs and robust information-sharing platforms among departments is essential for synchronizing leadership efforts and ensuring the effectiveness of initiatives that promote sustainability among students.

### 4.2. Limitations and Future Research

Despite analyzing students' green voice behavior, this study has limitations. The sample from five hospitality institutions may not be fully representative, requiring broader participation for generalization. Self-report questionnaires risk social desirability bias, suggesting the need for longitudinal studies or multiple data sources. Adapting business research scales may cause misunderstandings, highlighting the value of stakeholder interviews. Future research should also explore additional factors beyond university social responsibility (USR) and green work climate (GWC) to deepen understanding of green voice behavior (GVB).

### 4.3. Conclusion

This paper highlights the vital role of ethical leadership in enabling teachers to foster students' positive behavior by reinforcing institutional social responsibility and a green climate. Green voice behavior arises not just from modeling or persuasion but from a supportive climate and motivation shaped by instructors. Through social learning theory, teachers with moral leadership remain a trusted influence, serving as key role models in an ever-evolving society.

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# EXPLORING THE RELATIONSHIP BETWEEN GREEN SPACES, EXTRACURRICULAR ACTIVITIES, AND PRO-ENVIRONMENTAL BEHAVIOR AMONG HIGHER EDUCATION STUDENTS

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**ABSTRACT**

This study explores the impact of green spaces and extracurricular activities on pro-environmental behavior (PEB) among higher education students, integrating Attention Restoration Theory (ART), Connectedness to Nature Theory, and the AMO (Ability, Motivation, Opportunity) model as the theoretical framework. The research was conducted at universities and colleges in Ho Chi Minh City with green campuses. A quantitative approach was used to assess how these factors influence students' environmental attitudes and actions. The findings show a positive relationship between green spaces, extracurricular activities, and PEB, with key mediators identified as environmental knowledge (Ability) and a strong connection to nature (Motivation). The Structural Equation Modeling (SEM) analysis reveals an R-squared value of 0.424, indicating that the model explains 42.4% of the variance in pro-environmental behavior and demonstrating a moderate level of explanatory power. Based on the responses of 390 students, the results highlight the importance of integrating green spaces and environmental activities into higher education institutions to foster pro-environmental behavior among students.

*Keywords:* “Green spaces”, “Extracurricular activities”, “Pro-environmental behavior”, “Connectedness to Nature”, “AMO model”, “Environmental knowledge”.

## I. INTRODUCTION

### 1.1 Background of the study

Nature conservation is currently facing a pair of significant issues that are interconnected: the first is caused by human activities such as the use of fossil fuels, the emission of carbon monoxide, deforestation, and the second is caused by climate change, resource scarcity, and environmental degradation (Markey et al., 2019). Environmental protection is frequently considered as a critical topic (Akhtar et al., 2022). People are the main drivers in dealing with environmental challenges and climate change, and they have their own advantages in environmental sustainability. To identify a resolution, we need to begin by educating about the current condition of the environmental issues and how to deal with them. Students who live in cities require further research since they spend most of their time in the building surroundings (Hashimoto-Martell et al., 2012). In Canada, initiatives to promote environmentally friendly behaviours for students have been implemented, including integrating environmental education into the curriculum, upgrading gardening infrastructure, and providing step-by-step instructions for incorporating sustainable management into the curriculum (Breunig et al., 2014). This highlights that, throughout the decade of education for sustainable development, there has been an increase toward a stronger emphasis on environmental education.

In this setting, universities, both direct and indirect environmental stakeholders, must work collaboratively to preserve the environment. However, such efforts cannot be entirely effective unless they involve the university's students (Zamora-Polo et al., 2019). There is an urgent need to look into how sustainable campus initiatives (e.g., extracurricular activities, green campus projects) impact student views and actions toward achieving environmental objectives (Chakraborty et al., 2017). Students as well as learners in general are undeniably important stakeholders in environmental efforts at universities. Sustainability subjects are also integrated (environmental, social, economic, and cultural) (Giard and Schneiderman, 2013), indicating that educators recognize students' engagement value. Environmental knowledge formation can be a key predictor of pro-environmental behavior change, which is the intervention's targeted result (cole et al., 2019). Furthermore, understanding students' perceptions of university sustainability practices is vital because it provides policymakers with better guidance, such as how students perceive their university's green campuses following efforts to build and preserve green spaces (Shafei & Maleksaeidi,

2020). The appeal for quantitative research, which is now mostly done in Europe, should be expanded to include Asian institutions (Abubakar et al., 2016; Akhtar et al., 2020). AMO theory has been shown to be highly useful in figuring out how to inspire and shape behaviors, particularly voluntary behaviors; nevertheless, pro-environmental behaviors in education that are explained through AMO are sometimes neglected (Pinzone et al., 2016; Anwar et al., 2020). Thus, pro-environmental behavior is a necessary behavior to explain employing AMO theory. Previous research has also found that environmental awareness and knowledge have an impact on individual concern and effectively reduce environmental problems while also promoting this type of behavior in organizations (Fawehinmi et al., 2020).

Green spaces offer multiple favorable impacts that researchers have investigated and proven on human wellness, including stress reduction, enhanced mindfulness, reduced physical health issues, and comprehensive positive effects (Li et al., 2019). Despite these advantages, green space research frequently focuses on urban areas, exploring residents' perceptions and behaviors toward green spaces, as He and Zhu (2018) conducted interviews to conduct research on residents' behaviors and attitudes, and Zhou and Li (2015) analyzed the quality of green spaces. However, an important aspect of greening is the green campus in universities, where there are sufficient conditions to promote green campus development but insufficient attention (Washington-Ottombre et al., 2018), resulting in a lack of understanding of students' perceptions of green spaces in universities. Thus, green spaces in universities are both a benefit to students and a source of study into the attitudes and behaviors that result from green spaces.

The present societal development in Vietnam is causing a shift in the overall educational system. Educational innovation requires the development of curriculum and procedures aimed at improving learners' knowledge, abilities, and qualities (Hoduc et al., 2022). Current educational reform must still follow a certain procedure due to its structural organization, making it difficult to consistently keep up with change. As a result, informal education, with its flexibility, may aid in the reform process by facilitating students in embracing societal changes. As a result, activities that are conducted beyond the traditional curriculum are referred to as extracurricular activities, and they are becoming more prevalent in today's educational system. The advantages include not just enriching the academic program, but also increasing the learner experience, contributing to personal capital, soft skills, essential competencies, and interactions with others that may be constructed through extracurricular activities (Kosarikov & Davydova, 2022). Effective tactics are required for impacting the younger generation's green actions. Government organizations advocate boosting awareness through non-academic activities such as seminars, conferences, campaigns, and advertising collateral directed at young people, such as students (Saifullah et al., 2017).

Pro-environmental behaviors among the younger generation must be included in the attempts to construct green spaces in universities. It benefits people around it, and while the positive effect of green spaces on humans is often recorded, research on the opposite impact on the environment remains limited. Extracurricular activities aimed at supplementing the primary curriculum have been researched; nevertheless, studies on students' engagement in campaigns have been limited in terms of their influence on environmentally friendly behaviors. This article attempts to clarify the primary influence of green spaces in major institutions in Ho Chi Minh City, as well as students' extracurricular activities, on their environmentally friendly behaviors, with the goal of offering implications for naturally forming fundamental beneficial environmental behaviors.

The purpose of this study is to examine the students' perceptions of green space at university, as well as their engagement in voluntarily extracurricular activities that result in pro-environmental behavior. Moreover, the author investigates the mediating link between environmental knowledge and connectedness to nature, both of which are thought to be closely linked to involvement in green spaces and extracurricular activities. Therefore, the research question is as follows:

Question 1: How do green spaces affect students PEB?

Question 2: What impact does extracurricular activity involvement play in improving students' PEB?

Question 3: What significance do mediators, such as environmental awareness and a connectedness to nature, serve in the link between green space and extracurricular activity involvement and student PEB?

**1.2 Theoretical background and hypotheses**

Pro-environmental behavior is one of the extra-role behaviors that AMO theory may explain through integrating

elements like ability (A), motivation (M), and opportunity (O). These factors together will yield optimal performance, in which ability is the skills and expertise that an individual requires to perform a specific task, followed by the individual's desire to decide whether to perform that specific action - motivation, and finally the individual can perform and desires to succeed but demands more possibilities - the surrounding forces that facilitate or prevent their behaviors and are beyond what they can influence (Morales-Sánchez & Pasamar, 2020).

Pro-environmental behavior (PEB) is characterized by Runhaar et al. (2019) as an intentional act undertaken by a person or together that positively impacts the environment, either directly or indirectly. This activity may be characterized as participation in structured activities that seek sustainable practices by decreasing or eliminating harmful environmental consequences, as noted by Rezapouraghdam et al. (2018). It may also be simplified by minimizing trash, turning off lights when unneeded in the workplace, cycling, decreasing paper consumption while printing, and advocating environmental activities (Akhtar et al., 2022).

Research indicates that green spaces at universities, which provide a connection with nature, are crucial for human well-being and serve as a strong positive predictor of environmental attitudes and behaviors (Nisbet et al., 2009). Students' engagement in green spaces on campus—through walking, relaxation, group study, outdoor activities, and clean-up initiatives—can enhance involvement in significant green initiatives (Krasny & Delia, 2015). The AMO theory may be used to argue that green spaces serve as an inspiration for behavioral motivation, since exposure to such environments fosters a sense of commitment and connection to nature, prompting individuals to prioritize preserving of such spaces before addressing broader environmental concerns. The author thus posits the following hypothesis:

H1: Campus green spaces positively influence students' pro-environmental behaviors.

H2: Connectedness to Nature positively influence students' pro-environmental behaviors.

H3: Campus green spaces positively influence student’s environmental knowledge.

H4: Campus green spaces positively influence student’s connectedness to nature.

According to their study, Kosarikov and Davydova (2022) have stated that extracurricular educational programs are truly applicable to the post-industrial shift because they are organized following the associated initiatives on development, that promote sustainable growth, and intended to stabilize the climate and reduce humanity's environmental impact. This is in addition to the fact that these programs are suitable in helping students become familiar with and aware of the real-world circumstances. These perceptions and experiences will shape students' orientation. According to the author, extracurricular activities provide youngsters the chance to interact with the environment, learn about environmental issues, explore the beauty of nature, and take an effort to preserve it. As a result, the author suggests the following of hypotheses:

H5: Extra-curricular activities positively influence students' pro-environmental behaviors.

H6: Extra-curricular activities positively influence students' environmental knowledge.

H7: Students' environmental knowledge positively influence students' pro-environmental behaviors.

Due to environmental issues, encouraging pro-environmental behavior has become a priority in both developed and developing nations, since both are dealing with many environmental issues (Amoah & Addoah, 2020). An individual who understands more about the environment is more likely to participate in ways that aid the environment, according to several research (Van Birgelen et al., 2009; Amoah et al., 2018). But where do students learn about the environment? Sustainable development goals have forced educational systems to concentrate on learning by doing, a popular approach that enhances students' practical expertise in areas including the environment. In addition to having a direct effect on students' PEB, involvement in extracurricular activities and appreciation green space also has an indirect effect. Students will also feel more linked to nature because of caring for and participating in green settings, which will relate them to eco-friendly behaviors. As a result, the author puts up the following hypotheses on the mediating role:

H8: Students' knowledge regarding the environment mediates the association between campus green space and pro-environmental behavior (PEB).

H9: The connection of students to nature mediates the link between their campus green spaces and their pro-environmental behavior (PEB).

H10: The environmental knowledge of students mediates the relationship between their extracurricular participation and pro-environmental behavior (PEB).

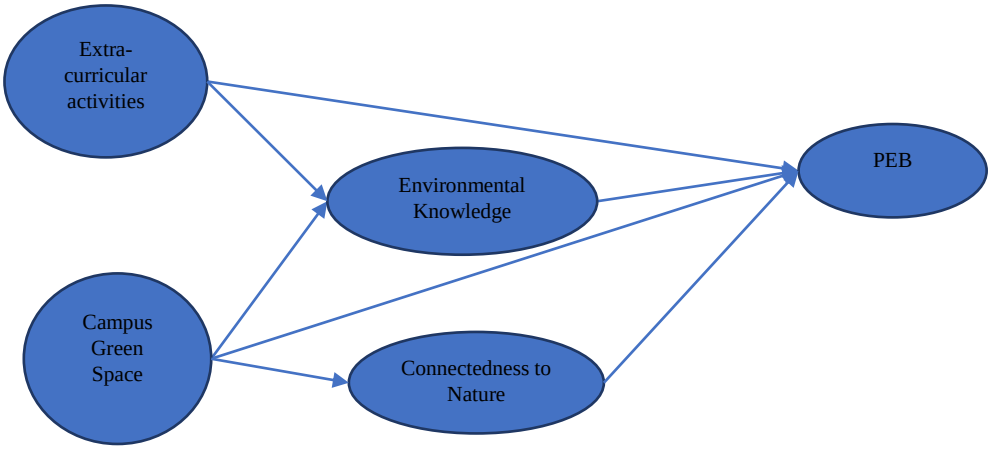



**Figure 1. Proposed conceptual model.**

## II. RESEARCH METHOD

### 2.1. Procedure, questionnaire design and data collection

To learn about green spaces at their schools and to acquire their thoughts on extracurricular activities, the author interviewed two professors who teach public economics and the restaurant and hotel business at two separate institutions. The author then conducted interviews with students to learn more about their viewpoints on the extracurricular activities they took part in. Lastly, to test the scale ahead of the formal survey, the author surveyed students and professors.

A final questionnaire was designed to elicit students` pro-environmental behavior. The objective of research and the importance of truth answers were clearly stated in order to reduce hypothetical bias. Accordingly, only colleges and universities with green campus space were targeted. Furthermore, a brief literature review was performed to identify relevant studies and explore instruments of items used. The survey covered 6 main constructs, including demographic information, environmental knowledge, connectedness with nature, green space campus, extra-curricular activities, and pro-environmental behavior. The instrument used a Likert scale ranging from 1- Totally disagree to 5- Totally agree. Questions for demographics were also included.

Data for this research were collected through online distribution between October and November 2024. The questionnaires were sent to a various universities and colleges with green space campuses in Ho Chi Minh city. A total of 390 respondents participated in this survey.

### 2.2. Data analysis

Data were analyzed by using Structural Equation Modeling (SEM) test in Smart PLS. SEM is a multivariate statistical technique that is used to analyze complicated relationships among observed and latent variables (Hair et al., 2019). This study applied Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate the measurement model. The measurement model was examined to confirm the validity and reliability of the constructs. Cronbach's alpha and Composite Reliability (CR) were used to assess reliability, with criteria of 0.7 or greater (Thorndike, 1995). Moreover, convergent validity was confirmed using Average Variance Extracted (AVE), with values above 0.5 being acceptable (Fornell & Larcker, 1981).

The structural model was examined to assess the proposed relationships between latent variables, and path coefficients were also estimated. The data analysis followed a two-step process. Initially, the measurement model was validated to confirm its reliability and validity. Subsequently, the structural model was evaluated to test the hypothesized relationships.

## III. RESULT AND DISCUSSION

### 3.1. Demographic profiles

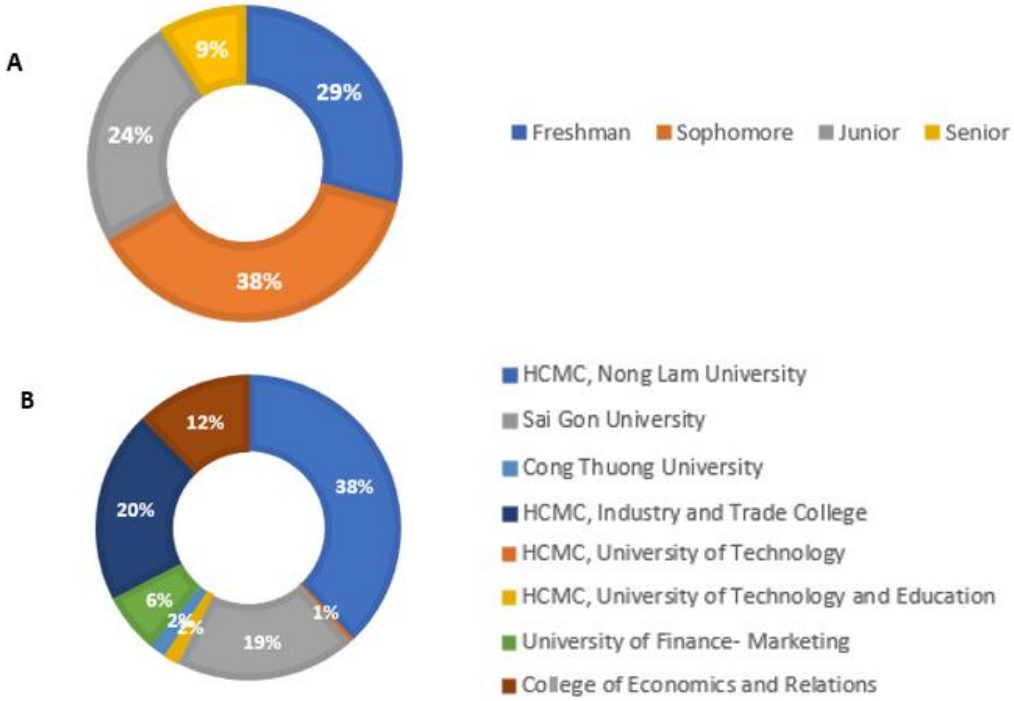



**Figure 2. Demographic profiles (A. The distribution of students across 4 academic years; B. The distribution of students across educational institutions)**

Figure 2 demonstrates the distribution of students, revealing that sophomores represent the largest group, accounting for 38%. Freshmen, juniors, and seniors follow, making up 29%, 24%, and 9%, respectively. In terms of educational institutions, Ho Chi Minh City Nong Lam University leads the group, comprising 38% of the total, followed by HCMC Industry and Trade College at 20% and Sai Gon University at 19%. Other institutions account for relatively low percentages.

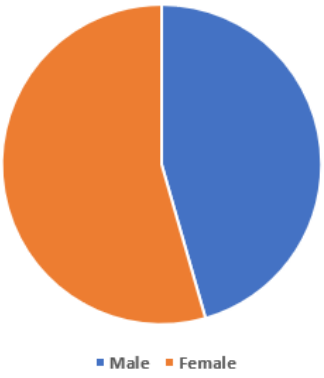



**Figure 3. Participants gender**

Figure 3 illustrates the gender distribution of the surveyed population. The group is nearly evenly split between males and females, with females slightly outnumbering males. Females represent approximately 55%, while males made up about 45% of the total.

### 3.2. Results

By emphasizing the relationships among constructs, the structural model concentrates on how they affect environmental knowledge, connectedness to nature and pro-environmental behavior. The results suggest that extracurricular activities, green spaces, and connectedness to nature are key factors influencing environmental knowledge and pro-environmental behavior. In particular, extra-curricular activities are fairly crucial in promoting environmental knowledge with a path coefficient of 0.275, and pro-environment behavior at 0.270. Likewise, green space campus positively affects environmental knowledge (0.196), and connectedness to nature (0.387), and a smaller but positive effect on pro-environment behavior (0.123). This result highlights how campus green spaces can improve

students` understanding of the environment and their sense of connectedness to the nature.

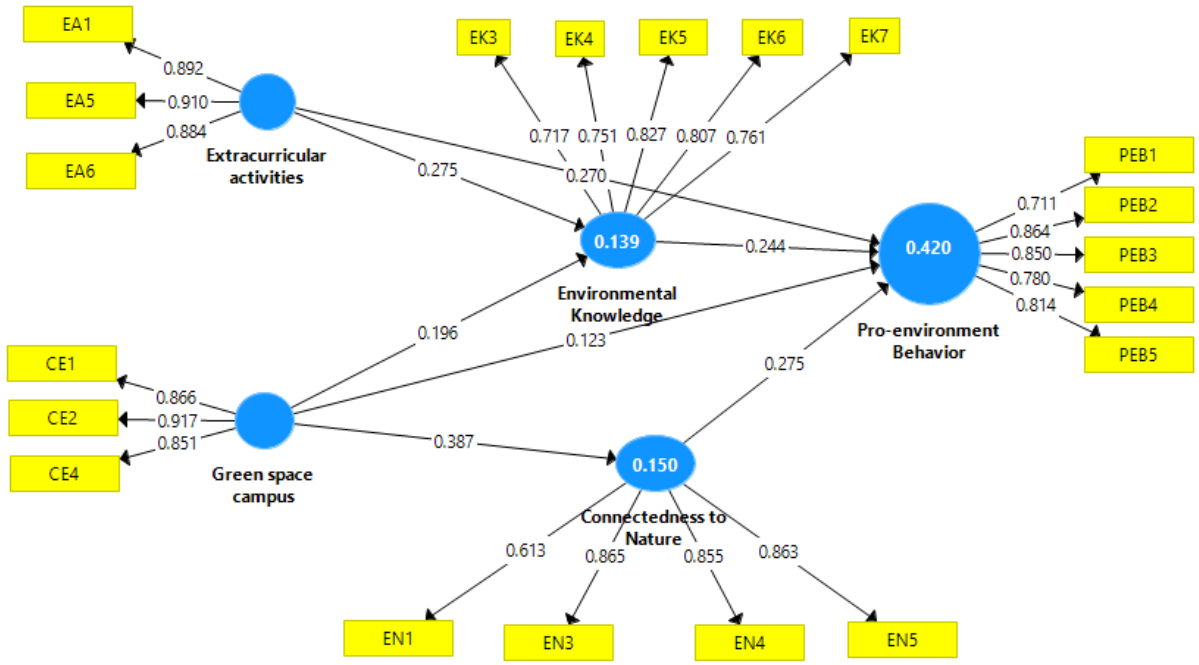



**Figure 4. The result of research model**

With a path coefficient of 0.275, connectedness to nature also has a beneficial impact on pro-environmental behavior, indicating its role as a mediator between pro-environmental outcomes and campus experiences. Furthermore, environmental knowledge had a smaller but positive impact on pro-environmental behavior (0.244), suggesting that although information influences behavior, activities and connectivity are more important. The Figure also reflects $R^2$ values, where Environmental Knowledge ($R^2$ = 0.139), Connectedness to Nature ($R^2$ = 0.150), and Pro-environment Behavior ($R^2$ = 0.420) are explained to varying degrees by their predictors.

Table 1 shows the path coefficients after running PLS Algorithm, emphasizing the relationships between constructs. extracurricular activities positively influence environmental knowledge with a path coefficient of 0.275 and pro-environment behavior with a coefficient of 0.270, while green space campus positively affects connectedness to nature (0.387), environmental knowledge (0.196), and pro-environment behavior (0.123). In addition, connectedness to nature has a positive effect on pro-environment behavior with a path coefficient of 0.275, while environmental knowledge also contributes positively to pro-environment behavior (0.244).

**Table 1. Results of beta coefficient**

| **Beta coefficient** | | | |
|---|---|---|---|
| | Connectedness to Nature | Environmental Knowledge | Pro-environmental Behavior |
| **Connectedness to Nature** | | | 0275 |
| **Environmental Knowledge** | | | 0.244 |
| **Extracurricular activities** | | 0.275 | 0.270 |
| **Green space campus** | 0.387 | 0.196 | 0.123 |
| **Pro-environmental Behavior** | | | |

Table 2 test the construct reliability and validity of variables based on survey results. With a standard value greater than 0.7 and consistent highest values between variables, the reliability of the variables are validated. AVE values for all constructs are above 0.5, meeting the criterion for convergent validity. The lowest AVE is 0.598 (Environmental Knowledge), while the highest is 0.802 (Extracurricular Activities).

As shown in the Table 3, there is a significant interaction among variables including green space campus, extracurricular activities, connectedness to nature and environmental knowledge in influencing the behavior of students towards environment. The table shows the bootstrapping results for path coefficients, which illustrate their statistical significance using Bias-Corrected Confidence Intervals (CI). All path coefficients are significant as their confidence

intervals (2.5%–97.5%) do not include 0, indicating strong support for the relationships. Furthermore, the original sample values of the study range from 0.123 to 0.387, with small bias values close to zero, indicating that the estimates are stable and unbiased. The results suggest positive and significant relationships between the constructs. Thus, it is evident that the proposed model relationships are well-supported.

**Table 2. Construct reliability and validity of variables**

| | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE |
|---|---|---|---|---|
| **Connectedness to Nature** | 0.817 | 0.853 | 0.880 | 0.650 |
| **Environmental Knowledge** | 0.832 | 0.839 | 0.881 | 0.598 |
| **Extracurricular activities** | 0.877 | 0.895 | 0.924 | 0.802 |
| **Green space campus** | 0.852 | 0.863 | 0.910 | 0.772 |
| **Pro-environmental Behavior** | 0.864 | 0.871 | 0.902 | 0.649 |

**Table 3. Confidence intervals bias corrected data**

| Hypothesis | Path coefficients | Original Sample (O) | Sample Mean (M) | CI | 2.50% | 97.50% | Result |
|---|---|---|---|---|---|---|---|
| H1 | Green space campus -> Pro-environment Behavior | 0.123 | 0.123 | 0.000 | 0.025 | 0.214 | Support |
| H2 | Connectedness to Nature -> Pro-environment Behavior | 0.275 | 0.278 | 0.003 | 0.176 | 0.370 | Support |
| H3 | Green space campus -> Environmental Knowledge | 0.196 | 0.199 | 0.002 | 0.092 | 0.305 | Support |
| H4 | Green space campus -> Connectedness to Nature | 0.387 | 0.388 | 0.001 | 0.278 | 0.483 | Support |
| H5 | Extracurricular activities -> Pro-environment Behavior | 0.270 | 0.269 | -0.001 | 0.166 | 0.374 | Support |
| H6 | Extracurricular activities -> Environmental Knowledge | 0.275 | 0.278 | 0.003 | 0.161 | 0.367 | Support |
| H7 | Environmental Knowledge -> Pro-environment Behavior | 0.244 | 0.246 | 0.002 | 0.144 | 0.345 | Support |
| H8 | Green space campus -> Environmental Knowledge ->> Pro-environment Behavior | 0.046 | 0.047 | 0.016 | 2.917 | 0.004 | Support |
| H9 | Green space campus -> Connectedness to Nature ->> Pro-environment Behavior | 0.112 | 0.115 | 0.026 | 4.360 | 0.000 | Support |
| H10 | Extracurricular activities -> Environmental Knowledge ->> Pro-environment Behavior | 0.068 | 0.068 | 0.020 | 3.312 | 0.001 | Support |

### 3.3. Discussion

The effect size of $O$=0.275 indicates a positive and fairly substantial association between pro-environmental behavior and being connected to nature. This finding is consistent with earlier research that highlights the importance of emotional and cognitive ties to nature in promoting pro-environmental behavior, such as (Mayer & Frantz, 2004). In another study, Daniel J. Anderson and Tobias Krettenauer explored that pro-environmental behavior is significantly

predicted by a strong emotional connection to nature (Anderson & Krettenauer, 2021). Connectedness to nature plays an important role to encourage pro-environmental behavior, even enhance well-being among university students (Ibáñez-Rueda et al., 2020).

Environmental knowledge also positively influences pro-environment behavior, which is in line with in line with studies like Hines, Hungerford, and Tomera. In Hines et al`s research, environmental knowledge is a key prerequisite for responsible behavior, though it might not always be sufficient to guarantee action without additional motivators (Hines et al., 1987).

In terms of the importance of extracurricular activities dimension, it obviously significantly enhances environmental knowledge and has a direct positive relationship with pro-environment behavior. These results are consistent with previous related studies by Cheng and Monroe (2012) and Zint et al (2014). Cheng and Monroe reveals that active participation in environmental programs improved cognitive understanding of environmental issues (Cheng & Monroe, 2012). In their research Zint indicates that if students take part in more or particular kinds of environmental acts, they are more likely to develop environmental stewardship traits (Zint et al., 2014).

This study also reveals that green space on campus has the strongest effect on connectedness to nature, highlighting its vital role in creating a strong emotional connection with the natural world. Additionally, green space campus also positively influences environmental knowledge, which aligns partially with Barton and Pretty's (2010) research on experiential learning opportunities in green environments (Barton & Pretty, 2010). Another critical result is the relationship between green space campus and pro-environmental behavior. Although this is the weakest relationship in the model, it is still significant. This result implies that green spaces on campus indirectly impact behavior through constructs like connectedness to nature and environmental knowledge, which is a novel finding.

Table 3 shows that students' knowledge regarding the environment mediates the association between campus green space and pro-environmental behavior with a path coefficient of 0.046 and a p-value of 0.004. This implies that having green space on campuses enhances individuals` understanding of the environment, which in turn promotes sustainable behavior. Moreover, a stronger mediation influence is observed for Connectedness to Nature in the relationship between Green Space Campus and Pro-environment Behavior with a path coefficient of 0.112, which emphasizes how experience and emotion connections to nature are in for encouraging sustainable behavior among students. A significant positive relationship was also identified in the relationship among Extracurricular Activities, Environmental Knowledge and Pro-environment Behavior, with a path coefficient of 0.068. Extra activities give students practical opportunities to learn about environmental issues and stimulate feasible solutions. This enhanced knowledge equips them with the skills and awareness to involve in pro-environment actions.

## IV. CONCLUSION AND RECOMMENDATIONS

This study uniquely integrates extracurricular activities and green space campus variables, providing a comprehensive perspective on environmental education. The findings also reveal that pro-environmental behavior is significantly mediated by both environmental knowledge and connectedness to nature. By exploring the association among these factors, the study provides valuable insights for practical applications and management policies.

Universities should prioritize green campus initiatives and extracurricular activities to encourage sustainable practices. By creating and maintaining green campus spaces and providing diverse extracurricular activities, universities can enhance students` connectedness to nature and translate into meaningful behavioral changes. Universities that prioritize sustainability can create a strong identity as their value, attracting more potential students. Moreover, educational programs should be considered to integrate into extracurricular activities. Engaging in activities like guided nature walks or outdoor environmental workshops can deepen students' knowledge and also strengthening their connection to nature. These practical applications not only enrich the learning experience but also encourage students to adopt sustainable actions in their lifestyles.

From a strategic management perspective, higher institutions need to incorporate sustainability into their mission and vision. In order to achieve this, commitment to promote green policies, setting measure sustainable targets should be required, ensuring that institutional culture embraces environmental responsibility. Adopting eco-friendly practices including green designs, water conservation systems and eco-friendly materials can further reinforce the institutions`

commitment.

However, this study only provides a snapshot of the relationships between variables at a single point in time. Therefore, this limits the ability to draw conclusions about the long-term effects of green spaces and extracurricular activities on pro-environmental behavior. Further research is essential to explore how these factors influence behavior over time. In additional, other potential factors including family background, socioeconomic status, or prior environmental education may be also considered in future research to expand the scope.

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# FACTORS INFLUENCING NET ZERO GOALS IN TOURISM – A MIXED-METHODS ANALYSIS

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**ABSTRACT**

This study explores the factors influencing the achievement of Net Zero goals in the tourism industry, aiming for a sustainable future. Using a mixed research method, we combined a quantitative survey of 180 tourism sector participants with in-depth interviews with 20 experts. The research model includes five independent variables: the extent of green technology adoption, investment in renewable energy, waste management practices, participation in ecotourism, and the application of circular economy principles; with the dependent variable being the level of Net Zero achievement.

Quantitative data analysis using SPSS shows that investment in renewable energy and the application of circular economy principles have the strongest impact on achieving Net Zero. The expert interviews further provide insights into the challenges of implementing sustainable solutions and the opportunities for technological innovation in the tourism industry.

This study contributes to both theory and practice by identifying key factors for achieving Net Zero in tourism and proposing a strategic framework for tourism businesses. The research results provide a basis for policy planning and business strategy, aimed at promoting sustainable tourism development and effectively responding to climate change. These findings are not only significant for tourism managers and policymakers but also offer valuable guidance for tourism businesses in transitioning their business models towards Net Zero.

*Keywords*: “net zero”, “sustainable tourism”, “green technology”, “circular economy”, “climate change”

## I. INTRODUCTION

The tourism industry faces mounting pressure to achieve Net Zero emissions while maintaining economic viability (UNWTO, 2023; Lenzen et al., 2021). As one of the world's largest industries, tourism significantly contributes to global carbon emissions through transportation, accommodation, and tourist activities, making it a critical focus for climate action (Rico et al., 2019; Sun et al., 2019). While recent studies have highlighted the importance of sustainable practices in tourism (Font et al., 2021; Peeters, 2022), the specific factors influencing Net Zero achievement remain inadequately explored.

This study addresses this knowledge gap by investigating five key factors influencing Net Zero achievement in tourism: green technology adoption, renewable energy investment, waste management practices, ecotourism participation, and circular economy principles (Gössling & Higham, 2021; Hall et al., 2023). Through a mixed-methods approach combining quantitative analysis of 180 tourism sector participants with qualitative insights from 20 industry experts, this research provides a comprehensive understanding of how these factors impact Net Zero goals.

The research contributes to both theory and practice by developing a framework for understanding Net Zero achievement in tourism (Gössling & Scott, 2023) and providing practical guidance for stakeholders. Our findings have significant implications for tourism managers and policymakers in developing effective sustainability strategies (Becken & Higham, 2023).

## II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

### 2.1 Net Zero Achievement in Tourism

Net Zero achievement in tourism represents the state where the sector's greenhouse gas emissions are balanced by removal from the atmosphere (Becken & Higham, 2023). This concept has become increasingly critical as the tourism industry faces pressure to address climate change while maintaining economic viability (Scott & Gössling, 2022). Recent studies emphasize comprehensive transformation in tourism operations (Font et al., 2022), particularly in carbon

management and environmental impact (Gössling et al., 2021).

To provide a stronger theoretical foundation, this section incorporates key models related to Net Zero achievement in tourism:

Tourism and Climate Change Nexus Model: This model highlights the bidirectional relationship between tourism and climate change, emphasizing how tourism contributes to climate change while being affected by it. It advocates for adaptive strategies and carbon reduction policies (Gössling & Hall, 2022).

Sustainable Tourism Development Model: This framework underscores the balance between economic growth, environmental sustainability, and social equity, stressing the need for long-term planning and stakeholder collaboration in achieving Net Zero targets (Sharpley, 2021).

Circular Economy Model: Focused on minimizing waste and resource use, this model encourages tourism businesses to adopt recycling, reuse, and resource-efficient practices, aligning with Net Zero goals through sustainable operations (Miller & Johnson, 2023).

Ecotourism Development Model: This model promotes low-impact tourism, environmental education, and community involvement, providing a pathway for tourism sectors to reduce emissions while enhancing conservation efforts (Buckley, 2023).

Incorporating these models enriches the theoretical framework, offering multidimensional perspectives on achieving Net Zero in tourism. The study builds upon these models to explore the influence of green technology adoption, renewable energy investment, waste management, ecotourism participation, and circular economy principles on Net Zero outcomes.

### 2.2 Factors Influencing Net Zero Achievement

#### 2.2.1 Green technology adoption

The adoption of green technology has emerged as a crucial factor in reducing tourism's environmental impact. Recent research by Zhang and Wall (2023) found that hotels implementing smart energy management systems reduced their carbon emissions by up to 30%. Similarly, Lee et al. (2022) demonstrated that tourism businesses adopting green technologies showed significant improvements in their environmental performance. Therefore:

*H1: Green technology adoption positively influences Net Zero achievement in tourism.*

#### 2.2.2 Investment in Renewable Energy

Investment in renewable energy represents a fundamental pathway to achieving Net Zero goals in tourism. A comprehensive study by Sustainable Tourism Partnership (2023) revealed that tourism facilities powered by renewable energy reduced their carbon footprint by up to 60%. This finding is supported by Sun and Kim's (2022) research showing a strong correlation between renewable energy adoption and reduced emissions in the hospitality sector. Thus:

*H2: Investment in renewable energy positively influences Net Zero achievement in tourism.*

#### 2.2.3 Waste Management Practices

Effective waste management has been identified as a critical factor in achieving Net Zero goals. Research by Thompson et al. (2023) demonstrated that hotels implementing comprehensive waste management systems reduced their carbon emissions by 25%. Additionally, Rico and Martinez (2022) found that proper waste management practices significantly contribute to reduced environmental impact in tourism operations. Therefore:

*H3: Advanced waste management practices positively influence Net Zero achievement in tourism.*

#### 2.2.4 Participation in Ecotourism

Buckley's (2023) extensive review of ecotourism practices revealed that destinations actively participating in ecotourism initiatives showed better progress toward Net Zero goals. This finding is supported by Chen and Wong (2022), who documented significant emission reductions in eco-certified tourism operations. Thus:

*H4: Participation in ecotourism positively influences Net Zero achievement in tourism.*

#### 2.2.5 Circular Economy Principles

The application of circular economic principles has shown promising results in achieving Net Zero goals. Research by Miller and Johnson (2023) demonstrated that tourism businesses implementing circular economy practices reduced their resource consumption by 40%. These findings align with Hall's (2022) study showing the positive impact of circular economic adoption on environmental sustainability in tourism. Therefore:

*H5: Application of circular economy principles positively influences Net Zero achievement in tourism.*

## III. RESEARCH METHODOLOGY

This study adopts a quantitative research approach to examine the factors influencing Net Zero achievement in tourism, following methodological recommendations from Hair et al. (2022). Data was collected through a structured questionnaire distributed to tourism businesses and organizations from October to December 2024, targeting senior managers and sustainability officers. Using stratified random sampling as suggested by Kline (2023), we achieved 180 valid responses from 250 distributed questionnaires, representing a 72% response rate. The measurement scales were adapted from previous studies, with Green Technology Adoption (5 items) from Zhang and Wall (2023), Renewable Energy Investment (4 items) from Sun and Kim (2022), Waste Management Practices (4 items) from Thompson et al. (2023), Ecotourism Participation (5 items) from Buckley (2023), Circular Economy Principles (5 items) from Miller and Johnson (2023), and Net Zero Achievement (6 items) from Becken and Higham (2023), all measured using a five-point Likert scale. Data analysis followed a systematic approach, beginning with descriptive statistics to understand sample characteristics (Anderson et al., 2023), followed by reliability analysis using Cronbach's alpha with a threshold of 0.7 (Peterson & Kim, 2023). We then conducted Exploratory Factor Analysis (EFA) using principal component analysis with Varimax rotation, applying standard criteria including KMO > 0.5, factor loadings > 0.5, and cumulative variance explained > 60% (Field, 2023). Finally, multiple linear regression analysis was employed to test the hypothesized relationships, following Tabachnick and Fidell's (2022) guidelines, including assessment of assumptions, multicollinearity diagnosis (VIF < 5), and model fit assessment ($R^2$, adjusted $R^2$, F-test).

The regression model was specified as:

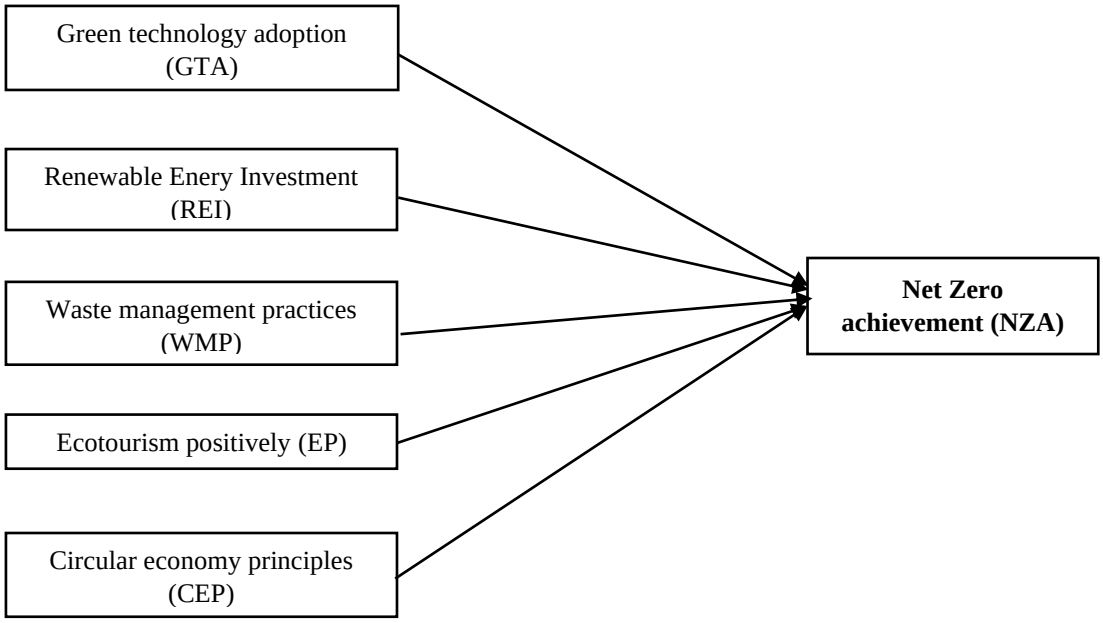



**Figure 1: Research model**

*Source: Author's proposal, 2024*

$NZA = \beta_0 + \beta_1 GTA + \beta_2 REI + \beta_3 WMP + \beta_4 EP + \beta_5 CEP + \varepsilon$, where NZA represents Net Zero Achievement, and the independent variables correspond to the five factors under investigation.

## 4. RESEARCH RESULTS AND DISCUSSION

### 4.1. Descriptive Statistics of Research Sample

**Table 1: Organizational and Respondent Characteristics**

| Characteristic | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Position of Respondent | CEO/General Manager | 45 | 25.0 |
| | Sustainability Manager | 62 | 34.4 |
| | Operations Manager | 48 | 26.7 |
| | Other Senior Managers | 25 | 13.9 |
| Organization Type | Hotels & Resorts | 65 | 36.1 |
| | Tour Operators | 45 | 25.0 |
| | Tourism Attractions | 32 | 17.8 |
| | Transportation | 28 | 15.6 |
| | Other | 10 | 5.5 |
| Organization Size | Small (<50) | 42 | 23.3 |
| | Medium (50-250) | 85 | 47.2 |
| | Large (>250) | 53 | 29.4 |
| Years in Operation | < 5 years | 25 | 13.9 |
| | 5-10 years | 58 | 32.2 |
| | 11-20 years | 62 | 34.4 |
| | > 20 years | 35 | 19.4 |
| Sustainability Certification | Yes | 132 | 73.3 |
| | No | 48 | 26.7 |

*Source: Survey data analysis*

Table 1 presents the characteristics of the surveyed organizations and their representatives. Most respondents were in senior management positions, with Sustainability Managers (34.4%) forming the largest group, followed by Operations Managers (26.7%) and CEO/General Managers (25.0%). Hotels and resorts represented the largest sector (36.1%), and most organizations were medium-sized enterprises (47.2%). More than half of the organizations (53.8%) had been operating for over 10 years, and a significant majority (73.3%) held sustainability certifications, indicating a mature sample with strong environmental commitments.

### 4.2. Reliability Analysis Results

The reliability of measurement scales was assessed using Cronbach's Alpha coefficient. According to Hair et al. (2022), scales with Cronbach's Alpha values greater than 0.7 are considered reliable. Table 2 presents the reliability analysis results for all constructs used in this study.

**Table 2: Scale Reliability Analysis Results**

| Construct | Number of Items | Cronbach's Alpha | Item-Total Correlation Range |
|---|---|---|---|
| Green Technology Adoption (GTA) | 5 | 0.875 | 0.682 - 0.841 |
| Renewable Energy Investment (REI) | 4 | 0.893 | 0.715 - 0.858 |
| Waste Management Practices (WMP) | 4 | 0.862 | 0.694 - 0.825 |
| Ecotourism Participation (EP) | 5 | 0.881 | 0.701 - 0.834 |
| Circular Economy Principles (CEP) | 5 | 0.896 | 0.728 - 0.863 |
| Net Zero Achievement (NZA) | 6 | 0.908 | 0.745 - 0.872 |

*Source: Survey data analysis*

The reliability analysis results demonstrate that all scales exhibited good internal consistency. Cronbach's Alpha values ranged from 0.862 to 0.908, well above the recommended threshold of 0.7. The item-total correlations for all items were above 0.6, indicating strong relationships between individual items and their respective scales. These results suggest that the measurement instruments used in this study are reliable and suitable for further analysis.

### 4.3. Exploratory Factor Analysis Results

Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis with Varimax rotation to examine the construct validity of the measurement scales. Prior to performing EFA, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were assessed to ensure the appropriateness of the data for factor analysis.

**Table 3: KMO and Bartlett's Test Results**

| Test | Value |
|---|---|
| Kaiser-Meyer-Olkin Measure | 0.893 |
| Bartlett's Test of Sphericity (Chi-square) | 3.245.672 |
| Degrees of freedom | 435 |
| Significance | 0.000 |

*Source: Survey data analysis*

**Table 4: EFA Results - Rotated Component Matrix**

| Items | (GTA) | (REI) | (WMP) | (EP) | (CEP) |
|---|---|---|---|---|---|
| GTA1 | 0.845 | | | | |
| GTA2 | 0.832 | | | | |
| GTA3 | 0.818 | | | | |
| GTA4 | 0.806 | | | | |
| GTA5 | 0.792 | | | | |
| REI1 | | 0.856 | | | |
| REI2 | | 0.841 | | | |
| REI3 | | 0.828 | | | |
| REI4 | | 0.815 | | | |
| WMP1 | | | 0.834 | | |
| WMP2 | | | 0.822 | | |
| WMP3 | | | 0.808 | | |
| WMP4 | | | 0.795 | | |
| EP1 | | | | 0.848 | |
| EP2 | | | | 0.835 | |
| EP3 | | | | 0.821 | |
| EP4 | | | | 0.809 | |
| EP5 | | | | 0.792 | |
| CEP1 | | | | | 0.862 |
| CEP2 | | | | | 0.845 |
| CEP3 | | | | | 0.831 |
| CEP4 | | | | | 0.818 |
| CEP5 | | | | | 0.804 |

*Source: Survey data analysis*

The EFA results demonstrate strong construct validity of the measurement scales. The KMO value of 0.893 and significant Bartlett's test ($p < 0.001$) confirm the data's suitability for factor analysis. Five distinct factors emerged, explaining 75.62% of the total variance, with factor loadings ranging from 0.792 to 0.862 and no significant cross-loadings. These findings support the proposed five-factor structure of the theoretical framework.

### 4.4. Correlation Analysis Results

Pearson correlation analysis was conducted to examine the relationships between variables and check for potential multicollinearity issues. Table 5 presents the correlation matrix along with means and standard deviations for all variables.

**Table 5: Descriptive Statistics and Correlation Matrix**

| Variables | Mean | SD | GTA | REI | WMP | EP | CEP | NZA |
|---|---|---|---|---|---|---|---|---|
| GTA | 3.82 | 0.74 | 1 | | | | | |
| REI | 3.65 | 0.82 | 0.485** | 1 | | | | |
| WMP | 3.94 | 0.68 | 0.412** | 0.438** | 1 | | | |
| EP | 3.78 | 0.71 | 0.395** | 0.428** | 0.445** | 1 | | |
| CEP | 3.71 | 0.76 | 0.442** | 0.468** | 0.432** | 0.415** | 1 | |
| NZA | 3.58 | 0.85 | 0.512** | 0.624** | 0.508** | 0.485** | 0.558** | 1 |

*Source: Survey data analysis*

The correlation analysis reveals that all independent variables (GTA, REI, WMP, EP, and CEP) have significant positive correlations with the dependent variable (NZA), with coefficients ranging from 0.485 to 0.624. The correlations among independent variables range from 0.395 to 0.468, indicating no serious multicollinearity issues as all values are below 0.7.

### 4.5. Multiple Regression Analysis Results

Multiple regression analysis was performed to test the hypothesized relationships between the independent variables and Net Zero Achievement. The results are presented in Table 6.

**Table 6: Multiple Regression Analysis Results**

| Model | | Coefficients are not standardized | | Standardized coefficient | Coefficient (t) | Coefficient (Sig.) | Multicollinearity statistics | |
|---|---|---|---|---|---|---|---|---|
| | | Coefficient (B) | Standard deviation | Beta coefficient | | | Tolerance | Variance magnification factor |
| 1 | (Constant) | 0.425 | 0.149 | - | -2845 | 0.005 | - | - |
| | GTA | 0.216 | 0.059 | 0.216 | 3.682 | 0.000 | 0.654 | 1.528 |
| | REI | 0.384 | 0.061 | 0.384 | 6.245 | 0.000 | 0.609 | 1.642 |
| | WMP | 0.185 | 0.057 | 0.185 | 3.248 | 0.001 | 0.678 | 1.475 |
| | EP | 0.162 | 0.055 | 0.162 | 2.924 | 0.004 | 0.696 | 1.436 |
| | CEP | 0.245 | 0.059 | 0.245 | 4.156 | 0.000 | 0.661 | 1.512 |

*Source: Survey data analysis*

$R^2 = 0.625$ Adjusted $R^2 = 0.614$ F-value = 58.246 ($p < 0.001$)

The regression model explains 61.4% of the variance in Net Zero Achievement (Adjusted $R^2 = 0.614$). The F-statistics are significant ($F = 58.246$, $p < 0.001$), indicating good model fit. All VIF values are below 2, confirming the absence of multicollinearity. All independent variables show significant positive relationships with Net Zero Achievement, with Renewable Energy Investment ($\beta = 0.384$, $p < 0.001$) having the strongest impact, followed by Circular Economy Principles ($\beta = 0.245$, $p < 0.001$) and Green Technology Adoption ($\beta = 0.216$, $p < 0.001$).

### 4.6. Discussion of Research Results

Based on the analysis results from the research, five main factors influencing the achievement of Net Zero goals in tourism have been identified. Renewable Energy Investment (REI) emerges as the most influential factor ($\beta = 0.384$, $p < 0.001$), aligning with Sun and Kim's (2022) research, showing that tourism organizations investing more in renewable energy infrastructure are making better progress toward Net Zero targets. Next, the application of Circular Economy Principles (CEP) is the second strongest factor ($\beta = 0.245$, $p < 0.001$), confirming Miller and Johnson's (2023) findings on the importance of circular economy practices in sustainable tourism. Green Technology Adoption (GTA) also shows significant positive impact ($\beta = 0.216$, $p < 0.001$), supporting Zhang and Wall's (2023) research on the role of green technologies in environmental performance. Waste Management Practices (WMP) demonstrates positive influence ($\beta = 0.185$, $p < 0.001$), supporting Thompson et al.'s (2023) research on the importance of effective waste management in reducing carbon emissions in the tourism sector. While showing the lowest coefficient among the five factors,

Ecotourism Participation (EP) still maintains a significant positive impact (β = 0.162, p < 0.004) on Net Zero Achievement, aligning with Buckley's (2023) findings on the relationship between ecotourism practices and environmental performance. These findings highlight the multifaceted nature of achieving Net Zero goals in the tourism sector and suggest that a comprehensive approach incorporating all five factors, with particular emphasis on renewable energy investment and circular economy principles, would be most effective in achieving Net Zero targets. The strong explanatory power of the model (Adjusted $R^2$ = 0.614) indicates that these five factors collectively account for a substantial portion of the variation in Net Zero Achievement, providing valuable insights for policy and practice in sustainable tourism development.

The findings demonstrate that investment in renewable energy (β = 0.384) and circular economy principles (β = 0.245) are the most influential factors in achieving Net Zero, aligning with the Circular Economy Model (Miller & Johnson, 2023) which emphasizes resource efficiency. Green technology adoption (β = 0.216) supports Zhang and Wall's (2023) work on smart energy management in tourism. Waste management practices (β = 0.185) resonate with Thompson et al.'s (2023) findings on emissions reduction through waste systems, while ecotourism participation (β = 0.162) aligns with the Ecotourism Development Model (Buckley, 2023). The study enhances the Tourism and Climate Change Nexus Model by demonstrating practical pathways to Net Zero, contributing to the Sustainable Tourism Development Model through actionable strategies for industry stakeholders. These insights provide tourism managers with evidence-based strategies and inform policymakers on effective sustainability policies.

## V. CONCLUSIONS AND MANAGERIAL IMPLICATIONS

### 5.1. Conclusions

This research examined the factors influencing Net Zero Achievement in the tourism sector through a comprehensive analysis of five key variables. The findings demonstrate that all identified factors significantly contribute to Net Zero Achievement, with Renewable Energy Investment and Circular Economy Principles emerging as the most influential factors. The research model explains 61.4% of the variance in Net Zero Achievement, indicating the robustness of the theoretical framework.

Studying makes several important contributions to both theory and practice. Theoretically, it extends the understanding of Net Zero achievement in tourism by empirically validating the relationships between key factors and Net Zero outcomes. Practically, it provides a framework for tourism organizations to prioritize their sustainability initiatives and allocate resources effectively.

### 5.2. Managerial Implications

#### 5.2.1. Investment in Renewable Energy Infrastructure

Given that renewable energy investment emerged as the strongest predictor of Net Zero achievement (β = 0.384), tourism organizations should prioritize their investments in renewable energy solutions. This includes implementing solar panels, wind energy systems, and energy storage facilities as part of a comprehensive long-term energy transition plan. Organizations are encouraged to establish strategic partnerships with renewable energy providers and technology suppliers, while exploring innovative financing mechanisms such as green bonds or sustainability-linked loans to support these investments. Such an integrated approach to renewable energy adoption will significantly contribute to achieving Net Zero targets in the tourism sector.

#### 5.2.2. Implementation of Circular Economy Practices

As the second most influential factor (β = 0.245), circular economy principles should be deeply embedded in tourism operations. Organizations should focus on developing comprehensive waste reduction programs and designing services with circularity in mind. This can be achieved through establishing partnerships with environmentally conscious suppliers, providing thorough staff training in circular economy practices, and implementing robust monitoring systems to measure outcomes. The integration of these practices will create a more sustainable operational model while supporting Net Zero objectives.

#### 5.2.3. Green Technology Integration

With a significant impact on Net Zero achievement (β = 0.216), green technology adoption represents a crucial area for investment. Tourism organizations should focus on implementing smart building management systems and energy-efficient technologies while adopting eco-friendly transportation solutions. Regular assessment of technology

effectiveness and comprehensive staff training programs are essential to maximize the benefits of these technological investments. This integration of green technologies should be viewed as a strategic tool for achieving long-term sustainability goals.

#### 5.2.4. Enhancement of Waste Management Systems

Waste management practices ($\beta = 0.185$) play a vital role in achieving Net Zero targets. Organizations should implement comprehensive waste sorting and recycling programs, supported by investments in waste reduction technologies. Establishing partnerships with specialized waste management companies and setting clear reduction targets are crucial steps. Regular monitoring and reporting of waste metrics will help track progress and identify areas for improvement in the organization's waste management strategy.

#### 5.2.5. Promotion of Ecotourism Initiatives

While showing the lowest coefficient ($\beta = 0.162$), ecotourism initiatives remain a significant contributor to Net Zero achievement. Tourism organizations should focus on developing sustainable tourism products and experiences that minimize environmental impact while maximizing educational value. This involves partnering with local communities, implementing environmental education programs, and obtaining relevant eco-certifications. Regular monitoring and transparent communication of environmental impact will help maintain stakeholder trust and support continuous improvement.

### 5.3. Policy Recommendations

Based on the research findings, policymakers should establish a comprehensive support system for Net Zero achievement in tourism. This system should encompass four key elements: a clear regulatory framework with specific implementation guidelines and carbon reduction targets; robust financial support mechanisms including tax incentives and green funding programs; comprehensive capacity building programs through industry training and knowledge sharing platforms; and standardized monitoring and reporting systems to track environmental performance. Special attention should be given to supporting small and medium-sized tourism enterprises through these initiatives. The successful implementation of these recommendations requires coordinated efforts between government agencies, industry bodies, and tourism organizations, supported by regular review and updates to ensure their continued effectiveness in driving the sector toward Net Zero goals.

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# THE IMPACT OF DESTINATION IMAGE AND MEMORABLE EXPERIENCE ON REVISIT INTENTION TO A DESTINATION: A RESEARCH CONCEPTUAL FRAMEWORK

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**ABSTRACT**

Destination image plays a crucial role in enhancing a destination's appeal. It is also a key factor influencing tourists' decision-making processes. Previous studies on destination image have concentrated on the relationship between destination image, satisfaction, and behavioral intentions. However, there is a lack of research concerning destination image and memorable tourism experience. Furthermore, empirical studies examining the impact of tourist-resident interaction through which memories related to tourism experiences are formed are scarce, as is research on its effect on tourists' perceptions of the destination image. Consequently, this study aims to establish the relationship between tourist-resident interactions (TRI), destination image (DI), memorable tourism experience (MTE), and tourists' intention revisit by utilizing the Stimulus-Organism-Response (SOR) model. To achieve this goal, this paper proposes a conceptual model that reflects hypotheses about the interdependence among these factors. The proposed conceptual framework not only lays the groundwork for further empirical research but also aids tourism stakeholders in developing strategies for marketing tourism experiences.

*Keywords*: "destination image", "memorable tourism experience", "revisit intention", "tourist-resident interaction".

## I. INTRODUCTION

Destination image (DI) is a key factor influencing tourists' decision-making process when choosing a destination (Chen & Tsai, 2007). If tourists leave with a positive image of a destination, their intention to return will be stronger. Therefore, many studies have examined the relationship between DI, satisfaction, and tourists' behavioral intentions. From the perspective of using a positive DI to evaluate overall satisfaction, it serves as a basis for measuring tourists' intention to return to the destination. However, compared to satisfaction, memorable tourism experiences (MTE) is considered the most significant factor influencing tourists' behavioral intentions (Zhang et al., 2018; Zhong et al., 2017).

Tourist-resident interactions (TRI) play a crucial role in shaping both tourists' experiences and their perceptions of a destination (Tung & Ritchie, 2011; Wei et al., 2019). While extensive research has examined TRI in the context of tourism development using various models and variables, most studies focus on residents' attitudes toward tourism or the emotional bonds formed between tourists and locals. However, there is limited empirical research on how TRI contributes to the formation of memorable tourism experiences (MTE) and influences tourists' perceptions of the destination. Therefore, in this study, the author aims to explore the relationship between TRI, MTE, and the intention to revisit the destination. This constitutes the innovative aspect and the principal research gap that this study seeks to address.

Previous studies have examined various antecedents and behavioral outcomes of MTE (Chandralal & Valenzuela, 2013; Chen & Rahman, 2018; Kim, 2014; Zhang et al., 2018). However, there is a lack of research that integrates these factors into a comprehensive model. Few studies examine how these relationships shape tourists' future behavior. (Melón et al., 2021; Zhang et al., 2018). Therefore, the current study seeks to contribute to the existing literature by applying the SOR (Stimulus-Organism-Response) model to propose a conceptual framework. This framework integrates key antecedents, including DI and TRI, as well as the outcome of RI mediated through MTE.

Unlike previous models such as the Theory of Planned Behavior (TPB), which primarily focuses on attitudes,

norms, and perceived control to predict behavioral intentions (Ajzen, 1991), the SOR framework offers a dynamic lens to explore how external stimuli (e.g., TRI) trigger internal cognitive and emotional processes (e.g., DI and MTE) that lead to behavioral responses (e.g., RI). This integration provides a more holistic understanding of tourist behavior by emphasizing the experiential and interactional dimensions often overlooked in traditional models.

The purpose of this article is twofold: (1) to review foundational theories and relevant literature on TRI, DI, and MTE, identifying key research gaps; and (2) to develop a conceptual framework that elucidates the relationships among TRI, DI, MTE, and RI using the Stimulus-Organism-Response (SOR) model. The SOR model, originally proposed by Mehrabian and Russell (1974), posits that external stimuli influence individuals' internal states, subsequently driving behavioral responses. In this study, it serves as a theoretical lens to explore how TRI (stimulus) shapes DI and MTE (organism), ultimately influencing RI (response). The findings are expected to provide evidence on how DI and interactions with local residents can enhance MTE, thereby promoting tourists' revisit intentions, with significant implications for shaping marketing strategies and improving tourism experiences for sustainable development.

## II. MATERIAL AND METHOD

### Material

#### Revisit intention (RI)

RI is a significant research theme in tourism literature, particularly in exploring the antecedents and motivators that drive tourists to revisit a destination. Overall, studies have extensively examined the factors influencing tourists' revisit intentions and demonstrated that these intentions result from an accumulation of effects based on multiple variables, necessitating consideration of diverse impacts. Among these, destination image, perceived value, and satisfaction are fundamental components in selecting a destination and forming revisit intentions (Chen & Tsai, 2007). Additional factors have also been incorporated in recent studies, including service quality (Hasan et al., 2020), co-creative experiences (Meng & Cui, 2020), and MTE (Zhang et al., 2018).

#### Destination image (DI)

DI is a valuable concept that has garnered widespread academic attention due to its significance as one of the most influential factors shaping consumer behavior, such as destination selection and visitation intention (Baloglu & McCleary, 1999; Beerli & Martín, 2004; Erawan, 2020). Since the 1960s, the concept of image has been utilized in fields such as social and environmental psychology, consumer behavior, and marketing, representing individuals' perceptions of objects, events, and behaviors driven by impressions, feelings, and beliefs (Crompton, 1979). In the field of tourism, extensive research on DI has been conducted, which can primarily be categorized into four main streams: (1) the definition and measurement of DI (Crompton, 1979; Echtner & Ritchie, 1991; Gallarza et al., 2002), (2) factors influencing DI (Baloglu & McCleary, 1999; Beerli & Martín, 2004), (3) the formation of DI in the minds of tourists (Baloglu & McCleary, 1999; Gallarza et al., 2002; Gartner, 1994), and (4) the impact of DI on behavioral intentions (Chen & Tsai, 2007; Chi & Qu, 2008; Marques et al., 2021; Qu et al., 2011; Tasci & Moreno-Gil, 2024).

Despite extensive research on DI, there is no consensus on its definition and components. Most studies agree that DI is a subjective interpretation of a destination, often categorized into cognitive, affective, and conative dimensions Most researchers, however, consider DI from the tourists' perspective and define it as the subjective interpretation of a destination stored in their minds. For example, Crompton (1979) defined DI as the combination of beliefs, thoughts, and impressions an individual holds about a specific destination. Various approaches have been taken to conceptualize DI. Echtner & Ritchie (1991) clarified a tri-component approach, including attribute-holistic, functional-psychological, and common-unique dimensions. Gartner (1994) simplified this by proposing that DI encompasses cognitive, affective, and conative components. Afshardoost & Eshaghi (2020) classified prior research into overall image, cognitive image, affective image, and conative image. Some scholars argue that DI comprises only two components: cognitive and affective (Zhou et al., 2024). Most studies treat DI as an abstract construct, often adopting a two- or three-component approach (Baloglu & McCleary, 1999; Gartner, 1994). Nevertheless, researchers tend to emphasize the integrative nature of DI by referring to it as an "overall image." In this context, the overall image represents tourists' comprehensive perception of a destination, integrating cognitive and affective components or being influenced by cognitive, affective, and conative dimensions (Stylos et al., 2016). The overall image has also been identified as a third

component, comparable to cognitive and affective images (Baloglu & McCleary, 1999).

**Memorable tourism experience (MTE)**

Tourist experiences lie at the core of the tourism and hospitality industry (Kim, 2014; Melón et al., 2021). Destinations must design and deliver MTE to enhance competitiveness and retain tourists (Neuhofer et al., 2012; Pine & Gilmore, 1998). MTE are among the most critical and powerful drivers of tourists' future behavior (Kim, 2014; Zhang et al., 2018). As a result, MTE have emerged as one of the key topics in recent tourism experience research. A review of the literature indicates that researchers have advanced the understanding of MTE around three major themes: (1) the nature of MTE (Chandralal & Valenzuela, 2015; Kim & Chen, 2019; Kim et al., 2012; Tung & Ritchie, 2011), (2) tools to measure MTE (Chandralal & Valenzuela, 2015; Kim et al., 2012; Stone et al., 2017; Tung & Ritchie, 2011), and (3) antecedents and outcomes of MTE (Kim & Ritchie, 2014; Wei et al., 2019; Wong et al., 2020).

The process of recalling a tourism experience is not merely about remembering all the events that occurred but involves a selective and reconstructive process shaped by each tourist's feelings and evaluations of the destination experience (Kim & Ritchie, 2014; Kim et al., 2012). Notably, while ordinary experiences tend to fade quickly over time, MTE have a unique ability to create enduring imprints and associations in tourists' minds (Kim, 2018). The key distinction between an ordinary experience and an MTE lies in the depth of its emotional impact and the meaningful value it provides to the individual (Zhang et al., 2018).

In the field of MTE research, scholars have proposed several notable definitions. For example, Tung & Ritchie (2011) defined MTE as positive experiences that tourists actively recall and reimagine after their trip. Chandralal & Valenzuela (2015) emphasized that MTE are extraordinary and vivid memories formed after tourists have experienced a destination. Particularly, Jong Hyeong Kim, known as a pioneer in this research area, proposed a widely recognized academic definition, describing MTE as tourism experiences stored in memory and positively recalled after the events have concluded (Kim, 2010; Kim et al., 2012).

Although there is general consensus that MTE represent a multidimensional construct, the specific dimensions that provide the most valid and reliable measures remain unclear (Chandralal & Valenzuela, 2015). Tung & Ritchie (2011) identified four essential elements that constitute MTE: affect, expectations, consequences, and recollection. Specifically, emotional aspects (affect) involve positive feelings and perceptions related to the experience; unexpectedness (expectations) is expressed through the fulfillment of goals and unanticipated experiences; meaningfulness (consequences) reflects the value and significance perceived by tourists; and memorability (recollection) is captured through efforts to retain and recall the experience. Complementing these findings, Chandralal et al. (2015) analyzed travel blogs and identified seven key factors contributing to MTE: local culture, personally meaningful experiences, shared experiences, novelty perception, serendipity perception, professional tour guides and services, and emotional engagement. Similarly, Stone et al. (2017) identified five components leading to memorable culinary experiences: food or drink consumed, location/context, companions, events, and travel-related factors. However, a synthesis of the literature reveals that when examining the impact of MTE on behavior intentions, researchers frequently utilize the MTE dimensions proposed by Kim et al. (2012). These dimensions suggest that individuals with MTE recall seven dimensions: hedonism, novelty, local culture, refreshment, meaningfulness, involvement, and knowledge.

**Tourist-resident interaction (TRI)**

TRI refers to the social communication and exchanges between tourists and local residents at a destination. These interactions can include conversations, cultural exchanges, or shared activities (Tabaeeian et al., 2023; Xiong et al., 2021). Interaction facilitates a connection between tourists and locals, representing a reciprocal process where individuals share information and emotions to develop relationships (Li et al., 2024). Even brief and hurried interactions, such as a genuine smile from a local resident, can make a significant difference (Xiong et al., 2021). TRI plays a crucial role in tourists' spending behavior, satisfaction, and locals' attitudes toward tourism development (Eusébio et al., 2018; Pizam et al., 2000). Furthermore, such social interactions also enable value co-creation in tourism experiences (e.g., a friendly conversation between tourists and residents contributes to the destination experience for both parties). Positive interactions between tourists and locals, including staff members, can enhance tourists' affective

and conative destination image, ultimately improving their overall experience and loyalty to the destination (Stylidis, 2020; Tabaeeian et al., 2023).

Previous studies have explored several aspects of TRI measurement, which include the frequency and quality of interactions (Aleshinloye et al., 2019; Xiong et al., 2021). Interaction frequency refers to how often social communication activities occur between tourists and local residents at the destination. Interaction quality, from the perspective of tourists, highlights the extent to which the interactions are perceived as positive, pleasant, helpful, and enjoyable (Xiong et al., 2021).

Much of the existing research on tourist-resident relationships tends to focus on issues such as conflict, the impacts of tourism on local communities, and residents' attitudes toward tourism development (Hien, 2023; Huang et al., 2024; Su et al., 2021; Woosnam et al., 2014). Through synthesizing the scientific contributions from international studies on tourist-resident relationships, it is evident that the research works by Woosnam and colleagues stand out with comprehensive studies conducted at various tourism destinations. However, the majority of these studies concentrate on the emotional connection between tourists and residents (Woosnam et al., 2014; Woosnam et al., 2020). There remains a lack of experimental studies that investigate how TRI contributes to the formation of tourism-related memories, such as MTE, and its implications for tourists' perceptions of DI.

**Stimulus-Organism-Response Model (SOR Model)**

This study adopts the SOR framework (Mehrabian & Russell, 1974) to examine the role of TRI in shaping DI, MTE, and their impact on RI. Given the intangible nature of tourism products and services, the SOR model is highly applicable for understanding tourist behavior (Jiang, 2022; Sthapit et al., 2024). The SOR framework explains how external stimuli influence individuals' cognitive and emotional states, leading to behavioral responses. The model consists of three key components: stimulus, organism, and response. The SOR model was selected over alternative frameworks, such as the Expectancy-Value Model or Social Exchange Theory, due to its ability to capture the sequential process from external stimuli (TRI) to internal psychological states (DI and MTE) and subsequent behavioral outcomes (RI). Unlike Social Exchange Theory, which focuses on reciprocal benefits in interactions, SOR emphasizes the emotional and cognitive transformations triggered by stimuli, making it particularly suitable for examining how memorable experiences and destination perceptions mediate revisit intentions.

TRI as Stimulus (S); DI, MTE as Organism (O); RI as Response (R)

In tourism, external stimuli such as natural landscapes, green practices, and storytelling (Jiang, 2022; Yuxin et al., 2024) impact tourists' experiences. TRI is a critical stimulus, fostering emotional and cognitive responses through conversations and cultural exchanges, enhancing curiosity and understanding of local culture (Yu & Lee, 2013; Tabaeeian et al., 2023).

DI serves as a cognitive and affective filter in the SOR framework, transforming external stimuli into subjective perceptions (Mehrabian, 1974; Rasoolimanesh & Lu, 2024). It includes tangible elements (e.g., landscapes) and intangible ones (e.g., atmosphere), influencing tourist behavior. DI evolves over time based on new stimuli, interactions, and personal experiences (Tasci & Moreno-Gil, 2024).

MTE emphasizes tourists' lasting emotional and subjective impressions (Kim, 2010). Authentic and personalized interactions with locals create memorable stories and emotions, reflecting the intrinsic processes of the SOR model (Pine & Gilmore, 1998; Tung & Ritchie, 2011).

The "response" in the SOR model represents tourists' final behavioral actions, such as revisit intention, driven by preceding stimuli and processes (Rasoolimanesh & Lu, 2024). This study identifies TRI as the "stimulus," DI and MTE as intermediaries ("organism"), and RI as the "response." Existing research confirms DI and MTE mediate behavioral intentions, underscoring the SOR model's relevance in explaining tourist decision-making (Asyraff et al., 2024).

**Methodology**

To conduct this study, the authors adopted a literature review method, systematically searching, collecting, analyzing, and synthesizing research findings from domestic and international sources. These sources included peer-reviewed articles from academic journals, books, reports, and scientific papers in English and Vietnamese, focusing on

TRI, DI, MTE, and RI. Documents were selected based on their relevance to the research objectives, determined by the presence of keywords such as "tourist-resident interaction," "destination image," "memorable tourism experience," and "revisit intention" in titles, abstracts, or full texts. The analysis process involved a qualitative synthesis of findings to identify patterns, contradictions, and gaps, which were then used to formulate hypotheses within the SOR framework.

Additionally, to develop the conceptual framework, the authors utilized the conceptual exploration method, which is the outcome of qualitative theorization processes (Jabareen, 2009). Through constructing the conceptual framework, the elements of TRI, DI, MTE, and RI are interconnected, thereby clarifying the specific phenomena of each factor while also supporting and complementing one another to establish a concrete research framework. Following Jabareen's (2009) approach, the process of developing a conceptual framework primarily includes the following four steps:

First, The research group conducted an initial classification and screening of selected documents by reviewing secondary data sources obtained through keyword searches on academic e-databases (Scopus, Web of Science, Google Scholar, Nasati). The research team accessed documents through academic e-databases (Scopus, Web of Science, Google Scholar, Nasati) to ensure a comprehensive and credible literature base. During the preliminary screening phase, the research team read the titles and abstracts of documents to select studies relevant to the research topic. Subsequently, the team proceeded to read the full texts, engaging in self-reflection and critical evaluation to select representative case studies most effectively corresponding to the research context. This process of selecting documents was based on the literature evaluation framework proposed by Boote and Beile, which consists of five criteria: (1) comprehensiveness, (2) synthesis, (3) research methodology, (4) significance, and (5) interpretation (Boote & Beile, 2005).

The next step involved identifying research gaps. Specifically, during this stage, the team read and reread the selected documents, analyzing their content and "detecting" gaps within the existing literature. The third step was the development of hypotheses for the study. The goal of this stage was to synthesize the concepts and formulate hypotheses into a conceptual framework.

The fourth step entailed validating the conceptual framework. To ensure the theoretical and practical relevance of the proposed framework, the research team discussed its feasibility with academics from three institutions: Hoa Sen University, School of Hospitality and Tourism-Hue University, and Saigon University. Feedback was obtained, and the framework was revised accordingly.

## III. RESULT AND DISCUSSION

### 3.1. Research Gaps

Through a comprehensive review of existing literature, the following research gaps have been identified:

First, although many prior studies acknowledge the role of DI in shaping tourists' behavioral intentions, most of these studies primarily focus on the relationship among DI, satisfaction, and behavioral intentions. These studies largely evaluate RI (RI) through positive DI as a basis for assessing overall satisfaction (Chen & Tsai, 2007; Chi & Qu, 2008; Marques et al., 2021; Prayag et al., 2016; Ragab et al., 2020; Yuxin et al., 2024). However, according to Kim (2018), MTE are considered more influential than satisfaction in predicting tourists' behavioral intentions. Similarly, Zhong et al. (2017) highlighted that MTE are a stronger predictor of emotional commitment compared to satisfaction. Nevertheless, MTE remain an emerging topic (Hosany et al., 2022), with limited studies investigating the antecedents and outcomes of MTE (Melón et al., 2021; Zhang et al., 2018).

Second, while there has been research examining the relationship between DI and MTE, the direction and nature of this relationship remain contradictory (Stavrianea & Kamenidou, 2022; Zhou et al., 2024). Some scholars argue that MTE influence tourists' perceptions of DI (Chang, 2022; Kim, 2018; Kladou et al., 2022; Pappas et al., 2022; Phuc, 2023; Rasoolimanesh & Lu, 2024), whereas others believe that a positive DI can foster MTE (Çevrimkaya & Zengin, 2023; Kutlu & Ayyıldız, 2021; Melón et al., 2021; Rasoolimanesh et al., 2021; Seyfi et al., 2024; Stavrianea & Kamenidou, 2022; Zhang et al., 2018; Zhou et al., 2024).

Within this relationship, most studies view DI as a cognitive construct, focusing on destination attributes primarily associated with tourists' activities and needs, such as the natural environment (scenery, climate, beaches), amenities (accommodations, restaurants, shopping), attractions (activities, heritage, culture/events), accessibility (transportation,

connectivity), and social environment (friendliness, safety, value for money). However, DI is a fluid concept influenced by both cognitive and emotional evaluations of individuals. Um and Crompton (1990) argued that a destination's overall impression is more significant than its individual attributes, as an overall image reflects multiple dimensions beyond those measured through distinct attributes (Baloglu & McCleary, 1999; Echtner & Ritchie, 1991).

Echtner & Ritchie (1991) noted that DI operates as an overarching evaluative structure, measuring tourists' comprehensive impressions of a destination. Similarly, Zhang et al. (2014) and Afshardoost & Eshaghi (2020) emphasized in their meta-analyses that the overall image strongly represents DI. Despite this, only Melón et al. (2021) considered DI as an overall image encompassing cognitive, affective, and general impressions. Moreover, the specific characteristics and resources unique to a destination play a role in shaping the relationship between DI and MTE (Kim, 2014, 2022). Consequently, the same destination can evoke varying images among potential consumers, influencing different decision-making processes based on the information they perceive (Zhang et al., 2018). Hence, findings from prior studies conducted at global destinations may not be wholly applicable to other specific destinations.

For MTE, the majority of studies identify seven dimensions of MTE, as developed by Kim et al. (2012), which include hedonism, novelty, knowledge, meaningfulness, involvement, local culture, and refreshment, all leading to strong memorability. However, some studies have raised concerns about the applicability of Kim et al.'s (2012) scale. For instance, Sthapit et al. argued that using student samples in Kim et al.'s research limits generalizability, as students do not fully represent typical tourists (Sthapit & Coudounaris, 2018; Sthapit et al., 2020). Students differ from non-students in terms of skills, personality traits, and experiences, with most student samples coming from narrow age ranges and higher education levels (Sthapit et al., 2020). Additional research has confirmed distinctions between student and non-student samples (Jones & Sonner, 2001; Ok et al., 2008). Therefore, it is necessary to conduct further studies to examine the seven dimensions of MTE across diverse research contexts.

More importantly, TRI contributes to both the overall experience and the shaping of tourists' perceptions of visited destinations (Tung & Ritchie, 2011; Wei et al., 2019). Despite numerous studies exploring the relations between tourists and locals in the context of tourism development—employing diverse models and variables—most focus on residents' attitudes toward tourism development or their emotional connections (Han, 2019; Hien, 2023; Su et al., 2021; Woosnam et al., 2020). While TRI plays a critical role in creating tourism experiences and shaping DI, empirical studies on this topic remain insufficient and fragmented.

Thus, this paper aims to provide a more comprehensive investigation into the interrelationships among TRI, DI, MTE, and RI to destinations. These identified research gaps present opportunities for further exploration. The findings of this study are expected to offer meaningful insights for tourism managers, particularly regarding the initiation of local community involvement in tourism development, enhancing DI and tourist experiences through interactions between locals and tourists.

### 3.2 Research Hypotheses

#### Tourist-resident interaction and destination image

It is challenging to separate tourists' perceptions of a destination from its local residents. This is particularly evident given that very few tourism destinations exist without local communities residing there. In reality, individuals often choose a destination to visit because of the opportunity to interact with locals and learn about customs, traditions, heritage, and culture. Several studies have suggested a connection between locals, tourists, and the development of a DI. For instance, Baloglu and McCleary (1999) and Echtner and Ritchie (1991) argue that the overall image a person develops of a destination encompasses a comprehensive impression of that place. Tourists may struggle to fully understand a destination or its overall image without acknowledging the role of local residents in shaping this image through interactions and subsequent relationships.

Tourists can form their DI from multiple sources of information, such as marketing channels, social media, and through their actual experiences when visiting the destination (Beerli & Martín, 2004; Gartner, 1994). The tourists' real or perceived image of a destination may be influenced by their perspectives and experiences with local residents. This implies that the behavior of locals, whether positive or negative, can significantly impact DI from the tourists' perspective. For example, the hospitality and reception provided by local residents play a critical role in measuring

tourists' perceptions of DI (Echtner & Ritchie, 1991). Positive behaviors from locals, such as interactions and engagement, can reinforce the view that locals are hospitable and friendly, whereas irresponsible behaviors such as shouting at tourists could have a severely negative impact on tourists' perceptions of the community and destination (Kour et al., 2020).

Further investigations into the sources of information used by tourists conclude that word-of-mouth communication from friends, family, and practical experiences are important factors in shaping DI (Baloglu & McCleary, 1999; Gartner, 1994). Within the tourism context, locals are often considered destination experts due to their familiarity with the location. They actively provide information, promote attractions, highlight amenities, and suggest unique activities to tourists, effectively acting as place marketers (Stylidis et al., 2022). Stylidis (2020) contended that locals' perceptions of their destination are communicated to tourists through direct encounters and interactions, subsequently influencing tourists' DI and actual experiences (Stylidis, 2020).

Similarly, this principle extends to employees within the tourism and hospitality sector, whose professional expertise, knowledge, and personal experiences contribute to enhancing tourists' experiences, thereby improving DI (Cheng et al., 2018; Stylidis, 2020). Based on these insights, the following hypothesis is proposed:

H1: TRI has a direct positive effect on DI

**Tourist-resident interaction and memorable tourism experience**

In destinations where local communities coexist with tourism resources, the activities of these communities directly impact tourists' experiences (Su et al., 2021). In many cases, locals participate in the provision of certain goods (e.g., local products, souvenirs) and services (e.g., guided tours, homestays) for tourists, as the nature of purchasing and consuming tourism products involves service interactions between tourists and locals. Co-creation of value is characterized by the active participation and positive interaction of tourists with both other tourists and local residents throughout the tourism experience (Sthapit et al., 2020). Tourists enhance their experiences through their active collaboration with destination locals (Lee et al., 2024).

In today's world, TRI in the co-creation process is further strengthened by information and communication technologies. Locals are often actively engaged in various social media platforms (e.g., Facebook, TripAdvisor), providing guidance and answering questions related to local tourism. This support helps tourists in trip planning and contributes to the co-creation of value. Additionally, through their expertise as tourism staff, some locals play critical roles in building tourists' memorable experiences (Shi et al., 2023). Empirical studies have also confirmed that co-creation between tourists and locals influences the memorability of tourism experiences (Meng & Cui, 2020; Sthapit et al., 2020; Sthapit et al., 2024).

Moreover, the creation of MTE is primarily influenced by the quality of experiences (Tung & Ritchie, 2011), in which tour guides and local residents can significantly impact the quality of tourism experiences (Tabaeeian et al., 2023). TRI helps tourists form lasting impressions and enhances their MTE through various activities. Stylidis et al. (2022) showed that constructive interactions between tourists and locals foster a deeper understanding of local culture, traditions, norms, and rituals. This phenomenon can provide tourists with a heightened sense of authenticity, as they have the opportunity to fully participate and integrate into the surrounding community (Cifci, 2021).

In the context of heritage tourism experiences, Rasoolimanesh et al. demonstrated that authenticity and tourist engagement positively influence MTE (Rasoolimanesh et al., 2021). Kim and Ritchie highlighted that, beyond destination attributes, local residents' behavior and hospitality contribute to creating MTE (Kim & Ritchie, 2014). Similarly, Wong et al. confirmed that TRI with local minority communities plays a crucial role in shaping memorable ethnic tourism experiences (Wong et al., 2020). Tabaeeian et al. (2023) also verified that host-tourist interaction affects MTE through the quality of relationships and service quality. Based on these findings, the following hypothesis is proposed:

H2: TRI has a direct positive effect on MTE.

**Tourist-resident interaction and revisit intention**

The presence of local residents at a destination creates numerous opportunities for tourists to engage in interactions

with them, which can influence tourists' attitudes, behaviors, and future destination decisions (Stylidis, 2020). Tourists might consciously or unconsciously interact with locals at a destination. Woosnam et al. (2020) identified meeting and interacting with local residents as one of the most significant motivators for tourism. Additionally, tourists often need the assistance of locals when visiting unfamiliar destinations.

While Choo & Petrick (2014) did not find a relationship between TRI and RI in the context of farm tourism, several recent studies have revealed that the sincerity of hosts positively influences tourists' behavioral intentions (Wu et al., 2024). A study by Tabaeeian et al. (2023), based on social exchange theory, demonstrated that host-tourist interaction influences tourists' RI through service quality and the quality of relationships. Similarly, Stylidis (2020) confirmed that the quality of interactions between locals and tourists positively correlates with tourists' behavioral image, in which the conative component of DI is often construed as tourists' intentions to revisit or recommend the destination to others (Gartner, 1994). When tourists feel connected to the local culture or form strong relationships with local residents, they develop a sense of emotional attachment, which often motivates them to return to the destination to maintain and deepen these relationships (Aleshinloye et al., 2019). Based on these findings, the following hypothesis is proposed:

H3: TRI has a direct positive effect on RI.

**Destination image and memorable tourism experience**

According to Baloglu & McCleary (1999), DI is a crucial factor shaping tourists' expectations and experiences. A positive DI regarding landscapes, culture, and people encourages tourists to engage more deeply in activities at the destination, thereby fostering meaningful and memorable experiences (Pine & Gilmore, 1998; Tasci et al., 2007). High expectations derived from a positive DI, when met or exceeded, often lead to more impressive experiences while influencing how tourists approach and process information about the destination (Melón et al., 2021).

Empirical studies have demonstrated a strong relationship between MTE and DI. Personal experiences at the destination help make DI more realistic, creating a positive image for tourists (Kim, 2018; Kladou et al., 2022). Conversely, DI also directly impacts MTE by enhancing the perception of value and quality of the experience (Chen & Tsai, 2007). Attributes such as local culture, hospitality, infrastructure, and service quality all contribute to forming a cognitive DI, thereby promoting MTE (Kim, 2014, 2022; Zhang et al., 2018).

The study by Zhou et al. (2024) emphasizes that both cognitive and affective DI positively influence MTE, with cognitive DI playing a dominant role. Moreover, Kutlu & Ayyıldız (2021) point out that cognitive DI has a strong impact on aspects such as culture, novelty, engagement, and meaningful experiences. These studies confirm that a positive DI not only generates high expectations but also serves as a key determinant of memorable experiences, increasing tourists' RI if the actual experiences align with the promoted image. Therefore, the following hypothesis is proposed:

H4: DI has a direct positive effect on MTE.

**Destination image and revisit intention**

DI, in the context of tourism as a country, city, or region, is considered a crucial factor influencing tourists' destination selection, evaluation, and future behavioral intentions (Stylos et al., 2016; Zhang et al., 2018). It represents tourists' beliefs, knowledge, emotions, and feelings about a destination (Afshardoost & Eshaghi, 2020). DI is a core component of successfully promoting a tourism destination, as it establishes the distinctiveness and unique qualities of the destination compared to others. A positive DI enhances tourists' satisfaction with their trip (Marques et al., 2021; Prayag et al., 2016; Ragab et al., 2020; Yuxin et al., 2024). Such satisfaction serves as a powerful motivator for tourists to recommend the destination and revisit it. An impressive DI can foster destination brand loyalty (Zhou et al., 2024). Tourists may return because they trust the quality and value that the destination offers. Therefore, maintaining and developing a positive DI, combined with effective marketing strategies, can help tourism destinations enhance revisit rates and cultivate loyalty (Echtner & Ritchie, 1991; Tam, 2024; Tasci et al., 2007).

Previous studies have suggested that RI (RI) can be influenced by the overall DI (Qu et al., 2011; Stylos et al., 2016). Stylos et al. (2016) assert that DI is a significant predictor of tourists' revisit intention. Afshardoost and Eshaghi (2020) found that DI directly affects behavioral intentions, including RI. Marques et al. (2021) indicate that when

tourists are satisfied with the DI, they are more likely to recommend the destination and its products to others. DI not only serves as an initial draw but also acts as a key driver encouraging tourists to return. While the majority of studies acknowledge that DI positively influences behavioral intentions, some cases have shown contradictory results. For example, Shahijan et al. (2015) discovered that DI does not significantly impact RI. More recently, Asyraff et al. (2024) have found that cognitive DI does not significantly influence RI to the destination. Assaker et al. (2011) recognized that the impact of DI on RI may diminish over time, particularly among tourists seeking novelty. Based on the foregoing, the following hypothesis is proposed:

H5: DI has a direct positive effect on RI.

**Memorable tourism experience and revisit intention**

MTE is considered the ultimate level of experience that consumers aspire to attain (Tung & Ritchie, 2011). In practice, after a vacation, what remains with tourists are their memories of the experiences at the destination (Sthapit & Coudounaris, 2018). Consequently, tourism studies emphasize the importance of memorable experiences because memory serves as the most essential source of information for an individual when making decisions about revisiting and word-of-mouth communication (Chen & Rahman, 2018). Memories can influence the destination selection process and consumers' future behaviors (Kim & Ritchie, 2014). Furthermore, when tourists have MTE, they tend to believe that revisiting will bring similar value and enjoyment, fostering attachment to the destination. Thus, MTE not only affects tourists' satisfaction but also motivates them to revisit or recommend the destination to others.

Several empirical studies have confirmed that MTE is found to be a highly influential determinant of RI and the development of destination loyalty among tourists (Kim, 2018; Melón et al., 2021; Zhang et al., 2018; Zhou et al., 2024). Specifically, when tourists have unforgettable memories of their trip, they tend to share these experiences on social media platforms. As a result, the destination becomes more popular, and revisit rates increase. This argument, initially proposed by Wei et al. (2019), has been supported and validated by numerous studies, further affirming the pivotal role of MTE in predicting tourists' word-of-mouth behavior and revisit intentions. Therefore, the following hypothesis is proposed:

H6: MTE has a direct positive effect on RI.

**The mediating role of memorable tourism experience**

Further research is needed to examine MTE from diverse perspectives (Zhang et al., 2018). However, there remains a scarcity of empirical studies investigating MTE as a mediating factor. Specifically, Zhou et al. (2024) explored the mediating role of MTE in the relationship between cognitive DI and RI among local tourists visiting historical towns. Similarly, Çevrimkaya and Zengin (2023) identified the significant influence of MTE and tourist satisfaction on the relationship between DI and tourists' destination recommendation intentions.

MTE encompasses moments or events that leave a deep and lasting impression on tourists' minds, often shaped by positive and meaningful interactions. For instance, a tourist may remember a special evening when they were invited to participate in a traditional festival with local residents, where they not only enjoyed unique culinary delights but also immersed themselves in the local culture. Such experiences not only reinforce a positive DI but also enhance future revisit intention. This highlights the idea that positive interactions can lead to memorable experiences, thereby increasing the likelihood of tourists seeking to return to a destination. Empirical research on MTE has similarly demonstrated the positive and direct relationships between tourist-resident interaction, destination image, and MTE, as discussed in H2, H4, and H6. Thus, the following hypotheses are proposed:

H7: MTE mediates the relationship between DI and RI

H8: MTE mediates the relationship between TRI and RI.

**The mediating role of destination image**

The interaction between tourists and local residents often creates profound experiences and impressions, directly influencing how tourists perceive a destination (Tse & Tung, 2021). Such interactions can enhance the DI in the minds of tourists, making the destination more appealing. DI, as a set of perceptions and emotions associated with a place, can strongly impact tourists' RI (Chen & Tsai, 2007). When this image is improved through positive interactions, the

likelihood of tourists wanting to return also increases (Stylidis, 2020). Therefore, DI is not only an outcome of interaction but also an important mediating factor that links TRI with revisit intention, creating a positive feedback loop that promotes sustainable tourism.

For instance, a tourist visiting Hoi An who engages in friendly interactions with local residents—such as learning about the history of the ancient town or being invited to sample unique local delicacies—may develop a positive impression of Hoi An as a hospitable and culturally rich destination. This positive impression then fosters a stronger intention to revisit the destination in the future.

The mediating role of DI in the relationship between perception and behavior has been acknowledged in several studies. Specifically, Zhou et al. (2024) demonstrated that affective DI serves as a mediator between cognitive DI and revisit intention, where the cognitive aspect of DI in their study was related to learning about local customs. Stylidis (2020), based on contact theory and the mere exposure effect, provided insights into how tourists form destination images through their interactions with local residents and tourism staff at a destination in Greece, and how these images influence RI through behavioral image. Furthermore, empirical studies on DI have shown a positive and direct relationship with TRI and revisit intention, as discussed in hypotheses H1 and H5. Thus, the following hypothesis is proposed:

H9: DI mediates the relationship between TRI and RI.

Based on the above hypotheses, the conceptual framework of this study is proposed as presented in Figure 1.

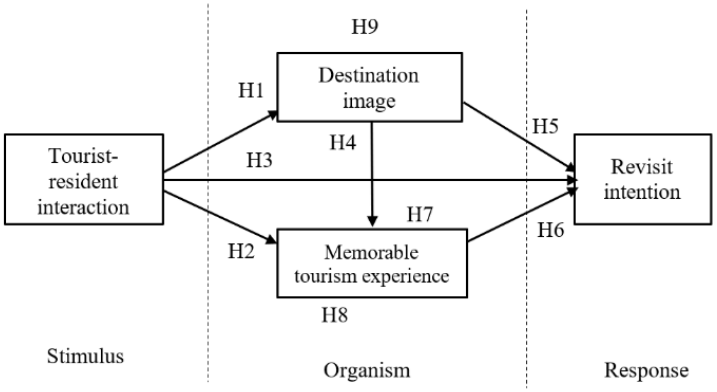



**Figure 1. A Conceptual Framework of DI, MTE, TRI and RI**

While this study establishes a conceptual foundation, empirical validation is necessary to confirm the proposed relationships. Future research could employ quantitative methods, such as structural equation modeling (SEM), to test the hypotheses using survey data collected from tourists at diverse destinations. A mixed-methods approach, combining surveys with qualitative interviews, could further explore how TRI shapes DI and MTE across different cultural and contextual settings. Such empirical testing would provide robust evidence to support or refine the conceptual framework, enhancing its applicability to real-world tourism management.

## IV. CONCLUSION

### Discussion

While scholars acknowledge the importance of examining the relationship between DI and MTE, current research reveals two opposing perspectives: some suggest that MTE influences DI, while others argue that DI fosters MTE. Additionally, DI is often examined cognitively, focusing on specific attributes, yet it is a dynamic concept influenced by emotional evaluations, with limited research addressing its overall image. Regarding MTE, reliance on Kim et al.'s (2012) seven-dimensional model raises concerns about sample representativeness, necessitating further investigation across diverse contexts. Notably, the lack of empirical studies on TRI's influence on MTE and its impact on DI underscores the need for this conceptual framework. By applying the SOR theory, this study integrates TRI, DI, MTE, and RI, offering theoretical insights and practical recommendations for enhancing tourism experiences and promoting sustainable development. Nine hypotheses are proposed, encompassing six direct and three indirect effects, providing a

comprehensive perspective on these interrelationships.

**Conclusion**

This study proposes a conceptual framework integrating DI, MTE, TRI, and RI, offering significant theoretical and practical implications. Theoretically, it introduces a novel model within the SOR framework, positing that TRI (stimulus) influences DI and MTE (organism), driving RI (response). This contributes to understanding tourist behavior and supports validation of the MTE scale across contexts. Practically, it emphasizes enhancing TRI to strengthen DI and MTE, aligning actual experiences with promoted images, and engaging local communities to improve tourist experiences and revisit intentions—key to sustainable tourism.

However, this study has limitations as a conceptual paper lacking empirical validation. Future research should test the framework empirically, potentially using surveys or experimental designs at specific destinations, to confirm its applicability. Exploring moderating factors, such as cultural differences or tourist demographics, could further refine the model. These efforts will enhance its theoretical rigor and practical utility for destination management.

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# SESSION 6: INTERNATIONAL INTEGRATION

# THE CRITERIA OF GREEN BUILDINGS TOWARD SUSTAINABILITY

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**ABSTRACT**

In recent years, the construction sector has seen a significant rise in $CO_2$ emissions due to increasing energy demands for heating, cooling, and lighting. In 2022, operational energy-related emissions reached 10 gigatons of $CO_2$, reflecting a 5% rise from 2020 levels (UNEP). With the construction industry responsible for over 40% of global carbon emissions, there is a critical need for sustainable solutions. This study focuses on the role of green buildings in promoting sustainable development. Using a systematic analysis of scientific literature and case studies, the research evaluates low-carbon materials, and sustainable design principles. The findings show that green buildings significantly reduce energy consumption and emissions through features such as renewable energy systems, and sustainable materials. Despite these benefits, adoption remains slow due to insufficient policies and incentives. The study concludes that green buildings are essential for sustainable development by addressing climate change and resource efficiency.

*Key words:* $CO_2$ reduction, construction industry, energy efficiency, green buildings, sustainable development

## I. INTRODUCTION

In 2024, the global population reached 8.2 billion and is expected to increase to 10.3 billion by 2080. Back in 2015, approximately 54% of people lived in urban areas. Projections suggest that by 2050, this urban percentage will rise to 66% (United Nations, 2022). Cities account for over 70% of global $CO_2$ emissions (Oh et al., 2016). In addition to the significant fossil fuel consumption by industrial and motorized transport systems, the construction industry is responsible for over 40% of global energy use and more than 30% of carbon emissions (Oh et al., 2016)

The sector's $CO_2$ emissions related to operational energy reached ten gigaton of $CO_2$ equivalent, marking a five percent increase from 2020 and a two percent rise compared to the peak levels in 2019 before the pandemic. In 2021, the energy demand for heating, cooling, lighting, and building equipment increased about four percent from 2020 and three percent from 2019 (UNEP, 2022; IEA, 2022). According to Inger Andersen, Executive Director of the United Nations Environment Program (UNEP), "Years of warnings about the impacts of climate change have now materialized. If we do not swiftly reduce emissions in line with the Paris Agreement, our situation will worsen significantly" (UNEP, 2022).

There is a broad consensus that cities in the 21st century must evolve to be both greener and smarter, which has led to a strong emphasis on sustainable urban development, especially among developing nations. The concept of sustainability encompasses a wide range of issues that are intricately linked and involve detailed analysis of various factors related to people, the environment, and society. This global concern addresses the need for cities to adapt to environmental challenges by adopting practices that reduce ecological impact while enhancing the quality of life for their inhabitants. As urban areas expand and evolve, integrating sustainability into city planning and development becomes increasingly critical, aiming to balance economic growth with environmental stewardship and social well-being.

Recently, there has been an increasing focus on the advancement of green. These buildings are crafted with a commitment to high standards of quality while prioritizing the conservation of resources and the protection of the environment. Green buildings aim to do more than just reduce pollution; they are designed to be healthy, efficient, and comfortable for people to live and work in (Basbagill et al., 2013). By integrating sustainable practices into their design and construction, green buildings seek to foster a more balanced and harmonious interaction between human activities and the natural world. This approach aims to minimize the ecological footprint of buildings while enhancing the well-being of their inhabitants and contributing positively to the surrounding environment.

Also referred to as eco-friendly buildings, aim to reduce their environmental impact at every stage of their lifecycle. They emphasize resource efficiency, reduced energy consumption, and lower emissions (Basbagill et al., 2013). The main goal of green buildings is to obtain specific environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or BREEAM (Building Research Establishment Environmental Assessment Method), which serve as standards for sustainability.

## II. LITERATURE REVIEW

### 2.1. Sustainable development

This principle shows that the idea of sustainable development isn't entirely new, especially when considering its widely recognized definition: "Sustainable development refers to progress that satisfies current needs without hindering future generations' capacity to fulfill their own needs," as outlined in the Brundtland Commission Report from 1987 (Green et al., 2012).

The sustainable development concept covers four key dimensions: environmental, social, economic, and institutional, with the institutional aspect becoming more widely acknowledge (Doan et al., 2017) . The environmental dimension examines how human activities affect natural ecosystems, including resource use and pollution. The social dimension focuses on human well-being and community impacts, such as health, welfare, and fairness in society. The economic dimension is related to economic development and the fair distribution of resources. The institutional dimension involves governance, collaboration, and regulatory frameworks that influence social interactions. Key indicators of institutional sustainability include political engagement, equal access to education, social welfare systems, and gender equality.

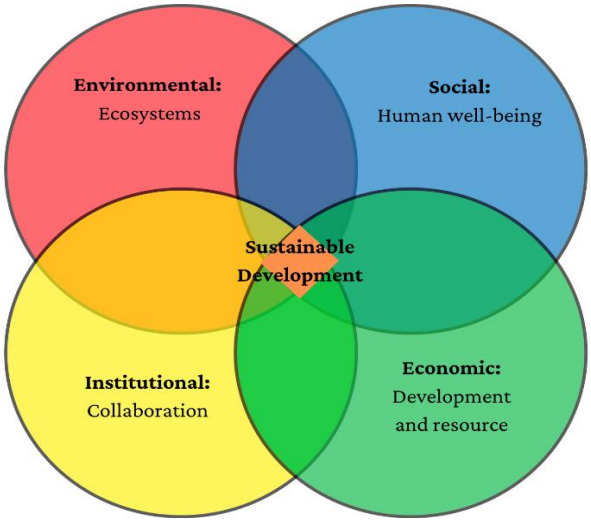



**Fig. 2.1 Sustainable development's 'fourth circle'**

*Source:own source*

### 2.2. Green building:

A green building was initially defined as "design strategies that minimize negative impacts on the environment and ecosystems compared to conventional construction methods." (Doan et al., 2017)

The green building movement started in the 1970s to address environmental issues, is transforming construction. It focuses on creating energy-efficient, healthy buildings that boost productivity. The aim is to reduce buildings' negative impacts on urban, local, and global ecosystems. By prioritizing sustainability and efficiency, the movement seeks to lessen environmental harm and improve the harmony between built and natural environments. This shift changes how buildings are designed, constructed, and operated, aiming to enhance life quality while protecting resources (Yudelson, 2010).

Investing in green buildings increases because of the crucial role in both human well-being and environmental health. Since approximately 90% of our time is indoors, the design and construction of buildings can have profound effects on our living conditions. According to the U.S. Environmental Protection Agency (2004), as referenced by

Klepeis and Tsang et al. (1995), buildings can impact our environment in numerous ways, both beneficial and detrimental. On one hand, buildings provide essential shelter and protection from environmental extremes. On the other hand, they can emit volatile organic compounds, which pose significant health risks.

Buildings are major resource consumers, using 50% of global energy and 70% of timber, along with other raw materials. This heavy resource use emphasizes the need for green building practices. Sustainable methods can reduce environmental impacts, improve indoor health, and lessen the strain on resources.

Buildings generate significant waste throughout their lifecycle, from construction and operation to demolition. This waste comes from materials, energy use, and maintenance processes. Buildings also contribute to air and noise pollution, increase landfill use, and affect water quality through runoff. These issues highlight the environmental challenges of traditional building practices and the need for more sustainable solutions (Amaral et al., 2020).

However, the importance of green buildings becomes even more pronounced in the critical effort to combat carbon dioxide emissions, which are driving global climate change. By focusing on optimizing energy consumption and incorporating renewable energy sources, green buildings play a crucial role in significantly lowering greenhouse gas emissions. This directly tackles the pressing global issue of climate change (Oh et al., 2016).

In the early stages, those involved in green building were relatively few, and their aspirations to minimize the environmental impact of construction were often viewed as ambitious and unrealistic. Today, however, the green building movement is gaining momentum, largely due to advancements in technology that have made these goals more attainable. Modern green builders utilize recycled materials, which helps to decrease the amount of waste sent to landfills. Additionally, they work to lessen the environmental footprint of buildings by reducing their overall energy demands. A key approach is using alternative, clean energy sources to reduce environmental impact. These practices help green buildings promote a sustainable future by tackling resource use and emissions (Oh et al., 2016).

Today, green building is understood as: " a structure designed and constructed to provide a safe, healthy, and efficient living and working space while harmonizing with nature. It optimizes the use of resources (energy, land, water, materials), reduces environmental impact, and minimizes pollution throughout its lifecycle." (Doan et al., 2017)

**2.3. Key features of green building**

Green buildings are characterized by several key features that minimize or eliminate negative impacts and create positive effects on the climate and the natural environment. (Debrah et al., 2022)

Energy Efficiency: One of the primary goals of green buildings is to minimize energy consumption. This is accomplished using strategies like improved insulation, energy-efficient heating and cooling systems (HVAC), and renewable energy technologies such as solar panels (Sun, 2024). By optimizing these aspects, green buildings significantly reduce their overall energy use and carbon footprint.

Water Conservation: Green buildings prioritize reducing water consumption by incorporating water-saving fixtures, rainwater harvesting systems, and advanced wastewater treatment technologies. These strategies conserve water resources and improve water management throughout the building's lifecycle (Basbagill et al., 2013).

Sustainable Materials: The selection of materials for green buildings is guided by the principles of sustainability. This involves choosing materials that are not only environmentally friendly but also locally sourced, which helps to lower the environmental impact associated with transportation and resource extraction. Sustainable materials contribute to reducing the overall ecological footprint of construction projects.

Indoor Air Quality: Green buildings enhance indoor air quality by using advanced ventilation and air filtration systems. These systems reduce pollutants and provide clean, fresh air, creating healthier living and working spaces for occupants (Sinha et al., 2013)

Waste Reduction: The method is achieved through practices such as recycling and reusing materials whenever possible. By reducing the amount of construction waste that ends up in landfills, green buildings contribute to a more sustainable approach to waste management and resource use.

These characteristics collectively enhance the environmental performance and livability of green buildings, making them a vital component of sustainable development.

**2.4. Green building rating system:**

Green buildings emphasize environmental performance and often seek certification through established standards. Rating systems for green buildings include the Building Research Establishment Environmental Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED) in the United States, the Comprehensive Assessment System for Built Environment Efficiency (CASBEE) in Japan, and the Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB) in Germany. The robust advancement of green buildings is a crucial strategy for promoting sustainable development within the construction industry (Sinha et al., 2013). However, the actual impact of green buildings on $CO_2$ emissions is still not fully demonstrated.

In the United States, communities now have more opportunities than ever to support greener building practices and development. Numerous organizations have created model codes and rating systems that communities can use to establish green building programs or update building regulations.

**Table 2.1. Rating of Green Building Systems and Their Cooperation**

| Standard | Project types | Subject Area |
|---|---|---|
| The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®)<br>A set of rating systems designed to improve the environmental and health performance of buildings, sites, and neighborhoods.<br>/Rating and certification system/ | New building<br>Existing constructions | Sustainable sites<br>Energy efficiency<br>Water efficiency<br>Materials and resource use<br>Indoor environmental quality<br>Emissions<br>Operations and maintenance |
| The International Code Council's 2012 International Green Construction Code (IgCC)<br>A model code that establishes standards to improve the environmental and health performance of buildings, sites, and structures.<br>/ Model code/ | New building<br>Alterations | Sustainable sites<br>Energy efficiency<br>Water efficiency<br>Materials and resource use<br>Indoor environmental quality<br>Emissions<br>Operations and maintenance |
| BREEM<br>BRE's third-party certification for the built environment, has been enhancing asset performance since 1990. It supports environmental and social governance (ESG), health, and net zero goals for millions of buildings globally. BREEAM Infrastructure also promotes sustainability in civil engineering projects.<br>/Rating and certification system/ | New building<br>Existing constructions | Sustainable sites<br>Energy efficiency<br>Water efficiency<br>Materials and resource use<br>Indoor environmental quality<br>Emissions<br>Project/environmental management |

*Source : Stephanie Vierra, 2016)*

**2.5. Emission reduction in the green building construction process.**

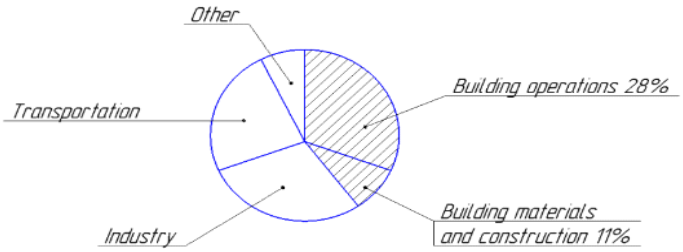



**Fig 2.2 The percentage of CO2 emission by human activities**

*Source: Dolmatov et al., 2022)*

Buildings are major resource consumers, using 40% of global energy and are responsible for significant $CO_2$ emissions. Within this total, the construction activities themselves contribute 28% of the emissions each year. Additionally, the production and transportation of building materials, often termed as embodied carbon, account for another 11% of the annual emissions. This division highlights the significant environmental impact of both the actual construction processes and the lifecycle emissions associated with building materials (Huang et al., 2018).

Construction can greatly impact environmental resources, so adopting eco-friendly practices is crucial. These methods can reduce site disruption, lower landfill waste, and cut down on resource use. They also help improve indoor air quality, creating healthier spaces for occupants. Moreover, sustainable practices can lead to cost savings by minimizing waste and enhancing resource efficiency, making green building strategies financially viable. Thus, environmentally conscious development benefits both the planet and the project's budget.

When performing a comparative analysis of the carbon emissions associated with various building materials or construction methods, several critical factors should be considered to ensure a comprehensive evaluation:

– Type of Material: The specific characteristics of each building material, including its composition and the environmental impact of its production, play a significant role in determining its overall carbon footprint. Different materials have varying levels of emissions associated with their extraction, manufacturing, and application.

– Transportation and Logistics: The emissions generated from transporting materials to the construction site are an essential component of the overall carbon footprint. This includes the fuel consumption and emissions from vehicles and logistics operations involved in the delivery of materials.

– Consumption Volumes: The quantity of materials used in construction projects affects the total emissions. Higher volumes of material consumption generally lead to increased emissions, both from the production phase and the logistical process.

– Product Life Cycle and Recycling: Evaluating the entire life cycle of a product, from its production to its end-of-life disposal, is crucial. This includes assessing the potential for recycling and the environmental impact of disposal methods. Materials that are easily recyclable or have longer life spans typically contribute to lower overall carbon emissions.

By examining these key indicators, a more accurate and thorough comparison of the carbon emissions associated with different building materials and construction techniques can be achieved. This approach helps in making informed decisions that balance environmental impact with practical considerations in construction projects.

The modern industry manufactures a diverse array of construction and thermal insulation materials, utilizing varying numbers of components with different levels of processing, as well as differing amounts of energy and labor. Typically, as the number of technological steps involved in producing these materials increases, so does their overall carbon footprint. Moreover, construction materials are often used far from their production sites, which inevitably incurs additional costs for packaging, storage, loading, and transportation. Conversely, materials that are produced from local resources and used close to their production locations help to reduce CO2 emissions significantly.

A substantial portion of the Ecological Footprint, exceeding 16%, is linked to transportation and related services. To fully assess the impact of transportation on CO2 emissions, it is important to consider both the emissions from vehicles and the ecological footprint of the materials used in road and facility construction. Unfortunately, current trends are unfavorable. For instance, greenhouse gas emissions from industrial processes and the use of industrial products rose from 218.5 million tons of CO2 in 2015 to 243.1 million tons of CO2 in 2018 (Dolmatov et al., 2022). Utilizing local raw materials for building production and minimizing transportation distances can significantly reduce emissions. Additionally, the quality and quantity of packaging used play a vital role in the potential for disposal and recycling of packaging materials.

The consumption of construction materials is determined by various elements, such as the specific material needs of a product and the expectations and requirements of the end user. The effectiveness of production methods and the integration of raw materials further affect this consumption. Presently, there is a noticeable upward trend in consumer

demand.

People are unwilling to relinquish the comfort of having their own vehicle and residing in homes that surpass the basic acceptable consumption levels. This trend reflects aspects of consumer psychology, which continues to evolve with a steady upward trajectory (Dolmatov et al., 2022). During the design phase, comparing alternative construction methods allows for informed decisions about the viability and benefits of different technologies and solutions. However, if a product is already in use—such as an existing residential building—an analysis of its lifecycle might indicate that it no longer meets current standards and requirements, potentially suggesting the need for decommissioning or renovation (Dolmatov et al., 2022). This approach ensures that both new and existing constructions align with contemporary environmental and sustainability goals.

## III. METHODOLOGY

The methodology used in this study is systematic method which follows a clear process, including searching for relevant articles, extracting data, and reporting the results.

The following databases were chosen for the literature search based on the high number of results: IEEE Explore, ScienceDirect, PubMed, Google Scholar, and Web of Science. This study chose a group of scientific articles based on keywords related to sustainable development and reducing emissions in green building construction. These keywords included terms like "sustainable development," "green buildings," "carbon emissions," and "building materials." Most of the articles were published between 2010 and 2023. Articles were screened based on their abstracts, ensuring they covered both sustainability and construction-related aspects.

The study used content analysis to analyze the articles, which focus on finding important strategies for reducing emissions and choosing materials in green building projects. The final selection included 26 articles, chosen based on their relevance to the research questions and methodological rigor. These articles served as the foundation for developing the study's criteria and indicators for evaluating green building strategies.

The study followed a systematic approach to answer the research questions (RQs):

For RQ1: How does green building contribute to sustainable development? the study looked at the abstracts of the articles to make sure they were related to both sustainability and construction. Then defined what sustainable development means, considering both the environment and society. The study highlighted the main features of sustainable buildings, focusing on energy efficiency, low-carbon materials, and long-term benefits for the environment.

For RQ2: How can emission reductions be achieved in green building construction? the study reviewed materials and case studies to find methods that can reduce emissions from construction activities and from materials used in buildings. The research focused on the benefits of green building practices, like using low-carbon materials, improving energy efficiency, and adding renewable energy sources. The study used data about carbon emissions from construction activities, to understand how emissions can be reduced throughout a building's life.

Finally, the study looked at the results and concluded the future of reducing emissions in green building construction. The findings offered new insights and avoided repeating what has been said in previous studies. This approach highlights how green building strategies help reduce emissions and looks forward to future solutions in this area.

## IV. RESULTS AND DISCUSION

### 4.1. The present market for green building

With the increasing availability of compelling evidence about climate change, those who were previously uncertain are now recognizing that adopting green building practices is a prudent choice. Many are beginning to understand the link between global environmental issues and the potential financial implications for their operations. Beyond the immediate benefits, such as operational cost savings, marketing advantages, and design efficiencies, there is a growing awareness of the long-term advantages of green building. These include protection against fluctuating energy prices, enhanced energy security, and other related factors (Kathleen O’Brien, owner of a green building design firm in Seattle, USA).

The green building market encompasses a diverse range of structures, including commercial, institutional, and

residential buildings, as well as properties owned by public, educational, nonprofit, and corporate entities. Green buildings are present across the globe, spanning a variety of types and functions, from large museums and libraries to animal shelters and industrial facilities. The scope of green building projects is extensive, covering both new constructions and the renovation of historic buildings. These projects can occur in various settings, including urban infill sites, brownfield redevelopment areas, and suburban "greenfield" locations. The scale of these projects varies widely, ranging from small buildings of a few thousand square meters to large developments exceeding one million square meters. (Zhang et al., 2019)

However, green buildings still account for only a small fraction of total construction investments. It is estimated that by 2030, the investment opportunity in green buildings will reach $24.7 trillion, whereas the total investment in construction in 2019 was $5.6 trillion, with only $148 billion allocated to green buildings. This highlights the need for greater efforts to promote the growth of green buildings, with green finance being one of the key solutions to address this challenge (Debrah et al., 2022).

**4.2. Criteria, indicators, and weighting**

Creating a specific framework with clear criteria, indicators, and weights is important to suit different regional and local needs. This study presents a methodology for establishing such a framework while comparing it with established certification systems, particularly integrating key principles from the LEED v4 certification system.

Each criterion is measured using specific indicators. About half of these are based on actual data, while the rest focus on policies or trends.

The weight given to each criterion shows how important it is for sustainability. These weights can change based on local priorities. For example, developed regions may focus on reducing emissions, while developing regions might prioritize saving water or adding more green spaces.

Indicators are rated on a simple scale (e.g., 0–10 points). Scores for each criterion are then multiplied by its weight to find the total score. Standards are used to keep results consistent, helping projects compare their performance to best practices:

– High Scoring Indicators (10/10): Renewable energy use, carbon emissions, and energy savings are essential for getting a green building certification. These factors are given high importance because they directly affect the building's energy use and environmental impact.

– Moderate Scoring Indicators (8/10): Waste reduction, air quality, and access to public transport are important, but they may have a slightly smaller effect on the overall certification compared to energy use and carbon emissions.

– Lower Scoring Indicators (7/10): Indicators like recycled materials and access to natural light are still important for sustainability, but they are not as crucial as energy savings or waste management when determining certification.

The study incorporates core principles from the LEED v4 certification system to develop a structured and adaptable evaluation framework for green buildings. LEED v4 prioritizes sustainability across multiple categories, and its key elements align closely with the criteria and weighting system used in this research. The integration of LEED v4 principles is reflected in the following ways:

**Table 4.1 Criteria, indicators, and weights *(own source)***

| **Criteria**<br>Reeder (2010), Doan et al. (2017), and Stephanie Vierra (2016) | **Indicators name**<br>Reeder (2010), Doan et al. (2017), and Stephanie Vierra (2016) | **Weight scale (100%)** |
|---|---|---|
| **Energy Efficiency** | Renewable energy use<br>Energy savings | 25 |
| **Water Efficiency** | Water consumption per capita<br>Recycling | 20 |
| **Material and Resources** | Recycled materials<br>Waste reduction | 15 |

| | | |
|---|---|---|
| **Indoor Environmental Quality** | Air quality<br>Access to natural light | 15 |
| **Site Sustainability** | Proximity to public transport<br>Green spaces | 10 |
| **Innovation and Design** | Advanced sustainable technologies | 10 |
| **Emissions and Carbon Footprint** | Carbon emissions<br>carbon offset programs | 5 |

The number of points required for a building to achieve green building certification depends on the certification system being used.

– LEED (Leadership in Energy and Environmental Design), Buildings earn points across various categories, such as energy efficiency, water efficiency, and sustainable materials. The certification levels are as follows: Certified (40–49 points), Silver (50–59 points), Gold (60–79 points), and Platinum (80+ points) with the maximum possible points of 110 (Reeder, 2010).

– BREEAM (Building Research Establishment Environmental Assessment Method) also awards points in categories like energy, water, and materials. Its certification levels are: Pass (≥ 30% of the total score), Good (≥ 45%), Very Good (≥ 55%), Excellent (≥ 70%), and Outstanding (≥ 85%) (Reeder, 2010).

### 4.3. Application of Green building concept: Olympic House

The building was completed in 2019 and is an office space with a size of 135,000 square feet. It holds prestigious rankings, including LEED V4 Platinum, SNBS Platinum, and Minergie P certifications. The design was carried out by 3XN Architects.

Olympic House has attained LEED Platinum certification, the pinnacle of the global LEED green building standard. As reported by the U.S. Green Building Council (USGBC), the organization behind LEED, this building has earned the highest number of points 93 in the LEED v4 new construction category to date. (Olympic News, 2019)

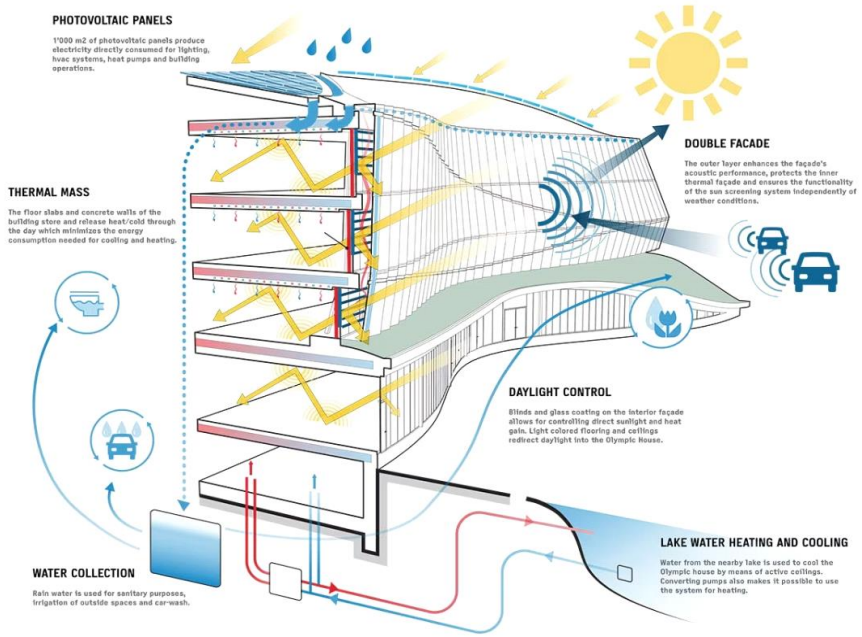



**Fig 4.1 Green building application**

*Source: Olympic News, 2019*

A significant 80 percent of the investment in the construction of the building was allocated to local businesses, supporting the regional economy. Additionally, over 95 percent of the materials from the previous International Olympic Committee (IOC) headquarters were either reused or recycled, demonstrating a strong commitment to sustainability and waste reduction.

The building features cutting-edge renewable energy technologies, such as solar panels and heat pumps that use

water from Lake Geneva. These innovations significantly lower the building's environmental impact. It is estimated that the new building will use 35 percent less energy and 60 percent less municipal water than a typical new construction, demonstrating a major improvement in energy efficiency and water conservation. (Olympic News, 2019)

**Table 4.2 Apply score on case study *(own source)***

| Criteria | Indicators name | Scheuer & Keoleian (n.d.), Basbagill et al. (2013), Debrah et al. (2022), Sun (2024), and Reeder (2010) | Score (1-10) |
|---|---|---|---|
| **Energy Efficiency** | Renewable energy use | using significant renewable energy like solar panels or wind power | 9 |
| | Energy savings | energy-efficient with smart systems but not fully optimized | 8 |
| **Water Efficiency** | Water consumption per capita | Using efficient water-saving technologies like low-flow fixtures | 8 |
| | Recycling | having a robust water recycling system, such as rainwater harvesting or greywater reuse | 8 |
| **Material and Resources** | Recycled materials | using some recycled materials, but not extensively | 7 |
| | Waste reduction | waste management strategies are in place | 8 |
| **Indoor Environmental Quality** | Air quality | has good ventilation and air filtration | 8 |
| | Access to natural light | a significant amount of natural light throughout the building | 8 |
| **Site Sustainability** | Proximity to public transport | located near public transport hubs | 9 |
| | Green spaces | includes green spaces, but not an abundance | 8 |
| **Innovation and Design** | Advanced sustainable technologies | using some cutting-edge technologies for sustainability | 8 |
| **Emissions and Carbon Footprint** | Carbon emissions | having minimized its carbon footprint | 9 |
| | carbon offset programs | using carbon offset programs | 10 |

In total, Olympic House has earned nearly 80 point based on its sustainability efforts across various categories. This high score reflects the building's strong performance in energy efficiency, waste reduction, carbon emissions management, and its innovative use of sustainable technologies. With this score, Olympic House achieved a LEED V4 Platinum certification (Olympic News, 2019).

## V. CONCLUSION

Green buildings offer numerous benefits and should be recognized as a practical solution to address development challenges and the increasing demand for construction in developing nations. These challenges include rapid population growth, excessive urbanization, uncertainties in energy supply, and the negative environmental effects of climate change. By providing sustainable and efficient solutions, green buildings can help mitigate these issues effectively.

Despite their advantages, the adoption of green building practices has been slow, facing criticism due to limited government support. To accelerate progress and integrate these practices more effectively, the government must implement stronger policies. This could include stricter regulations mandating green building standards or incentives that encourage sustainable construction. Such measures would facilitate the transition to environmentally friendly building practices while contributing to broader sustainability and environmental protection goals.

Vietnam’s green building sector is anticipated to expand significantly, driven by growing environmental awareness and the government's commitment to achieving carbon neutrality by 2050. Applying green building principles will be crucial for attaining sustainable development objectives. Successful projects like the Olympic House provide valuable insights into how Vietnam can incorporate energy-efficient designs, resource conservation, and urban sustainability into its construction industry. Establishing a structured scoring system will help assess green buildings, promote innovation, and ensure accountability. While challenges persist, key drivers such as strategic investments, regulatory improvements, and heightened public awareness will be essential for advancing Vietnam’s green building sector and achieving long-

term sustainability.

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# INVESTIGATING SOME FACTORS INFLUENCE THE ADOPTION OF TELEMEDICINE SERVICES AMONG THE YOUNG IN HO CHI MINH CITY

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**ABSTRACT**

In the rapidly evolving healthcare landscape, telemedicine services, though relatively new in Vietnam, have emerged as a crucial tool for enhancing access to medical treatment. This study investigates the factors influencing the adoption of telemedicine services among the youth in Ho Chi Minh City, utilizing the Technology Acceptance Model (TAM) as the theoretical framework. Data were collected from 116 young individuals in Ho Chi Minh City through a systematic questionnaire, employing non-probability and convenience sampling methods. The data, analyzed using structural equation modeling (SEM), reveal that perceived utility (PU), perceived ease of use (PEOU), and perceived behavioral control (PBC) significantly impact the adoption (ADO) of these services. By elucidating the factors affecting telemedicine adoption, this paper underscores the importance of user-centered approaches to enhance the acceptability and utilization of telemedicine among young people. Thus, these findings have significant implications for healthcare professionals and policymakers aiming to promote telemedicine as a viable healthcare alternative in urban settings.

*Key words:* "telemedicine", "adoption", "TAM"

## I. INTRODUCTION

### 1.1. Background of the study

Conventional healthcare is transitioning to digital platforms owing of COVID-19 and other illnesses. Telemedicine and swift technical advancements facilitate remote healthcare (Suci Megawati, 2024). The global healthcare system must implement innovative infection-reduction technology while maintaining patient outcomes. The utilization of telemedicine in medical professions has surged since the pandemic, notwithstanding continuous developments (Andrés R. Latorre-Rodríguez, 2024).

Telemedicine is described as the use of telecommunications technology, such as telephones and computers, to provide clinical health care from a distance (American Medical Association, 2024). Over the years, it has progressed since the epidemic. Dermatology, allergies, and immunology are among the fields where telemedicine is used. Indeed, it has several advantages; yet, young people in Vietnam, particularly in Ho Chi Minh City, are skeptical (Natale Daniele Brunetti, 2015). There has been limited study into telemedicine acceptability among teenagers in Ho Chi Minh City. To overcome this gap, this study evaluates many approaches for encouraging young people to use telemedicine and increasing acceptance.

Human attributes, technical skills, and organizational components all have an impact on healthcare technology adoption. Several ideas identify factors influencing the adoption of healthcare technology. Notable models include the Technology Acceptance Model (TAM) (Rahimi, Nadri, Lotfnezhad Afshar, & Timpka, 2018), Extended Technology Acceptance Model (TAM2) (AlQudah, Al-Emran, & Shaalan, 2021), Unified Theory of Acceptance and Use of Technology (UTAUT) (Ursavaş, 2022), Theory of Planned Behavior (TPB) (Ajzen & Schmidt, 2020), and the Diffusion of Innovations Theory (Ohkubo, Limaye, & Harlan, 2015). Despite substantial study, the extent to which children in growing urban areas use telemedicine is unknown. As a result, the purpose of this study is to investigate the factors influencing young people's acceptance of telemedicine services, using TAM as a foundation model.

This study examines the key factors influencing telemedicine adoption among the youth in Ho Chi Minh City. The study examines the telemedicine readiness of young individuals and identifies potential adoption drivers. The findings empower healthcare practitioners, technology developers, and policymakers to address the telemedicine demands of Ho Chi Minh City's people.

This paper delineates two theoretical and practical breakthroughs. This theoretical study, grounded on the Technology Acceptance Model (TAM), investigates the acceptability of telemedicine among juveniles in Ho Chi Minh City. The TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) influence technology adoption. Young individuals perceive telemedicine healthcare as attractive and straightforward, as evidenced by perceived usefulness (PU) and perceived ease of use (PEOU). The model evaluates young engagement with the advantages and effectiveness of telemedicine. Furthermore, the study enhances the model by integrating attitude, facilitating factors, and perceived behavioral control. Telemedicine, along with its theories and models, is analyzed.

### 1.2. Vietnamese telemedicine background

Vietnam has been improving its telemedicine services, especially since COVID-19 required remote care. The Vietnamese government has encouraged telemedicine to alleviate the physician scarcity and resource shortage, especially in rural areas. For hospitals to provide teleconsultation to smaller provincial and district institutions, the Ministry of Health launched the Telehealth Project in 2020. In its first year of implementation across all medical categories, this enabled about 1,000 virtual consultations (Ministry of Health Vietnam, 2020). However, Vietnam must overcome many obstacles to use telemedicine. Due to limited internet and digital device access, rural infrastructure remains a major issue. The World Bank estimates that 73% of Vietnamese use the internet, emphasizing a large gap between urban and rural populations. Nguyen et al. found that healthcare practitioners and patients lack the digital skills to use telemedicine services. Telemedicine is growing in Ho Chi Minh City, thus there are opportunities. IT-savvy residents live in a city with strong infrastructure and many hospitals. Telemedicine is growing in Vietnam because to business, especially health technology businesses like Doctor Anywhere and eDoctor (Nguyen & Tran, 2022). These companies offer remote consultations, prescription delivery, and electronic health records, increasing the chance of telemedicine adoption.

Due to their technological prowess and smartphone ownership, Ho Chi Minh City youth are likely to adopt telemedicine. Statista (2023) predicts that 74% of Vietnam's population used smartphones in 2022, with 73% aged 18–34. This generation uses mHealth apps and teleconsultation the most, reflecting the global trend among digital health technology customers (Le et al., 2021). Due to the fast pace of their life and the growing focus on primary and secondary prevention, Ho Chi Minh City adolescents are open to alternative treatments. Pham and Do (2022) found that young, urban people choose telemedicine to reduce clinic time. In decision no. 749/QD-TTg, government telemedicine initiatives are supported by digital healthcare technology programs. Health IT entrepreneurs are tailoring their services to younger consumers. Social and fitness tracking, mental health support, and child-friendly interfaces are the main features. According to Nguyen et al. (2022), a new startup hub in the city has increased digital health solution investment over the previous five years. The findings show that Ho Chi Minh City's younger clients are particularly engaged in telemedicine and crucial to Vietnam's digital healthcare future.

## II. LITERATURE REVIEW

### 2.1. Theoretical framework

The Davis (1989) Technology Acceptance Model (TAM) is widely used to study user adoption of technology. According to the Theory of Reasoned Action (TRA), the TAM was created to explain computer usage. This adaptability and ease of application make it important in many fields, not only healthcare technology. TAM found that Perceived Usefulness and Perceived Ease of Use (PEOU) are the two main elements affecting an individual's Attitude Toward Use and Behavioral Intention to Use a technology. Perceived Usefulness (PU) is the extent to which an individual believes a system will boost productivity, according to Davis (1989). Telemedicine could enhance medical treatment and consultation times for PU. Second, Perceived Ease of Use refers to how much work a system requires. Healthcare professionals must recognize that a user-friendly telemedicine system will boost PEOU. Conduct, system adoption goal, and user usage behavior are directly related (Venkatesh & Davis, 2000). TAM predicts a large amount of users' acceptance behavior across technological contexts, making it important in technology adoption studies. The TAM is a benchmark in technology adoption research due to its simplicity and predictive power (King & He, 2006).

TAM has been used to study user attitudes regarding telemedicine systems that enable remote consultation, diagnosis, and EHR adoption. In their study of hospital information system adoption, Chau and Hu (2002) used the

TAM to study physicians' telemedicine adoption and found that perceived usefulness and simplicity of use influenced their attitudes. Thereafter, Aggelidis and Chatzoglou (2009) found that perceived usefulness (PU) influenced behavioral intention more than perceived ease of use (PEOU). During the COVID-19 pandemic, Huang et al. (2021) found that PU and PEOU strongly influence patients' telemedicine utilization. They also stressed that Internet connection and system support were vital for building perceived value amid the rapid growth of digital health services. These data confirm the model's ability to explain patient and provider adoption. Telemedicine in Vietnam is new, thus the TAM can be used to study behavioral trends. In a mixed-methods cross-sectional survey on telemedicine's acceptability during the pandemic, Nguyen et al. (2021) used the TAM and found that perceived usefulness was a key factor in adoption. If telemedicine's convenience and cost are adequately advertised to the Vietnamese public and young consumers, uptake may improve. TAM continues to provide vital insights about technology acceptability through its extensions and relevance to healthcare applications. It can be used to explain how people understand and use new health technologies, such as telemedicine.

### 2.2. Hypothesis formation

TAM is useful for assessing telemedicine use, especially among urban youth in Ho Chi Minh City. According to Davis (1989), Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) affect Attitude Toward Use (ATT), which affects adoption behavior. These constructions are not the only ones relevant to youngsters in Ho Chi Minh City. Telemedicine usage is influenced by smartphone access, reliable internet, and user-friendly interfaces. Nguyen & Do (2022) found that urban teenagers will use telemedicine more if infrastructure is not a problem. Another control variable that impacts adoption behavior is perceived behavioral control (PBC), which is the perceived ability to use telemedicine services (Ajzen, 1991).

Based on the TAM framework and additional factors, the following hypotheses are proposed:

H1: Perceived usefulness positively impacts attitude toward telemedicine adoption.

H2: Perceived ease of use positively impacts attitude toward telemedicine adoption.

H3: Attitude positively influences telemedicine adoption.

H4: Facilitating conditions positively influence telemedicine adoption.

H5: Perceived behavioral control positively influences telemedicine adoption.

The study model expands on the TAM components by identifying the link between PU and PEOU with Attitude, and FC and PBC with Adoption behavior. This methodology is especially important for studying the usage of Telemedicine among young individuals in Ho Chi Minh City.

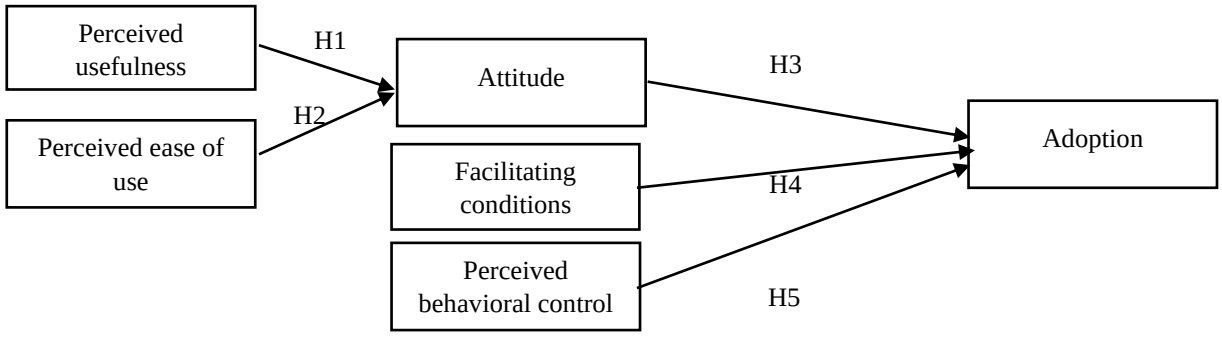



**Figure 2.1 - Research model**

#### 2.2.1. Perceived usefulness

The definition of perceived usefulness (PU) is "the degree to which a person believes that using a particular system would enhance his or her job performance." - in Davis' study "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology" (1989). The authors broaden the definition of "perceived usefulness" to include "the degree to which users believe that using a specific service will improve their personal performance." - in "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies" by Venkatesh and Davis (2000).

### 2.2.2. Perceived ease of use

Perceived ease of use (PEOU) is the degree to which a person feels that utilizing a specific system would be effortless (Davis, 1989) or the degree to which consumers believe that using a given service will be simple (Venkatesh & Davis, 2000). Furthermore, the amount to which users feel that utilizing a service would require no physical or mental effort - "User Acceptance of Information Technology: Toward a Unified View" Venkatesh, V. et al. (2003).

### 2.2.3. Attitude

Ajzen, I. (1991) defines attitude (AT) as the degree to which a person has a positive or negative judgment of the conduct in issue. Furthermore, in the early study of Fishbein M. & Ajzen I. (1975), AT refers to the taught inclination to respond consistently favorably or unfavorably to a particular item.

### 2.2.4. Facilitating conditions

According to Venkatesh et al. (2003), facilitating circumstances (FC) refer to an individual's belief that a technological infrastructure exists to help them when using a new service. Furthermore, enabling conditions refer to individuals' views of the availability of technology and/or organizational resources, such as knowledge, resources, and opportunities, that may be leveraged to overcome obstacles to service usage (Venkatesh et al. 2003). Thus, FC minimizes perceived obstacles to service uptake through support and help (Blok et al., 2020).

### 2.2.5. Perceived behavioral control

Perceived behavioral control (PBC) is the perceived ease or difficulty of doing the task at hand (Ajzen, 1991). Following that, Baker et al. (2002) found that PBC is a strong predictor of service acceptability and usage intention in a range of contexts.

### 2.2.6. Adoption

Adoption (AD) is described by the Cambridge Dictionary as accepting or starting to use something new, choosing or taking something as your own, and the process of beginning to utilize a new product or service.

## III. METHODOLOGY

This study targets HCMC individuals aged 18-30 who have basic knowledge of telemedicine. This group, which represents a sizable section of the population that is technologically adept and receptive to new ideas, is critical to understanding telemedicine adoption determinants because they frequently embrace new solutions first and may give useful insights regarding its usability and acceptance. This group is critical to the study because their actions have a direct impact on telemedicine uptake. Without a comprehensive adolescent telemedicine registry, non-probability sampling should be performed. Purposive selection will identify telemedicine specialists, ensuring that the sample accurately represents HCMC's youthful telemedicine customers. Examining a cohort can reveal telemedicine service utilization trends and their implications for healthcare accessibility and efficiency. Identifying the primary factors influencing telemedicine adoption among young people in HCMC can aid in the development of user-centered telemedicine solutions tailored to this demographic's needs and preferences. This project seeks to advance our understanding of how to use telemedicine in healthcare in order to enhance service delivery and patient outcomes.

Surveys are used to investigate human behavior because they give empirical data based on real-world observations (Kelley et al., 2003). Surveys were employed in this investigation. This study's online questionnaire was made available using Google Forms. We revised all questionnaire items based on a thorough literature review to guarantee content validity. Based on variable definitions, the survey was written in English. Every questionnaire item corresponds to a topic-related variable. It was translated from English to Vietnamese before being administered in Vietnamese, Vietnam's official language and the language spoken by the majority of young people, to ensure translation equivalence. The questionnaire ensures confidentiality and respects privacy. The 7-point Likert scale, which goes from (1) strongly disagree to (7) strongly agree, was chosen for assessment because it provides better dispersion and has fewer neutral responses. The inquiry relied on the equation $N > 50 + 8*m$. This guideline sets sample size based on the number of predictor variables in the model, ensuring regression analysis and robust findings. The formula (Cohen, 1988) calls for 50 samples, where N is the minimum sample size and m is the research model's predictor variables. The model has six predictor variables, hence N surpasses $50 + 8 * 6$ (Green, 1991). Thus, our sample of 116 is adequate because the study

requires 98 samples.

After gathering study data, partial least squares structural equation modeling is used to assess and draw conclusions on the factors impacting young people's telemedicine adoption in Ho Chi Minh City. Table 1 shows data dependability. In model structure analysis, the outer loadings coefficient represents the relationship between observable variables and latent variables, demonstrating the capacity to explain latent variable variation. Joseph F. Hair (2017) recommends an outer loading factor of 0.7 or greater. Table 1 shows that AT2, FC1, PBC1, PBC3, PEOU3, PU3, and PU4 all have outer loading coefficients less than this threshold: 0.677, 0.604, 0.624, 0.618, 0.571, 0.590, and 0.683. Exclude data with outer loading factors less than 0.4 from the model. If the Composite Reliability (rho_c) and Convergent Validity (AVE) indicators for that component are between 0.4 and 0.7, the coefficient will be retained (Joseph F. Hair, 2017). SmartPLS 4 provides three indicators for evaluating internal consistency reliability: Cronbach's alpha (ρA), composite reliability (rho_a), and composite reliability (rho_c). The focus should be on the reliability indicators ρA and CR for numerous fundamental reasons. Initially, ρA is the key measure for analyzing intrinsic consistency, displaying item similarity based on criteria. Values of 0.7 or above are deemed acceptable. The quantity of items in the criterion may influence this statistic, resulting in lower scores despite the criteria's dependability. In contrast, the CR assesses dependability more accurately by taking into account the normalized load of observed values and their mistakes, offering a more focused perspective in complicated models. A CR value of 0.7 or more is more reliable than ρA since it considers the load of each criteria item, especially in models with several variables. The ρA coefficient frequently underestimates dependability, whereas CR overestimates it. As a result, when evaluating results, both indicators must be considered; the acceptable dependability value often falls between these two coefficients, increasing variable reliability and boosting research quality and accuracy (Joseph F. Hair, 2017).

## IV. DATA ANALYSIS AND RESULT

### 4.1. Assessing the outer measurement model

**Table 4.1 – Loadings, cronbach's alpha, composite reliability (rho_c) and average variance extracted (AVE)**

| Constructs | Items | Outer loadings | Cronbach's alpha ($\rho_A$) | Composite reliability (rho_c) | Average variance extracted (AVE) |
|---|---|---|---|---|---|
| **AD** | AD1 | 0.716 | **0.696** | 0.813 | 0.521 |
| | AD2 | 0.713 | | | |
| | AD3 | 0.723 | | | |
| | AD4 | 0.734 | | | |
| **AT** | AT1 | 0.730 | **0.536** | 0.764 | 0.52 |
| | AT2 | **0.677** | | | |
| | AT3 | 0.754 | | | |
| **FC** | FC1 | **0.604** | **0.611** | | 0.554 |
| | FC2 | 0.77 | | | |
| | FC3 | 0.838 | | | |
| **PBC** | PBC1 | **0.624** | **0.626** | 0.78 | **0.473** |
| | PBC2 | 0.771 | | | |
| | PBC3 | **0.618** | | | |
| | PBC4 | 0.725 | | | |
| **PEOU** | PEOU1 | 0.759 | **0.473** | 0.741 | **0.493** |
| | PEOU2 | 0.758 | | | |
| | PEOU3 | **0.571** | | | |
| **PU** | PU1 | 0.739 | **0.638** | 0.787 | **0.483** |
| | PU2 | 0.755 | | | |
| | PU3 | **0.59** | | | |
| | PU4 | **0.683** | | | |

*Note(s): AD = Adoption; AT = Attitude; FC = Facilitating Conditions; PBC = Perceived Behavioral Control; PEOU = Perceived Ease of Use; PU = Perceived Usefulness.*

The validity of the data reported in Table 1 is assessed using the outer loadings coefficient. The suggested outside loadings indicate that a decent observation number should be more than 0.7. However, Table 1 reveals seven observations—AT2, FC1, PBC1, PBC3, PEOU3, PU3, and PU4—with outer loading values of 0.677, 0.604, 0.624, 0.618, 0.571, 0.59, and 0.683, respectively, all of which fall below this criterion. Observations with outer loading coefficients of less than 0.4 should be omitted from the model. When the coefficient is between 0.4 and 0.7, the choice to keep or remove an observation is based on the composite reliability (rho_c) and average variance extracted (AVE) for the relevant construct (Joseph F. Hair, 2017).

To ensure the reliability of the criteria, it is essential to focus on two key indicators: ρA and CR. The ρA indicator measures the internal consistency of items within the criteria, with values above 0.7 deemed acceptable. Similarly, a CR value of 0.7 or higher is considered satisfactory, as it accounts for the outer loadings of individual items. CR is particularly useful in models with multiple latent variables, offering a more precise reliability measure than ρA (Joseph F. Hair, 2017). In this study, all ρA values fell below the 0.7 threshold, suggesting insufficient reliability, which could compromise the accuracy of the findings. However, ρA values can be affected by the number of items, potentially resulting in low values even when the criteria are reliable. Therefore, we also examined the CR indicator, and the results showed that all CR values exceeded 0.7, confirming the reliability of the criteria used in this study.

Next, we will assess the convergent validity of the criteria using the Average Variance Extracted (AVE) index, as shown in Table 1 on SmartPLS. Convergent validity analysis suggests that when two distinct criteria measure the same concept and exhibit a high correlation, their convergence is considered strong (Kenneth S. Shultz, 2013). A criterion demonstrates good convergent validity if its AVE is 0.5 or higher, indicating that the latent variable accounts for at least 50% of the variance in each observed variable. If a criterion's AVE is below 0.5, we will incrementally remove observations with the lowest outer loadings to improve the AVE (Michael Hock, 2010). The AVE coefficient analysis results for the model variables, presented in Table 1, reveal that only AD, AT, and FC meet the threshold for ensuring convergent validity (AVE > 0.5). The remaining variables do not meet the required threshold.

**4.2. Inspecting the inner structural model**

**Table 4.2 - Heterotrait-monotrait ratio (HTMT)**

| | **Heterotrait-monotrait ratio (HTMT)** |
|---|---|
| **AT <-> AD** | 0.673 |
| **FC <-> AD** | 0.583 |
| **FC <-> AT** | **1.218** |
| **PBC <-> AD** | 0.770 |
| **PBC <-> AT** | **0.986** |
| **PBC <-> FC** | **1.062** |
| **PEOU <-> AD** | 0.594 |
| **PEOU <-> AT** | 0.841 |
| **PEOU <-> FC** | **0.868** |
| **PEOU <-> PBC** | 0.806 |
| **PU <-> AD** | 0.604 |
| **PU <-> AT** | **0.854** |
| **PU <-> FC** | 0.761 |
| **PU <-> PBC** | 0.807 |
| **PU <-> PEOU** | 0.838 |

*Note(s): AD = Adoption; AT = Attitude; FC = Facilitating Conditions; PBC = Perceived Behavioral Control; PEOU = Perceived Ease of Use; PU = Perceived Usefulness.*

We aim to evaluate the discriminant validity of the variables in our research model using the HTMT index. A construct is considered to have good discriminant validity if it not only shows distinctiveness from other constructs but also avoids overlap or redundancy in measurement. If the HTMT value for a pair of constructs exceeds 0.9, it indicates a violation of discriminant validity, suggesting an overlap between the variables. Values below 0.85 ensure good

discriminant validity, while those between 0.85 and 0.9 are acceptable (Henseler, 2015). The PLS-SEM analysis results show that the HTMT indices for the pairs AT ↔ AD, FC ↔ AD, PBC ↔ AD, PEOU ↔ AD, PEOU ↔ AT, PEOU ↔ PBC, PU ↔ AD, PU ↔ FC, PU ↔ PBC, and PU ↔ PEOU demonstrate good discriminant validity, confirming the independence and lack of overlap between these variables, with all indices below 0.85. However, pairs such as FC ↔ AT, PBC ↔ AT, and PBC ↔ FC have coefficients exceeding 0.9, indicating potential overlap. Additionally, PEOU ↔ FC and PU ↔ AT have HTMT coefficients of 0.868 and 0.854, respectively, suggesting some similarities. Despite this, values within this range are still considered acceptable but require careful monitoring to ensure true independence and avoid confusion in the research (Henseler, 2015).

**Table 4.3 - Outcome of the structural model examination (1)**

| Latent Construct | Items | VIF | R-square | R-square adjusted |
|---|---|---|---|---|
| **AD** | AD1 | 1.198 | 0.296 | 0.277 |
| | AD2 | 1.321 | | |
| | AD3 | 1.366 | | |
| | AD4 | 1.445 | | |
| **AT** | AT1 | 1.152 | 0.302 | 0.289 |
| | AT2 | 1.106 | | |
| | AT3 | 1.177 | | |
| **FC** | FC1 | 1.173 | | |
| | FC2 | 1.263 | | |
| | FC3 | 1.225 | | |
| **PBC** | PBC1 | 1.293 | | |
| | PBC2 | 1.445 | | |
| | PBC3 | 1.108 | | |
| | PBC4 | 1.223 | | |
| **PEOU** | PEOU1 | 1.224 | | |
| | PEOU2 | 1.193 | | |
| | PEOU3 | 1.038 | | |
| **PU** | PU1 | 1.471 | | |
| | PU2 | 1.440 | | |
| | PU3 | 1.072 | | |
| | PU4 | 1.218 | | |

*Note(s): AD = Adoption; AT = Attitude; FC = Facilitating Conditions; PBC = Perceived Behavioral Control; PEOU = Perceived Ease of Use; PU = Perceived Usefulness.*

**Table 4.4 - Outcome of the structural model examination (2)**

| PLS Path | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | f-square | Remark |
|---|---|---|---|---|---|---|---|
| **AT -> AD** | 0.189 | 0.192 | 0.148 | 1.282 | **0.2** | 0.024 | **unsupported** |
| **FC -> AD** | -0.01 | 0.019 | 0.144 | 0.066 | **0.947** | **0.000** | **unsupported** |
| **PBC -> AD** | 0.421 | 0.43 | 0.138 | 3.047 | 0.002 | 0.133 | supported |
| **PEOU -> AT** | 0.244 | 0.256 | 0.117 | 2.09 | 0.037 | 0.067 | supported |
| **PU -> AT** | 0.392 | 0.402 | 0.099 | 3.961 | 0.000 | 0.174 | supported |

*Note(s): AD = Adoption; AT = Attitude; FC = Facilitating Conditions; PBC = Perceived Behavioral Control; PEOU = Perceived Ease of Use; PU = Perceived Usefulness.*

The analysis results in Table 3 show that the R-square value for the variable AT is 0.302, indicating that the independent variables PU and PEOU explain 30.2% of the variance in AT. This suggests that when users develop a positive attitude towards using a service, PU and PEOU contribute 30.2% to this attitude, while other factors account for the remaining 69.8%. Similarly, the dependent variable AD has an R-square value of 0.296, meaning that AT, FC,

and PBC together explain 29.6% of the variance in AD. This implies that these three factors play a modest role in young people's acceptance of telemedicine services. Therefore, addressing these factors alone does not ensure user acceptance of telemedicine. Additionally, unlisted factors account for 71.4% of the variance, indicating a significant influence from other variables.

To determine whether the influence of these factors is evenly distributed, we must examine the f-square index in Table 4. The analysis results reveal an uneven distribution of influence. An f-square value below 0.1 indicates negligible effect, values between 0.1 and 0.15 are considered very low, values between 0.15 and 0.35 indicate moderate influence, and values above 0.36 demonstrate strong influence (Fox, 2016). The effects of PU on AT and PBC on AD are quantified as 0.174 and 0.133, respectively, suggesting a moderate level of impact. The other factors—AT → AD, FC → AD, and PEOU → AT—show minimal impact, with f-square values of 0.024, 0.000, and 0.067, respectively. Next, we will assess the statistical significance of our assumptions by examining the p-value to determine if the majority of respondents share a consistent understanding.

The p-value indicates the reliability of the previously presented hypothesis. A factor is deemed trustworthy when it meets a minimal degree of consistency, with 90% being the lowest. The degree of dependability is separated into three thresholds: 90%, 95%, and 99% (Freedman, 2007). The reason is that statistics is never based on exact numbers; inaccuracies are unavoidable since not everyone thinks alike. The first p-value for the AT coefficient is 0.200, or 20%, suggesting that the surveyed group's opinions are 80% identical. This value is insufficient to confirm AT's influence on the adoption of telemedicine services among young people, rendering the AT factor statistically insignificant. Conversely, the p-value for FC is 0.947, showing that only 5.3% of respondents believe FC influences telemedicine adoption, which is also statistically unreliable. In contrast, the p-values for PBC, PEOU, and PU are 0.002, 0.037, and 0.000, respectively, all surpassing the 95% confidence threshold. This indicates that over 95% of the surveyed group share the same viewpoint, making these results highly reliable and statistically significant. Notably, the PU coefficient has the highest f-square value among the five factors, at 0.174, and a p-value of 99%, signifying a substantial level of influence.

In summary, only three of the five factors—PBC, PEOU, and PU—are statistically significant and influence the adoption of telemedicine services among young people. Due to insufficient data, the factors AT and FC will be temporarily disregarded as their impact cannot be confirmed. Therefore, when making recommendations about the factors influencing the adoption of telemedicine services among young people in Ho Chi Minh City, focus should be directed towards the significant factors, as AT and FC do not show statistical significance or importance.

## V. DISCUSSION

Perceived usefulness stands out as the most influential factor shaping young people's attitudes toward telemedicine services, with an f-square coefficient of 0.174 and a p-value of 0.000, underscoring its high statistical significance. Telemedicine saves time and effort, which is crucial for students and busy individuals. It allows young people to book appointments without traveling to hospitals, enhancing healthcare convenience. Perceived ease of use (PEOU) also positively impacts service adoption, as indicated by an f-square coefficient of 0.067 and a p-value of 0.037. Technical support from healthcare providers helps users resolve issues quickly, improving their overall experience and encouraging continued use and recommendations to friends and family. While user attitudes might influence service adoption, the research shows an f-square coefficient for attitude of 0.024 and a p-value of 0.2, suggesting that attitude is not a decisive factor in adopting telemedicine services. This may be due to a lack of information about telemedicine benefits or skepticism about its effectiveness compared to in-person consultations. Additionally, without support from friends or family, young people's attitudes toward these services are unlikely to improve. Facilitating conditions do not significantly impact telemedicine adoption among young people, as shown by an f-square value of 0.000 and a p-value of 0.947. Modern youth are comfortable with technology and do not see infrastructure as a major barrier. Technological advancements in Ho Chi Minh City further ease access to these services, reducing concerns about physical facilities. Perceived behavioral control (PBC) significantly influences telemedicine acceptance, with an f-square value of 0.133 and a p-value of 0.002. Young individuals feel empowered to make decisions about telemedicine, from scheduling appointments to communicating with doctors. Their confidence in using technology facilitates easy access to these services.

Research on the adoption of telemedicine services among young people in Ho Chi Minh City produced significant insights but also highlighted notable limitations. A key issue is that the survey sample was predominantly composed of students, which may not accurately represent the broader population. Students often share similar lifestyles, habits, and health perceptions, meaning the data may not fully capture the perspectives and needs of other groups, such as workers, married individuals, or middle-aged people. This homogeneity within the sample provides an incomplete view of telemedicine acceptance. Students' shared habits and needs could lead to conclusions that do not apply to the wider community. In contrast, working adults may have greater health awareness and financial capacity to afford healthcare services, advantages that students might lack.

## VI. RECOMMENDATIONS AND CONCLUSION

This study primarily focused on students, a group with similar lifestyles, technological familiarity, and information habits. While the survey provides valuable insights into the opinions and behaviors of this subgroup, it may not fully represent all young people. Students, having grown up in a digital environment, tend to be optimistic about technology, which may not reflect the views of other young individuals, such as those who are working or have not attended university. To address this limitation, future surveys should include young working adults and non-graduates. This approach will capture a broader range of perspectives and behaviors, offering a more comprehensive understanding of service acceptability criteria. Including participants from diverse demographics and technology usage habits will enhance the persuasiveness of the results and help service providers make more informed recommendations. Additionally, conducting periodic surveys and monitoring the attitudes and behaviors of these groups will allow us to track service usage patterns and adjust hypotheses for future studies more effectively.

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**APPENDIX**

Appendix: Questionaire

Investigating some factors influence the adoption of telemedicine services among the young in Ho Chi Minh city

**Part 1: Demographic characteristics**

| **Demographic variable** | |
|---|---|
| Gender | Female |
| | Male |
| Age | Less than 20 |
| | 21-25 years old |
| | 26-30 years old |
| | Above 30 years old |
| Education level | No College Degree |
| | Associate's Degree |
| | Bachelor's Degree |
| | Master's Degree |
| Current occupation | Student |
| | Employed full-time |
| | Employed part-time |
| | Unemployed |
| Monthly income | Less than 3M VND |
| | 3M VND – 5M VND |
| | 5M VND – 7M VND |
| | 7M VND – 10M VND |
| | Above 10M VND |
| Do you have experience in using telemedicine services? | Yes |
| | No |

**Part 2. Measurement scale**

| **Constructs** | **Items** |
|---|---|
| Perceived Usefulness (PU) | PU1: Using telemedicine services will help me perform health-related tasks more effectively.<br>PU2: Utilizing telemedicine services will lead to better health outcomes in my daily life.<br>PU3: Telemedicine services can enhance my quality of life by providing convenience and quick access to medical care. |
| Perceived Ease of Use (PEOU) | PEOU1: Using telemedicine services will require minimal effort on my part.<br>PEOU2: Accessing telemedicine services will be very easy and convenient for me.<br>PEOU3: Using telemedicine services will not involve significant physical or mental strain. |
| Attitude (AT) | AT1: I have a favorable opinion about using telemedicine services for my healthcare needs.<br>AT2: I believe telemedicine services are a positive approach to healthcare.<br>AT3: Overall, I feel positive about the use of telemedicine technology for medical consultations. |
| Facilitating Conditions (FC) | FC1: I feel confident that the technical infrastructure is sufficient to effectively support my use of telemedicine services.<br>FC2: The support and assistance I receive make it significantly easier for me to adopt telemedicine services.<br>FC3: I believe I have access to the necessary resources and knowledge to |

| | |
|---|---|
| | navigate telemedicine services without issues. |
| Perceived Behavioral Control (PBC) | PBC1: I believe that using telemedicine services is easy for me to do.<br>PBC2: I feel confident in my ability to use telemedicine services effectively.<br>PBC3: I think that I can easily access and navigate telemedicine services when needed.<br>PBC4: I feel that I have the necessary resources and support to successfully use telemedicine services. |
| Adoption (AD) | AD1: I have accepted telemedicine services as a viable option for my healthcare needs.<br>AD2: I feel comfortable starting to use telemedicine services for my healthcare.<br>AD3: I consider telemedicine services to be an integral part of my healthcare routine.<br>AD4: I have begun to use telemedicine services regularly for my healthcare needs. |

# SUSTAINABLE TOURISM DEVELOPMENT WITH THE CULTURAL HERITAGE OF SOUTHERN VIETNAMESE TRADITIONAL HOUSES

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**ABSTRACT**

The cultural heritage of Southern ancient houses possesses unique historical and architectural value, making an important contribution to the sustainable development of tourism in Vietnam. This research examines the potential and challenges associated with the conservation and utilization of ancient buildings in Southern Vietnam to cultural heritage and sustainable tourism, the article evaluates the contributions of Southern ancient houses in creating distinctive tourism products, educating visitors about cultural values, and supporting local economies. The results indicate that, while these heritage sites hold significant potential to attract visitors and raise awareness about cultural heritage, their conservation and utilization face challenges such as visitor-related pressures, inadequate funding, and structural deterioration. The study suggests solutions including controlled renovation, the application of promotional technologies, streamlined tourism processes, and the empowerment of local communities. With a well-planned conservation and development strategy, the heritage of Southern ancient houses can serve as a central element in fostering sustainable cultural tourism in Vietnam within the context of contemporary societal development.

*Keywords:* "cultural heritage", "heritage preservation", "southern ancient houses", "sustainable tourism"

## I. INTRODUCTION

Vietnam, with its rich and diverse cultural heritage, is home to an invaluable repository of cultural treasures. Among these, the heritage of Southern Vietnamese traditional houses stands as an integral part, contributing significantly to the uniqueness of this cultural legacy. These traditional houses are not only architectural marvels bearing profound historical imprints but also serve as symbols of the cultural, social, and spiritual life of the Southern Vietnamese people. Closely tied to local communities, this heritage has emerged as a distinctive highlight in the journey toward sustainable tourism development in the region. The Southern Vietnamese traditional houses were established during the exploration and settlement of the southern lands in the 17th century, when people from northern and central Vietnam migrated southward. These houses represent a refined combination of cultural, architectural, and spiritual elements, creating a unique architectural identity that is unmistakable. Constructed primarily from wood, bricks, stone, tiles, and other traditional materials, they are well-adapted to the tropical monsoon climate and the geographical conditions of the southern region.

Beyond their role as residences, these traditional houses are living evidence of the deep cultural values of Southern Vietnamese communities over centuries. They reflect a harmonious relationship between humans and nature while preserving family traditions, ancestral worship practices, and distinctive customs of the Southern people. These elements collectively create a unique cultural heritage, highlighting the confluence of diverse cultural influences such as Vietnamese, Chinese, Khmer, and other traditions passed down through generations. With the robust growth of the tourism industry, Southern Vietnamese traditional houses have become one of the most attractive destinations, drawing the interest of both domestic and international tourists. Sustainable tourism, which aims to develop tourism while preserving heritage values, represents a vital and necessary direction. However, harnessing the tourism potential of Southern Vietnamese traditional houses requires strategic planning and practical approaches to both protect and promote their cultural values while generating economic opportunities for local communities [3].

Sustainable tourism development is a strategic approach that ensures a balance between economic, cultural, and

environmental factors to conserve natural and cultural resources while promoting long-term development. In this context, the preservation of traditional Southern Vietnamese houses plays a significant role in maintaining the unique cultural values of the region. It also serves as an effective tool to stimulate economic growth and enhance community awareness about heritage values. For instance, in Phú Yên [7], the preservation of heritage sites such as Tháp Nhạn and the organization of traditional festivals have demonstrated the effectiveness of harmonizing economic development with the protection of cultural values. Similarly, the experience from the Tremiti Islands shows that sustainable management policies can reduce environmental impacts while preserving heritage values [4], creating favorable conditions for sustainable tourism models, such as those involving traditional Southern Vietnamese houses. These examples emphasize that sustainable tourism is not only a goal but also a comprehensive solution for long-term development.

Travel tourism revenue in the Southeast and Mekong Delta region in 2023 is estimated at VND 33,659.1 billion out of a total of VND 68,966.6 billion, accounting for 48.8%. According to data from the General Statistics Office in 2024, service activities account for 42.36% of the country's GDP with an average growth rate of 9.0%, equivalent to VND 6,391 trillion. The development of the tourism industry not only contributes to creating jobs for workers but also promotes other supporting economic sectors such as accommodation and catering increased by 12.9%, travel services increased by 16%, passenger transportation increased by 8.3%, and freight transportation increased by 14% compared to the previous year. In addition, the number of international visitors to Vietnam also increased by 39.5%, reaching 17,583 thousand people. Vietnam's tourism industry not only contributes to economic growth but also creates many opportunities for social and cultural development, making tourism an important and indispensable economic sector in the region's sustainable development strategy [11][12].

Sustainable tourism development linked to Southern Vietnamese traditional houses is not merely about preserving and enhancing architectural heritage. It is also a long-term strategy to raise community awareness, protect the environment, and create economic opportunities tied to local culture. This is the primary goal of this paper: to elucidate the role and value of Southern Vietnamese traditional houses in sustainable tourism development and to propose strategic directions for their preservation and promotion in a contemporary context. By integrating heritage conservation with tourism development, we can harness the distinctive cultural values of Southern Vietnamese traditional houses. Simultaneously, this approach contributes to building a robust, sustainable, and socially responsible tourism industry. Sustainable tourism development not only ensures the preservation of cultural values for future generations but also delivers long-term benefits for the local economy and communities.

## II. CULTURAL HERITAGE AND SUSTAINABLE TOURISM DEVELOPMENT

Modern perspectives on heritage management increasingly emphasize the intricate relationship between preservation and the sustainable utilization of heritage values. This approach seeks to create opportunities to leverage heritage potential, thereby generating resources to reinvest in conservation and restoration efforts. Such a cyclical process ensures the sustainable development of these cultural values for future generations.

As Gaetano M. Golinelli (2018) has asserted, cultural heritage and its intrinsic values are inseparable from the broader social and economic context. The integration of culture and tourism must be approached harmoniously, as it not only reflects the identity of local communities but also plays a pivotal role in driving economic development and safeguarding cultural values. Cultural tourism goes beyond merely attracting visitors; it serves as a means of preserving and promoting heritage values, thus creating revenues to support long-term conservation efforts [7].

The International Council on Monuments and Sites (ICOMOS), during its conference on "Contemporary Tourism and Humanism," defined cultural heritage tourism as a form of tourism aimed at exploring historical sites and structures. These sites are not only cultural resources but also invaluable heritage assets that require thoughtful and sustainable utilization. Heritage tourism encompasses diverse forms and demands a balanced integration of preservation and development. Tourism, in this context, becomes more than a tool to attract visitors—it constitutes a cultural activity, while heritage conservation emerges as a driver for sustainable economic and social development.

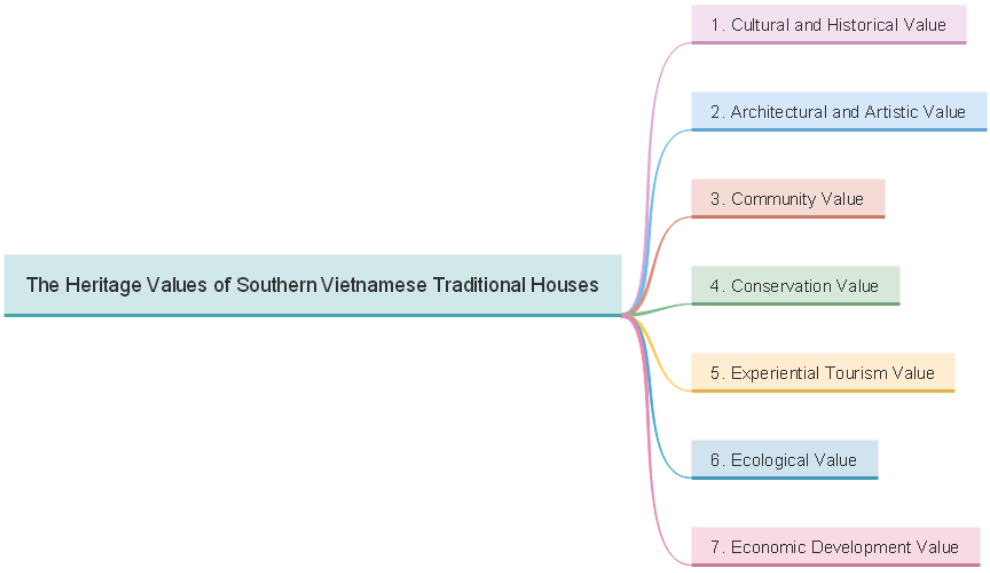
In the context of sustainable tourism development, Butowski (2019) identified and proposed key principles for sustainable tourism. The author emphasized that sustainable tourism must align with cultural heritage preservation,

environmental protection, and community development. Similarly, Huibin (2021) outlined four primary goals of sustainable tourism: conserving and maintaining the cultural identity of communities, promoting active participation of local populations, developing new markets, and establishing modern infrastructure with community involvement [10].

Sustainable tourism development linked to heritage preservation not only safeguards historical and cultural values but also contributes to economic growth, enhances community awareness, and supports the conservation and promotion of invaluable heritage. This comprehensive strategy harmonizes economic development with the preservation of cultural and historical values, addressing current needs while protecting cultural assets for future generations.

## III. THE HERITAGE VALUES OF SOUTHERN VIETNAMESE TRADITIONAL HOUSES

Southern Vietnamese traditional houses are one of the most distinctive cultural assets of the region, embodying profound values related to culture, history, architecture, and community. These houses are not merely unique architectural structures; they also serve as vibrant symbols of the life, traditions, beliefs, and significant historical milestones of the Southern Vietnamese people. To ensure the sustainable development of tourism associated with this heritage, it is essential to identify and promote these values within a harmonized framework. This approach aims to simultaneously preserve traditional elements while fostering local economic growth. By balancing conservation with sustainable development, the heritage of Southern Vietnamese traditional houses can serve as both a cultural cornerstone and an economic catalyst for the region.




**Figue 1: The values of the Southern ancient house heritage**

*Cultural and Historical Value*: The cultural and historical significance forms the core foundation of the heritage of Southern Vietnamese traditional houses. These structures are not merely architectural landmarks but also repositories of historical narratives, reflecting the trials, triumphs, and transformations of communities across generations. They represent invaluable heritage, offering visitors deeper insights into the formation and development of Southern Vietnam, from the migration of Vietnamese people to the South to pivotal historical events such as wars and cultural exchanges among ethnic communities. Southern Vietnamese traditional houses serve as living witnesses to the historical evolution of the region, encapsulating profound values related to social life, conflicts, and the coexistence of diverse ethnic groups. Preserving the cultural and historical values of these traditional houses not only helps sustain national identity but also establishes them as intellectually enriching tourism destinations. This, in turn, enhances community awareness of the importance of conserving and promoting these heritage assets for future generations.

Traditional Southern Vietnamese houses are not merely architectural structures but also cultural symbols reflecting the settlement history and way of life of the local people. From unique architectural elements to traditional customs, these houses embody distinct cultural values and play a crucial role in educating younger generations about local identity and fostering community cohesion. This heritage is not only a place of residence but also a bridge connecting the past and present, contributing to the promotion of cultural tourism [2]. According to research in Hồ Chí Minh City [5], when utilized effectively, cultural heritage can attract 50% to 80% of international tourists, generating substantial

economic benefits. Similarly, in Phú Yên [7], heritage assets such as fishing village architecture and traditional festivals highlight values akin to those of Southern Vietnamese houses, showcasing the role of cultural heritage in enhancing tourism appeal. This underscores that, with proper preservation and development, traditional Southern Vietnamese houses can become valuable tourism resources, contributing to economic growth and the preservation of regional cultural identity.

*Architectural and Artistic Value:* The architectural and artistic significance of Southern Vietnamese traditional houses is a particularly prominent and distinctive feature. These structures exhibit a harmonious blend of Eastern and Western architectural styles across historical periods, reflecting the interplay between indigenous culture and influences from Chinese, Khmer, and French colonial architecture. The design of these traditional houses, characterized by tiled roofs, wooden pillars, garden spaces, and intricate decorative details such as dragon and phoenix motifs, as well as the "four sacred animals" (*tứ linh*) and "four noble plants" (*tứ quý*), highlights the remarkable craftsmanship of artisans from past generations. These houses transcend their function as mere residences to serve as works of art, offering exceptional aesthetic value. Tourism development can leverage the architectural allure of these heritage sites to attract visitors interested in exploring classical architectural styles and traditional construction techniques. This approach not only enhances cultural appreciation but also contributes to the preservation and promotion of the artistic values embodied in Southern Vietnamese traditional houses. The development of tourism must address the challenge of preserving traditional architecture and materials while implementing necessary renovations to accommodate visitor demands. This process ensures the provision of appropriate amenities for tourists while maintaining the integrity and cultural value of the heritage site.

*Community Value:* Community value is an indispensable factor in the sustainable development of tourism associated with the heritage of Southern Vietnamese traditional houses. These houses are deeply intertwined with the daily lives of local residents, encompassing traditional practices, occupations, and community relationships. The active participation of local communities is a prerequisite for sustainable tourism development. Communities not only act as guardians of heritage but can also directly benefit from tourism activities. Experiential tourism programs, where visitors engage in activities such as gardening, preparing traditional dishes, or participating in local festivals, allow tourists to gain deeper insights into the lives of local people and the unique cultural values of the region. By fostering meaningful interactions between visitors and local residents, these programs not only protect the heritage of traditional houses but also generate tangible benefits for local communities. This dual approach ensures that both heritage preservation and community well-being are integral to the sustainable development of cultural tourism.

*Conservation Value*: Heritage conservation is a fundamental value and an indispensable requirement in any sustainable tourism development project. The preservation of Southern Vietnamese traditional houses must ensure their integrity, not only through restoration and rehabilitation efforts but also by fostering educational initiatives and raising community awareness about the importance of safeguarding historical and cultural values. Conservation extends beyond the physical repair of traditional houses to include the protection of the natural environment and ecosystems surrounding these heritage sites. Sustainable tourism can attract attention to these historical structures, but it must also mitigate negative impacts such as overtourism, which can diminish the heritage's value or contribute to environmental degradation. By adopting a holistic approach to conservation, which integrates ecological preservation, community involvement, and responsible tourism practices, the long-term sustainability of Southern Vietnamese traditional houses can be secured while enhancing their cultural significance for future generations.

The preservation of traditional Southern Vietnamese houses faces significant challenges, ranging from physical degradation of structures to a lack of investment resources for maintenance and restoration. Additionally, the pressure from mass tourism, characterized by high visitor volumes, has placed a heavy burden on these heritage sites, increasing the risk of commercialization and the loss of cultural authenticity. Furthermore, a lack of consensus and coordination among stakeholders, including authorities, local communities, and businesses, has undermined management and conservation efforts. According to studies in Cần Thơ [6], the management of historical and cultural sites faces major difficulties due to limitations in investment and planning. Similarly, experiences from the Tremiti Islands [4] indicate that high tourist densities and negative impacts on natural environments are common challenges, requiring more effective planning measures. These issues highlight the urgent need to implement sustainable conservation solutions to

ensure the protection and optimal utilization of traditional Southern Vietnamese houses.

*Experiential Tourism Value:* Experiential tourism has become increasingly important in attracting modern travelers, who seek not only to visit destinations but also to immerse themselves in local cultures. The heritage of Southern Vietnamese traditional houses offers an exceptional opportunity for visitors to experience the daily life of local communities. Tourists can learn to prepare traditional dishes, participate in agricultural or artisanal activities, and explore distinctive regional customs and traditions. This model of experiential tourism enhances the connection between visitors and local communities, fostering mutual understanding and appreciation. Moreover, it provides long-term and sustainable benefits for both parties. As an ideal tourism model, it not only preserves and promotes the values of cultural heritage but also generates income for local communities, motivating them to protect and maintain their heritage. By integrating cultural immersion with economic incentives, experiential tourism ensures that Southern Vietnamese traditional houses remain vibrant and sustainable assets for both tourism and heritage conservation.

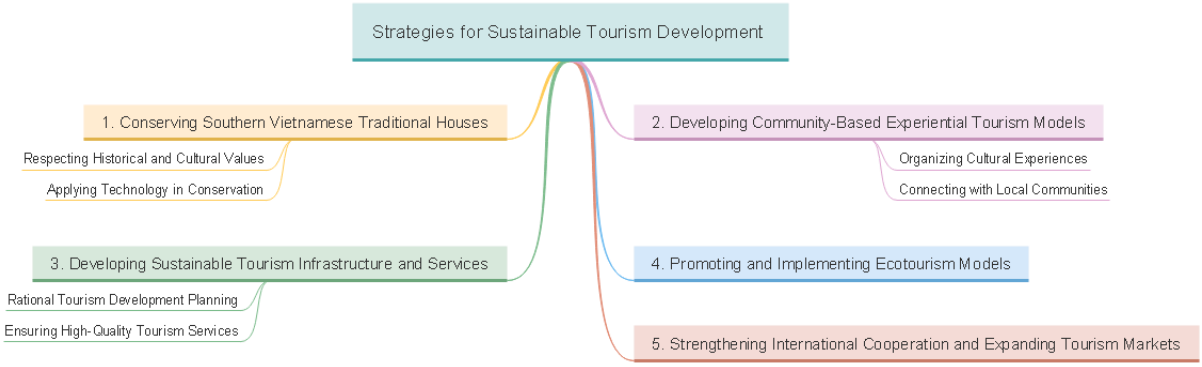
*Ecological Value:* Ecology serves as a critical support for the cultural and community values of Southern Vietnamese traditional houses. Many of these heritage sites are closely connected to natural landscapes, such as fruit orchards, ponds, or medicinal plant gardens. Sustainable tourism must prioritize the protection and maintenance of these natural ecological elements, ensuring habitats for flora and fauna while safeguarding the integrity of the local ecosystems. Preserving the ecosystems surrounding these heritage sites not only maintains their natural beauty but also enhances the visitor experience. Tourists can engage in environmentally focused activities such as tree planting, wildlife conservation, and other ecological initiatives. These activities not only enrich the tourist experience but also contribute to environmental awareness and the sustainable development of both the heritage sites and their surrounding environments. The surge in tourist numbers can cause structural damage to the foundations, brick walls, tiled roofs, and natural surroundings of heritage houses. Environmental pollution from tourism-related waste, noise, and artificial lighting may disrupt the authentic living space. Therefore, strict regulations on visitor capacity, regular maintenance, and conservation measures are essential to mitigate negative impacts on heritage sites. Organizing diverse eco-tourism experiences enables tourists to immerse themselves in local life while minimizing potential threats to the regional ecological environment.

*Economic Development Value:* Economic value, though presented last in this discussion, is no less significant. Tourism development associated with Southern Vietnamese traditional houses has the potential to generate stable income streams for local communities and regional governments. However, such tourism must be developed responsibly to ensure that it does not compromise the cultural and historical integrity of the heritage. A sustainable tourism model allows local communities to benefit economically from tourism while preserving natural resources and cultural heritage for future generations. Additionally, tourism development can improve the quality of life for local residents by creating employment opportunities, fostering the growth of ancillary industries, and facilitating the construction of essential community infrastructure. By balancing economic benefits with cultural preservation, sustainable tourism can serve as a catalyst for local development while safeguarding the enduring value of Southern Vietnamese traditional houses. The values outlined serve as the foundational framework for the sustainable tourism development strategies proposed in the following section. These values emphasize the significance of Southern Vietnamese traditional houses as a multifaceted cultural asset, requiring a holistic approach that integrates conservation with economic and community development. Based on these principles, specific action strategies are proposed to promote sustainable tourism associated with them.

A sustainable tourism model will enable local communities to generate increased revenue from tourism while preserving natural resources and cultural heritage for future generations. However, tourism must be developed responsibly and managed effectively at all levels, from governance to individual community members, to minimize disruptions to traditional lifestyles and prevent excessive commercialization. Unregulated tourism development may lead to residents abandoning heritage houses due to rising property prices or changes in their living environment, ultimately eroding the vibrant cultural landscape as local inhabitants relocate. Additionally, cultural activities may become distorted to cater to tourists, compromising their authenticity and diminishing their intrinsic historical and social value.

## IV. STRATEGIES FOR SUSTAINABLE TOURISM DEVELOPMENT LINKED TO THE CONSERVATION AND PROMOTION OF SOUTHERN VIETNAMESE TRADITIONAL HOUSES

The heritage of Southern Vietnamese traditional houses, with its unique architectural beauty and profound cultural significance, plays a crucial role in the sustainable tourism development of the region. However, a clear and comprehensive strategy for sustainable tourism is essential. Such a strategy must tightly integrate the conservation and promotion of these heritage sites, creating long-term economic and social benefits for local communities.




**Figue 2: Strategies for Sustainable Tourism Development Linked to the Conservation and Promotion of Southern Vietnamese Traditional Houses**

### 4.1 Conserving Southern Vietnamese Traditional Houses

Southern Vietnamese traditional houses are not merely architectural landmarks but also historical witnesses to the culture and lives of generations in the region. Thus, their conservation is fundamental and indispensable in any sustainable tourism development strategy.

*Respecting Historical and Cultural Values:* The conservation of traditional houses should begin with the recognition and respect of their historical and cultural values. Effective conservation requires scientific measures, from assessing the structural quality of these houses to applying traditional restoration techniques. Heritage sites must be safeguarded from the adverse impacts of overtourism, such as damage to architectural details or the erosion of their integrity. Raising awareness among local communities and visitors about the importance of heritage conservation is critical to preserving these values for future generations.

*Applying Technology in Conservation*: Modern technology can play a pivotal role in the conservation and promotion of Southern Vietnamese traditional houses. Virtual reality (VR) and augmented reality (AR) technologies can recreate the spaces and histories of these houses, offering visitors immersive experiences without compromising the physical structures. Digital platforms, such as websites and mobile applications, can provide information about the heritage and promote tourism effectively before visitors arrive.

The application of Virtual Reality (VR) can digitally reconstruct the architectural space of traditional heritage houses through three-dimensional (3D) modeling, allowing visitors to explore these structures remotely without compromising their physical integrity. The development of VR-based virtual museums or immersive virtual heritage tours expands accessibility, particularly for individuals who lack the opportunity to visit these sites in person. Furthermore, VR can be utilized to restore the original state of deteriorated architectural structures or simulate historical transformations of heritage houses over time, thereby enhancing their educational value. Meanwhile, Augmented Reality (AR) can be integrated into mobile applications to provide interactive and real-time information at heritage sites. Tourists can use their personal devices to scan QR codes or activate AR content, enabling them to view historical imagery, architectural details, or even simulations of traditional daily life activities within heritage houses. This technology not only enhances visitor engagement and interaction but also assists tour guides in delivering information in a more immersive and compelling manner. Additionally, AR holds significant potential for organizing cultural events, interactive art exhibitions, and historical reenactments, as well as supporting educational programs on architecture and history. Beyond enhancing the tourism experience, AR and VR also play a crucial role in the preservation and management of heritage assets. The development of a digital heritage database for traditional Southern Vietnamese houses not only facilitates systematic documentation and archival storage but also supports experts in

analyzing, restoring, and safeguarding these structures from the risks of deterioration due to environmental factors and the passage of time.

To preserve and sustainably develop traditional Southern Vietnamese houses, the application of modern technology and the establishment of experiential tourism models involving local communities are critical solutions. AR/VR technology allows for the detailed recreation of the architecture and life associated with these houses, providing authentic and immersive experiences for visitors [1]. This not only enhances the value of the heritage but also expands opportunities to promote local culture beyond the region. According to research on Vietnam's tourism development, the use of AR/VR has proven effective in enhancing visitor experiences and spreading heritage values to diverse audiences. Additionally, building experiential tourism models where local communities play a central role will encourage active participation in conservation and development. Research in Phú Quốc [8] suggests that developing unique tourism products tied to culture and the local environment not only attracts tourists but also protects cultural values. These solutions not only safeguard and promote the heritage of traditional Southern Vietnamese houses but also ensure sustainable tourism development, balancing economic and cultural benefits.

**4.2 Developing Community-Based Experiential Tourism Models**

Experiential tourism has become an increasingly popular trend in modern tourism, particularly as travelers seek not only to visit destinations but also to immerse themselves in the cultural and traditional life of local communities. For the heritage of Southern Vietnamese traditional houses, the development of experiential tourism represents an effective approach to both preserving and promoting heritage values while simultaneously generating sustainable economic benefits for local communities.

*Organizing Cultural Experiences*: Southern Vietnamese traditional houses can serve as venues for cultural activities that allow visitors to explore the lives of local people through generations. Tourists can participate in traditional agricultural practices, gardening, or artisanal activities such as weaving, pottery-making, or basketry. Culinary experiences can also be organized, where visitors learn to prepare traditional Southern Vietnamese dishes such as *bánh xèo*, *canh chua*, or festive dishes associated with traditional celebrations. These activities not only enrich the tourist experience but also enhance the cultural appreciation of the region.

*Connecting with Local Communities*: When local communities understand the significance of their heritage and are involved in decisions regarding its utilization, they become active participants in preserving and safeguarding cultural values. Training programs on tourism management, heritage conservation, and economic development through tourism should be conducted to enhance local capacities. Such initiatives help foster community awareness of the importance of protecting heritage while simultaneously empowering them to benefit from tourism. A community-centered approach ensures that sustainable tourism development supports cultural preservation and provides long-term economic opportunities.

Local communities play a central role in resource management and the preservation of traditional cultural values, especially in the context of sustainable tourism development. Their participation not only ensures authenticity and vitality for tourism activities but also raises awareness of heritage conservation. A fair benefit-sharing mechanism from tourism activities will help improve the livelihoods of local residents while fostering their commitment and responsibility to protect cultural values. Research in Hồ Chí Minh City [1] highlights the importance of communities in sustainably preserving and utilizing cultural heritage, yielding long-term benefits for both economic and social development. Similarly, experiences in Saudi Arabia [2] show that the active involvement of local communities not only aids in protecting heritage values but also drives economic development by creating jobs and improving incomes. With effective support and coordination, local communities can become the driving force for the sustainable preservation and development of cultural values [9], such as traditional Southern Vietnamese houses.

**4.3 Developing Sustainable Tourism Infrastructure and Services**

The sustainable development of tourism associated with the conservation and promotion of Southern Vietnamese traditional houses requires thoughtful investment and development of tourism infrastructure and services. These efforts must ensure that heritage elements remain intact while supporting visitor engagement and local economic growth.

*Rational Tourism Development Planning*: Tourism development planning around heritage sites must follow a

scientific approach to avoid disrupting the structural integrity of traditional houses or adversely affecting the surrounding environment. Infrastructure projects such as roads, parking areas, and visitor facilities should be designed harmoniously to blend with the heritage landscape, preserving the historical ambiance of the area. Overdevelopment of modern structures must be avoided to maintain the authenticity and charm of these cultural sites.

*Ensuring High-Quality Tourism Services*: Tourism services related to traditional houses must meet high standards, ranging from visitor engagement to the organization of activities. Tour guides should receive professional training in the history, culture, and architecture of the heritage to provide accurate and compelling information to visitors. Accommodation, dining, and other visitor services should retain traditional characteristics while offering the comfort and convenience expected by modern tourists.

### 4.4 Promoting and Implementing Ecotourism Models

The development of ecotourism is a strategic approach to preserving the natural environment surrounding Southern Vietnamese traditional houses. The areas around these heritage sites can be planned as green spaces, allowing visitors to engage in activities such as forest walks, exploring fruit gardens, or participating in wildlife conservation projects. Visitors can also contribute to ecological sustainability through activities like tree planting, environmental cleanup efforts, and learning about local ecosystems. These initiatives not only enhance the visitor experience but also promote environmental stewardship and sustainable practices.

### 4.5 Strengthening International Cooperation and Expanding Tourism Markets

Finally, fostering international cooperation and expanding tourism markets are critical components of sustainable tourism development for Southern Vietnamese traditional houses. Partnerships with international organizations, heritage conservation experts, and tourism development specialists can provide valuable knowledge and expertise to help local managers and communities craft effective tourism strategies. Collaborative efforts can facilitate knowledge exchange, resource sharing, and access to global markets, thereby promoting the heritage of Southern Vietnamese traditional houses to a wider audience while supporting sustainable growth in the region.

The development of tourism linked to the heritage of traditional Southern Vietnamese houses should focus on building cultural tourism routes that connect these heritage sites with other tourism types to create diversity and appeal for visitors. These routes not only highlight the unique cultural values of traditional houses but also effectively utilize other cultural and natural resources in the region. Additionally, enhancing promotional activities, particularly emphasizing the distinctiveness and historical significance of the heritage, will help attract more international visitors. Experiences from Cần Thơ demonstrate that constructing tourism routes connecting historical and cultural sites has significantly increased the value of destinations [6]. Similarly, in the Tremiti Islands, the strategy of developing sustainable tourism routes based on the conservation of heritage values and natural environments has proven successful in balancing preservation and development [4]. These directions, if applied to the heritage of traditional Southern Vietnamese houses, will not only promote cultural tourism but also contribute to the sustainable preservation of the region's unique heritage values.

## V. CONCLUSION

Southern Vietnamese traditional houses are not only historical architectural structures but also vital cultural assets that reflect the identity, spiritual beliefs, and way of life of the Southern Vietnamese people. Their preservation and promotion in the context of sustainable tourism development must go beyond mere economic exploitation and be closely aligned with the conservation of cultural, historical, and community values. The integration of heritage conservation with tourism fosters economic growth, improves local livelihoods, and enhances public awareness of the significance of preserving cultural heritage. Furthermore, the implementation of experiential and ecological tourism models strengthens the connection between visitors and local communities while minimizing negative environmental impacts. From a practical perspective, sustainable tourism development linked to Southern Vietnamese traditional houses offers numerous tangible benefits. Economically, it provides stable income streams for local communities, attracts investments in green tourism infrastructure, and stimulates the growth of related sectors such as hospitality, handicrafts, and cultural enterprises. Socially, it helps to preserve traditional crafts, culinary heritage, and local customs by actively involving residents in tourism activities. Environmentally, the adoption of circular economy principles and

low-impact tourism strategies reduces waste, minimizes energy consumption, and safeguards the natural landscape surrounding heritage sites.

However, the successful implementation of these strategies requires strong institutional support and well-defined policy frameworks. Government agencies must establish dedicated heritage conservation funds and introduce tax incentives for businesses that integrate digital technology (such as AR/VR) into heritage tourism. Public-private partnerships should be encouraged to foster collaboration between technology firms, tourism startups, academic institutions, and conservation organizations. Additionally, pilot projects should be launched to test the feasibility of smart heritage management solutions, incorporating real-time visitor monitoring, AI-driven data analysis, and blockchain-based financial transparency in heritage conservation funding. Furthermore, digital transformation in heritage tourism management should be prioritized. The use of AI and Big Data to analyze visitor trends and predict tourism demand can help mitigate over-tourism and ensure the sustainable use of heritage assets. The integration of Blockchain technology can enhance financial accountability in conservation projects, allowing transparent tracking of funds allocated for restoration and maintenance efforts. Additionally, the creation of immersive virtual heritage platforms using AR/VR can expand access to heritage tourism for global audiences while reducing the environmental footprint associated with mass tourism.

Ultimately, the sustainable development of tourism centered on Southern Vietnamese traditional houses must be viewed as a multi-dimensional approach that balances conservation, community engagement, and economic viability. By implementing effective policies, fostering innovation through technology, and promoting responsible tourism practices, these heritage assets can serve as catalysts for long-term cultural sustainability and economic resilience. Through a well-coordinated strategy that bridges tradition and modernity, Southern Vietnamese traditional houses can continue to thrive as symbols of national identity while driving sustainable tourism growth in the contemporary era.

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# DIFFERENTIAL ANALYSIS FRAMEWORK PROPOSAL OF INDIVIDUALS TELLING THE TRUTH AND LYING IN THEIR MOTHER TONGUE AND IN A FOREIGN LANGUAGE

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**ABSTRACT**

In an endeavor to deepen insights on misinformation detection, this study presents a framework for multilingual cognitive states analysis. Ultimately, we would want to create a machine learning system that would have the potential to improve current deception detection technologies.

We will analyze time reaction, verbal and facial cues of individuals telling the truth and lying both in their native language and in a foreign language. It is believed that the « cognitive load » when speaking a foreign language is heavier than in a native tongue. Cognitive load is a construct rooted in the understanding that human working memory (WM) has limited processing capacity, which plays a pivotal role in tasks requiring memory storage, information processing, and attention. (Baddeley & Hitch 1974). Speaking a foreign language requires retrieving words directly from one's memory or adding an extra translation step while at the same time tailoring the content of the message. We will distinguish pre-verbal preparation of the content of a message and then verbalization. The analysis involved a "within-subjects" studies of four individuals in their native language, Vietnamese, and in a foreign language, English.

*Key words*: "misinformation", "deception detection", "verbal cues", "nonverbal cues", "automated methods"

## I. INTRODUCTION

### 1.1 Background of the study

Lying is a technique enabled by speech (Bloch, 2008) that entails, according to the predominant view in the philosophical literature, a believed-false proposition (Zuckerman et al., 1981; Reins, 2021). The mechanism is that a speaker A asserts to a listener B that proposition *p* is true, knowing that p is false (Feehan and Chisholm 1977, Stokke, 2018; Viebahn, 2019). Studying how people tell lies is called « deception detection ». It refers to the investigative methods used to assess a person's sincerity and trustworthiness taking into account behavioral and physiological indicators as well as wider contextual and situational data (Ekman, 2021). However, since the creation of the first polygraph in 1921, deception have failed to identify successful methods of lie detection (Synnott, Dietzel & Ioannou, 2015). And, in 2007, it was still premature to assume that lie detection wizards did exist (Bond Jr and Uysal, 2007). Researchers in the field consider humans to be very bad at lie detecting. We are barely able to pick up lies on the basis of nonverbal cues (Brennen & Magnusen, 2023). In fact, humans are much better liars than they are at detecting lies, despite a hundred years research on the topic (Denault et al., 2022).

One reason is that there is not one typical pattern of deceptive behaviour and that nonverbal and verbal cues to deception are ordinarily faint and unreliable (Vrij, 2000). This makes lie detection a difficult task, as there is no nonverbal or verbal cue that lie detectors can truly rely upon (Vrij, 2011). More recent studies have involved the use of functional Magnetic Resonance Imaging technologies (fMRI). A brain region in the prefrontal cortex has been found to indicate that someone may be lying when there is an elevated blood level in that area. However, even if emotion, mentalizing, and risk-taking during deception elevates blood level in an area cannot logically infer that someone is lying and we can't conclude that deception is taking place (Sip, McGregor, Roepstorff & Frith, 2008). Mere observation of brain activity is not enough to make revert inferences. Differences in response to lies and truth that become evident when calculating the average results of a group do not necessarily show up in each individual. Similar to knowing the average height of children of eight years old can't prove that a child who is exactly that height is eight years old. Making reverse inferences from physiology to mental states may be erroneous as it could simply indicate that this person is thinking about lying. In the cognitive process of thinking of a lie, deciding whether to lie or not involves the

same brain region. Someone may decide to invent and tell a lie but revert to just telling the truth. The is why the use of fMRI cannot be an ultimate indicator of deception. Ultimately, the best general advice from the psychological literature on verbal lie detection remains simply that a person is lying if we can identify that what they say is inconsistent either with other things that they have said or with other evidence (Brennen & Magnussen, 2022). Besides, even if a brain region for lies has been identified, no clear brain region is associated with truth telling. So, the use of fMRI still cannot prove or disprove that someone is lying (Vrij, 2011). Ultimately, what this shows is that deception detection studies on large groups of people to gather large amounts of data in order to each group averages have not been conclusive but on the other hand, "within-subjects" studies may seem to be the way (Vrij, 2016). There is a consensus that there exists no unique lie response, and therefore evaluating whether a response is truthful or not always requires its comparison to an appropriate "baseline" (Meijer et al., 2016). In this experiment, the baseline would be telling the truth in Vietnamese.

It is pointed out that the best indicator for deception is that a liar has more difficulties giving details than someone who is telling the truth. Detecting deception still evolves mostly on identifying inconsistencies and contradictions. To differentiate truth tellers from liars, interviewees are encouraged to provide more information. The richer an account is perceived to be in detail, the more likely it is to be believed (Bell & Loftus, 1989; Johnson, 2006; Johnson, Foley, Suengas, & Raye, 1988).

### 1.2 Research Questions and objectives

We will assess the differences in verbal and non-verbal cues when telling the truth and lying. Here's the cross-table that offers the basis of our study.

| | Native Language | Foreign Language |
|---|---|---|
| Telling the truth | Telling the truth in a native language | Telling the truth in a foreign language |
| Telling a lie | Telling a lie in a native language | Telling a lie in a foreign language |

**Fig. 1 The four "psycho-linguistic" categories of analysis**

However, one important aspect of deception, namely « guilt knowledge », is not included as part of the procedure of the experiment because the participants were specifically asked to lie. In deception, the intention to deceive is crucial. (Sip, McGregor, Roepstorff & Frith, 2008). A specific test, the Guilty Knowledge Test (GKT), a psychophysiological questioning technique which purports to assess whether suspects conceal « guilty knowledge », will thus not be used in this study. In this present study, the intention does not come from the liar, because if someone is *instructed to lie*, they know that they are not deceiving anyone. Besides, as "within-subjects" studies are found to be more fruitful, we have decided to do an in-depth within-subjects study of only four willing participants, but who have decided to remain anonymous. A total of 6 respondents have up to now participated, but only 4 out of the 6 responded seriously enough in order to gather valid data.

#### Response Times (RT)

The cognitive approach to deception holds that lying is cognitively more challenging than truth telling. (Suchotzki, Verschuere, Bockstaele& Crombez, 2017). We believe that it takes more time for someone to think of a lie and to create a lie than to tell the truth.

#### Cognitive Load

Not only creating a lie in one's mother tongue may take more time than telling the truth, but also, in a foreign language, there is an extra cognitive load (Adler, 2024), so we believe response times to increase when lying in a foreign language.

## II. MATERIAL AND METHODOLOGY

The research is based on video-taped interviews in which participants answer a questionnaire of ten questions. Each question is repeated four times to have a comparable base of study. Respondents will reply by telling the truth then by telling lies in their native language, and in the foreign language. All questions are personal and are « easy » questions that are not aimed at making the respondents feel challenged and more comfortable. American Security investigators are instructed to observe the interviewees' normal mode of behaviour (baseline behaviour) when asking non - threatening background questions (Frank, Yarbrough, & Ekman, 2006)

**Questionnaire**

| | Question | Nature of the information | Nature of the lie |
|---|---|---|---|
| 1 | What's your name ? | « Identity truth » | Everything except my name |
| 2 | How old are you ? | « Identity truth » | Everything except my age |
| 3 | Where do you come from ? Where were you born ? | « Identity truth » | Everything except the place I was born |
| 4 | How many brothers and sisters do you have ? | « Identity truth » | Everything except the exact number of brothers and sisters the respondant has |
| 5 | What do you like doing in your free time ? | Interest truth – hobbies and interests may evolve over time, this is a « more complex truth » | |
| 6 | What did you do yesterday ? | The protagonist/informant needs to dig a bit in their short-term memory. | The protagonist/informant needs to dig a bit in their short-term memory but also to create a lie different from what the respondant can recall from their short-term memory |
| 7 | What is it ? (show a pen or any tangible object) | The identification of the nature of an object | |
| 8 | Can you swim ? | Yes/No question about personal skills | |
| 9 | Can you fly ? | Yes/No question about personal skills | |
| 10a | So, what can you do then ? So what else can you do ? | Open question about personal skills | |
| 10b | What are you going to do tomorrow ? | Telling the truth about an intention, a specific kind of lie | Lying about an intention or « future lie » may be corrected or confirmed when the intention is executed or not |

**Fig. 2 The ten questions of the questionnaire**

We suggest a categorization of these different kinds of deceptive information. Questions 1-4 and 7 involve an « everything except » kind of lie. Question 5 depends on a « volatile truth ». Consequently, it would imply a « volatile lie ». Question 6 could be considered as a memory lie for which the truth could be fragile. Questions 8 and 9 revolve around « yes/no truths » and consequently « yes/no lies ». Considering Ekman's terminology of lies (1991), the lies we are studying here correspond all to his broad category of « fabrications ». We may suggest that fabricated lies go through a 3-phase cognitive paradigm namely 1) identification of the actual truth, 2) inhibition of that truth, 3) fabrication of the lie.

While our questionnaire and the setting of the experiment does not imply the intention to deceive, it might still be more "natural" than using a "misstatement statement paradigm" (Zhang, 2020) where participants were instructed by the screen to make a correct or a false statement about an animal and its color presented in the material.

## III. RESULTS AND DISCUSSION

### 3.1 Verbal cues

The table below presents the verbal responses of participant 4. We will not give names to keep the participants anonymous.

| | **Tiếng Việt Sư Thật – truth** | **TV nói dối** | **English truth** | **English lie** | |
|---|---|---|---|---|---|
| 1 | Tên em là Tuyệt. | Em tên Hân. | My name is Kim Tuyen. | My name is Nhu. | Different lie |
| 2 | Em 18 tuổi. | Em 21 tuổi. | I'm 18 years old. | I'm 21 years old. | Same lie |
| 3 | Em sinh ra o Long An | Em sinh ra ơ Binh Chanh. | In Long An | I'm born in HCMC. | Different lie |
| 4 | Có, 1 chị | Em không có anh chị em. | I have only 1 sister | I don't have any sister. | Same lie |

| | | | | | |
|---|---|---|---|---|---|
| 5 | Em đi ngũ. | Em thích đọc sách. | I just sleep. | I do homework and I read book. | 50% same lie |
| 6 | Em chỉ là ngũ và học bài. | Ah, hôm qua em đa giúp mẹ làm từ thiện. | I do a lot of homework and sleep. | I just don't do nothing. | Different lie |
| 7 | Cài bút dỏ. | Cài này là một cài bút màu xanh. | This is a red pen. | Uh, I think this is a blue pen. | Same « identity adjective lie » |
| 8 | Em biệt bơi một chút. | Em không biệt bơi. | Yes, I swim a little. | No, I don't know. | Same lie |
| 9 | Không, em không biệt bay. | Em biệt bay. | No, I don't. I can't fly. | Yes, I fly like an airplane. | Same but Exagerated lie |
| 10 | Em chỉ biệt bơi một chút, và chơi cầu lông. | Em không biệt làm gà nựa. | I can do some badminton and some sport. | I can not do nothing. | Same lie |

**Fig. 3 The verbal responses of participant 4**

An interesting verbal output of this experiment comes with the choice of the lie. As the respondant was asked to repeat lying at the same question, and also knowing that the choice of the lie was open, it was interesting to find out that for 7 out of 10 times, the lie was repeated. Out of the four participants of the study, one participant created new lies each time (10 times out of 10), but the three others mostly kept the same lies. The explanation may simply rely on the fact that it's easier to repeat the same lie rather that coming up with a new fabricated lie. In this exercise, we may identify a glimpse of what could be done in a subsequent experiment to study the « journey of lies » and Interpersonal Deception theory because the present exercise does not involve a conversation but a setlist of questions.

### 3.2 Response Times

The original hypothesis about Response Times (RT) was that telling the truth was easier than lying, and that lying in a foreign language would be the hardest. So, we were expecting that Time Responses would gradually increase from questionnaire A (telling the truth in Vietnamese) to questionnaire D (Lying in English).

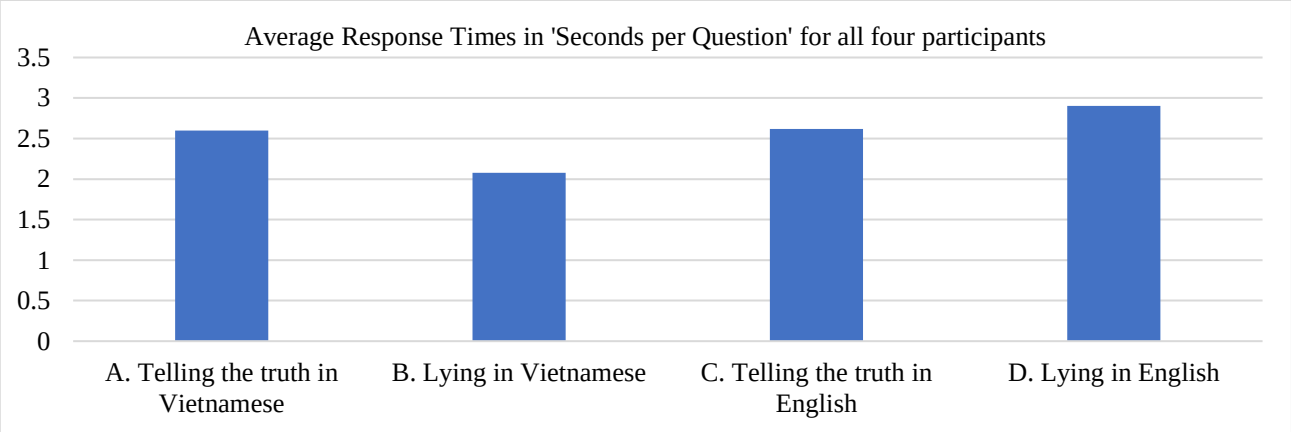



**Fig. 4 The average response times in seconds per question for each of the four questionnaires**

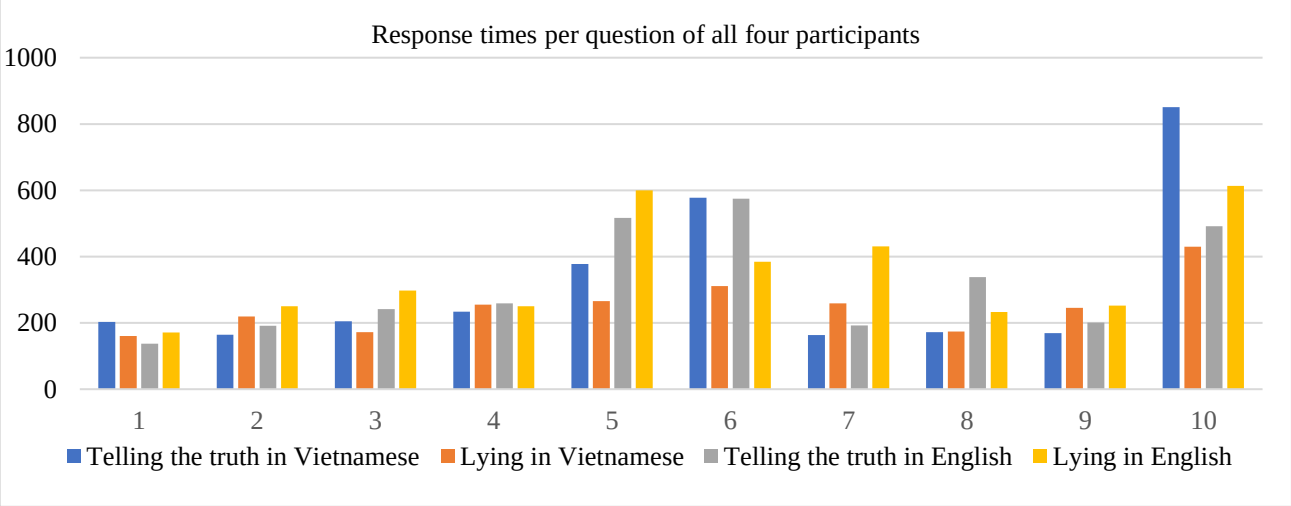



**Fig. 5 Response times per question for each of the four questionnaires**

The graph in figure 4 contradicts our first prediction. The average response time of telling the truth in Vietnamese

was longer than telling the truth. This result corroborates the fact that truth-tellers give more details (Bell & Loftus, 1989; Johnson, 2006; Johnson, Foley, Suengas, & Raye, 1988) which consequently takes more time to do than answering without giving details. In fact, the previous experiments that found out that lying implied longer response times related to what we may refer to as "mechanical truths/lies". One experiment (Sheridan, 2010) involved replying by lying or by telling the truth about whether a number was larger or smaller than another one. Mechanically, it took longer to identify the truth, and then to reply by the opposite because it involved an extra cognitive step. In our present experiment, the questions were personal and the respondants made more effort in trying to be more precise when telling the truth, whereas when they were told to lie, they merely fabricated a lie different from the truth.

More remarkarble findings are identified when comparing response times for each questions. For example, the respondents had to remember what they did the day before (question 6), or what they truly intended to do the next day (question 10). The search for the truth took much longer than the make-up of a « random lie », a lie that bears no consequences which may be a shortcoming of the experiment, which is that the participant could make up any lie which, instead of a « real lie » could only be considered as a "non-truth". We may also consider the emotional resonance when someone speaks their first language (Caldwell-Harris, Ayçiçeği-Dinn, 2009) which in contrast, implies an emotional distance when speaking a foreign language. From this perspective, the participants could have feel more "emotionally detached" when lying in a foreign language. Consequenlty, lying may become easier in a foreign language. This has been confirmed in experiments (Suchotzki, Gamer, 2018) that revealed smaller response time differences between lying and truth telling in the foreign language compared to response time differences in lying and truth telling in a native language. An experiment that involved Turkish university students who had learned English as a foreign language found reduced skin conductance responses (SCRs) when listening to emotional phrases in English compared to Turkish, their native language (Caldwell-Harris, Ayçiçeği-Dinn, 2009). Interviews, surveys, and studies of autobiographical memory indicate that bilingual speakers experience reduced emotion when speaking their second language (Altarriba and Santiago-Rivera, 1994, Bond and Lai, 1986, Dewaele, 2004, Dewaele, 2008, Gonzalez-Reigosa, 1976, Marian and Kaushanskaya, 2004, Pavlenko, 1998, Pavlenko, 2002, Pavlenko, 2005, Schrauf, 2000, Schrauf and Rubin, 1998).

Figures 4 and 5 present the combined statistics of all four participants, but as pointed by (Vrij, 2016), lying is idiosyncratic. This means that deception detection can only be validated by within-subject studies. In fact, we see strong variations of time differences between participants.

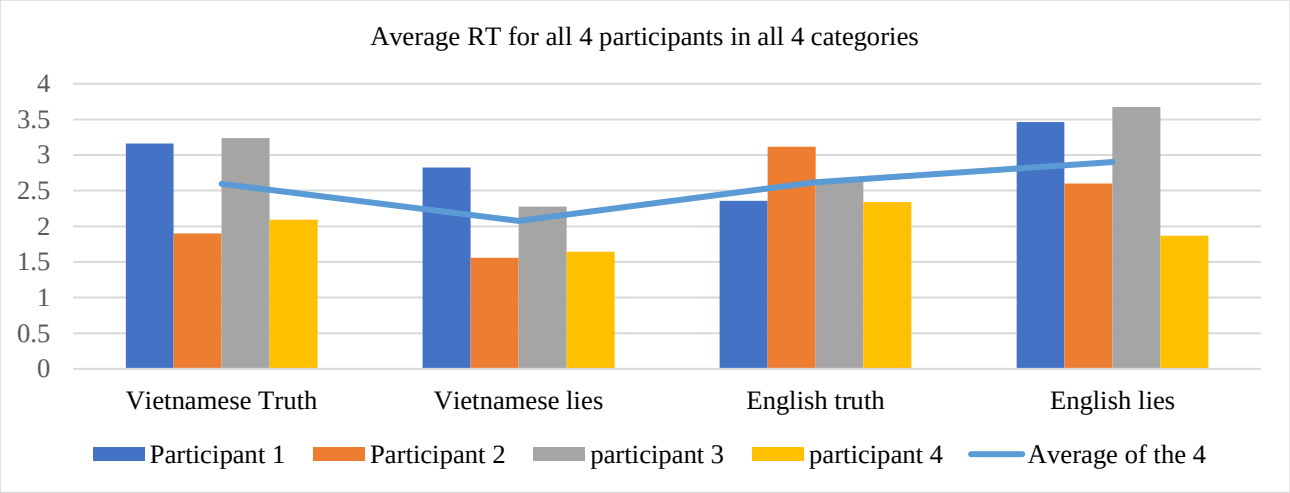



**Fig. 6: Average response times in 'seconds per question' of each participants for each of the 4 questionnaires**

Figure 6 presents the average reponse time per question for all questions per participant and per questionnaire. Participants 1 and 3 were the slowest at replying in Vietnamese, and in lying in English. Participant 2 differs from participant 3 mainly for being slower at telling the truth in Enligsh. We may wonder what the reason could be. One pattern emerges for participant 4 which is that this participant was the fastest at replying for each of the different questionnaire. This is one idiosyncratic, or "within-subject" element that we will want to identify, which is the average RT in general, for all questionnaires, and all languages.

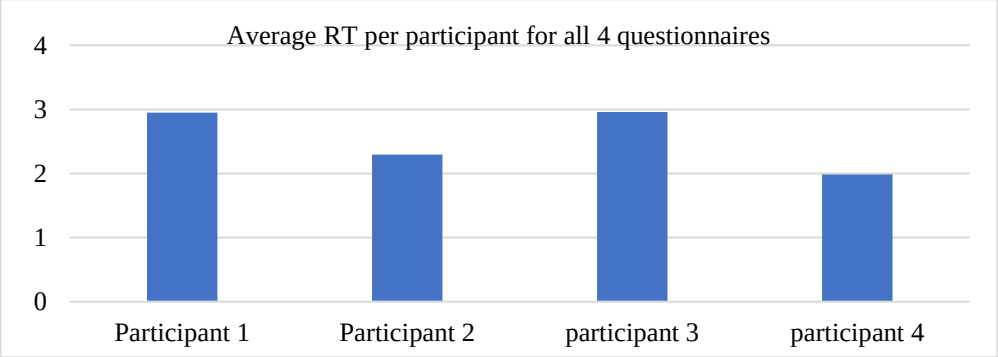



**Fig. 7 Average response times in seconds per question of each participant and for all questionnaires**

Figure 7 shows that participant 4 is, in general, the quickest to answer to questions presents the average reponse time per question for all questions per participant and per questionnaire. Participants 1 and 3 have the same average of response times.

### 3.2 Nonverbal cues

Kress and van Leeuwen (2006) prove that the image not only has lexis like language but also the has grammar as in the following: "Just as grammars of language describe how words combine in clauses, sentences and texts, so our visual 'grammar' will describe the way in which depicted elements –people, places and things- combine in visual 'statements' of greater or lesser complexity and extension." (Kress and van Leeuwen, 2006: p. 1) In the process of studying deception, we are also studying cognitive states. In recent years, numerous studies have been published that employ a range of machine learning classifiers and feature extraction techniques (Islam, Saha, Chowdhury, Sorowar and Rab, 2021), a list of visual features is provided in table of Facial Action Units (FAU). They may also be referred to as 'micro expressions' (Ekman, 2009) which are brief, involuntary facial expressions that can reveal when a person is lying or experiencing a negative emotion (. Video analysis distinguishes top and intermediate levels where actions and activities are taking place and at the most primitive level, *movement*, motions easily charaterized by a defiite space-time trajectory (Bobick, 2001)

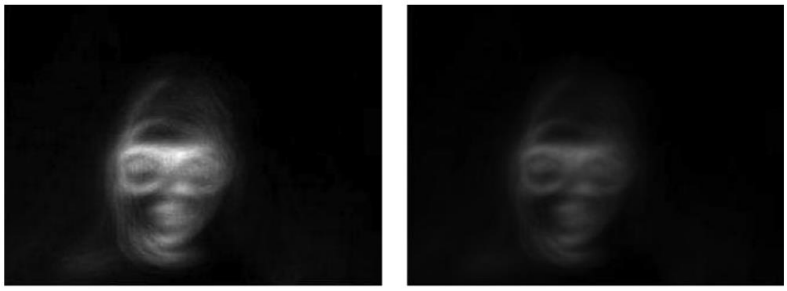
DESCRIPTION OF VISUAL FEATURES

| *Action Unit(AU)* | *Description* |
|---|---|
| 1 | Inner Brow Raiser |
| 2 | Outer Brow Raiser |
| 4 | Brow Lowerer |
| 5 | Upper Lid Raiser |
| 6 | Cheek Raiser |
| 7 | Lid Tightener |
| 9 | Nose Wrinkler |
| 10 | Upper Lip Raiser |
| 11 | Nasolabial Deepener |
| 12 | Lip Corner Puller |
| 13 | Cheek Puffer |
| 14 | Dimpler |
| 15 | Lip Corner Depressor |
| 16 | Lower Lip Depressor |
| 17 | Chin Raiser |
| 18 | Lip Puckerer |
| 20 | Lip stretcher |
| 22 | Lip Funneler |
| 23 | Lip Tightener |
| 24 | Lip Pressor |
| 25 | Lips par |
| 26 | Jaw Drop |
| 27 | Mouth Stretch |
| 28 | Lip Suck |
| 41 | Lid droop |
| 42 | Slit |
| 44 | Squint |
| 45 | Blink |

**Fig. 8 List of identified micro-expressions and visual features**

Coded Behaviors with Interrater Agreement Scores between two coders (Pearson Correlations) will be identified (Mann, Vrij, Bull, 2004). They are gaze aversion (in number of seconds in which the participant looked away from the interviewer, smiles (frequency of smiles and laughs), blinking, head nods, head shakes, (each sideways movement may be counted as a separate shake), shrugs (one or both shoulders are briefly raised in an "I don't know" type gesture), self-manipulations, hand and/or finger movements.

To identify « Biomarkers of deceit » and notably in nervousness, an existing tool is called Motion Energy Image could be used. For representing and analyzing human action, the Motion Energy Image (MEI) and the Motion History Image (MHI), can summarize the spatio-temporal content in a single image (Bobick and Davis, 2001). This tool would allow to identify spatio-temporal descriptors, through weighting Motion Energy Images (wMEIs) as to present an archetypal expression of the face when telling a lie and when telling the truth.



(a) (b)

**Fig. 8 Examples of weighting Motion Energy Images with different normalization techniques. Normalization with respect to (a) the maximum accumulated pixel value, and (b) the duration of the video. (Bobick and Davis, 2001)**

More recent technologies such as machine learning offer a more efficient and effective way to obtain the desired outcome but the choice of the technology, commerical or open-source, still has to be done. In the meantime, we still want to establish a valid theoretical framework. We will first try the framework manually before using machine learning technologies that will be programmed to capture the video sequences automatically. The suggested framework will be composed of 4 video sequences. Step 1 includes the facial features while the respondant is listening to the question. Step 2 refers to the response time and the facial features just after the end of the question of the interviewer and before the beginning of the verbalization of the answer. Step 3 refers to the start of the lie. The first short answer. Step 4 refers to ending the lie. Step 5 is the moment just after when the respondent is silent and during which the facial features are analyzed.

### 3.3 Qualitative results using the framework

The table below shows how the framework was used for participant 2 answering the truth (for question 1) in the native language, which would be considered the participant's « baseline » behavior (Meijer et al., 2016).

| Q1 | Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 |
|---|---|---|---|---|---|
| Truth in native language | Blinking three times while listening to the question | Heads tilts back while inhaling | Heads recovers straight position | One nod | Another consecutive nod |
| Lie in native language | No blink straight eyes controlled face (doesn't move) | No blink straight eyes controlled face (doesn't move) | One blink | Head tilts back | Head repositions down 1 nod |
| Truth in English | Straight face | Straight face | Heads circles right, up, left | One nod | One long blink |
| Lie in English | Straight face | Looks down | Looks down | Looks back up | Controlled shake |

The next table shows the framework for participant 2 answering the truth of question 5 in the foreign language.

| Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 |
|---|---|---|---|---|
| Blinking while listening to the question | Looks up, inhales, looks back down | Looks to the right, blinks, tilts the head to the left | Heads moves to the left | Nods again as to confirm the answer |

The next table shows the framework for participant 3 answering question 2 by a lie in the foreign language.

| Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 |
|---|---|---|---|---|
| Controlled smile, looks to the right | Looks up, eyebrows raising | Looks back straight | Controlled nod | Just after telling the lie, the respondant « increased » the smile, and then closed eyes |

The next table shows the framework for participant 4 answering question 10 with a lie in the foreign language.

| Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 |
|---|---|---|---|---|
| Blinks | Sits up straight | Blinks, looks right | Eyebrows raised | Eyes look straight, haid remains neutral, controlled shaling of the head |

A correlation was found between verbal and non-verbal cues in participant 3's behaviour, as in phase 5 of lying, a definite smile (9 out of 10 times), and a controlled smile (1 out of 10) was displayed. This participant was the one who created new lies for 10 of the 10 questions. On the other hand, Participant 4 did not smile but instead shook his head 9 times of out of 10. This proves that these tests are only valid for within-subjects studies.

## IV. CONCLUSION

To effectively validate the proposed framework, this study would have to be applied to a larger population scale to create a corpus that would allow for data mining. In the meantime, we may use available datasets such as the Real-life trial dataset by Michigan University and/or the Miami University deception detection dataset (Perez-Rosas, 2015, 2022).

### 4.1 Limitations

A procedural shortcoming of this experiement was the lack of « guilt knowledge ». In this manner, this study did not cover the analysis of « complete » but of « partial » lies. One interesting finding, however, was to see that, out of the four participants, one easily created new lies but the others did not. This would be an element of differential psychology to include in any further studies. As « there are large individual differences in people's behaviour, speech, and physiological responses (DePaulo & Friedman, 1998). A hypothesis is that an archetypal expression of deception, or of truth, can not be universal, but may only be identified individually similarly to how fingerprints or DNA are. This « within-subject » notion has to be taken seriously. Some people typically make many movements, while others do not; some people are eloquent, others are not; some people show large variations in physio-logical responses, others do not. Therefore, a simple decision rule such as 'He makes many movements, so he must be lying' or 'He does not say much, so he must be lying' will not work.

### 4.2 Further studies

This study may have paved the way to what could be called « honesty studies ». In the field of deception studies, a special focus on honesty is missing in the field (Vrij, 2008). Truth tellers can be detected from liars when encouraged to provide more information. If truth tellers provide more information, they are more likely to be believed, because the richer an account is perceived to be in detail, the more likely it is to be believed (Bell & Loftus, 1989; Johnson, 2006; Johnson, Foley, Suengas, & Raye, 1988). Besides, the questions we tackled may not only apply to how telling a lie in a familiar language differs from lying in a foreign language, but could also be expanded to an international study that could analyze cultural differences in telling lies. More further studies would involve Interpersonal Deception for which the deception occurs during a conversation (Nyroos, 2023) for which we would analyze the « journey » of a lie in which an individual who tells « lie A » and then « lie B » must have to « validate » and « not contradict » lie A. The protagonists, moreover, will be more or less inclined to believe each other. We would have to dig more into Interpersonal Deception theory (Buller, 1994) in which deceivers make choices depending on the type and amount of information to deliver, the actions appropriate to the context and the necessary behavior to build credibility (Buller, 1994). Conversation flow analysis may be an opportunity given by emerging technologies. Artificial intelligence (AI)

may enhance lie detection systems (Oravec, 2022) and are generating significant enthusiasm regarding their potential in this field, especially on its latest development in deep learning and machine learning.

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# LIABILITY FOR NON-CONTRACTUAL DAMAGES IN THE AGE OF ARTIFICIAL INTELLIGENCE

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**ABSTRACT**

In the digital age, the application of artificial intelligence in production, business and daily life activities is becoming more and more popular. Beside the potential and benefits, artificial intelligence begins to pose challenges to humans in many fields of science and technology. The emergence of artificial intelligence also entails many related legal issues, particularly, the legal aspect of intellectual property, labor, non-contractual compensation for damages or tort law, etc. Promoting the application of artificial intelligence in human life raises the need to protect people from the challenges of science and technology, especially when the law is showing signs of slowing down compared to the current remarkable progress of science and technology. The article focuses on liability for non-contractual damages caused by artificial intelligence and determining the subject status of artificial intelligence, from there, propose the recommendations in order to improve the current Vietnamese legal system.

*Keywords:* artificial intelligence, damages, subject, tort law.

## I. INTRODUCTION

The Fourth Industrial Revolution is also known as the digital age with the strong development of digital technology, artificial intelligence and other new technologies. Artificial intelligence (hereinafter referred to as AI) is mentioned as one of the outstanding achievements that brings many opportunities for change to society and the global economy (Thiên Kim, 2024). Research and development of AI has become a global trend, in which the US and China are the two countries leading in investing in this technology, followed by the UK and Israel. Accordingly, investment in development and research has produced typical AI products such as: GPT-4 (US), AI Ernie (China) (Phan Văn Hoà, 2024)...

With the continuous progress of science and technology today, AI is developing rapidly, being applied in all fields from culture to the world economy, occupying an important position in the digital age (Kinh tế số, 2023). In the medical field, AI is widely applied to improve professional qualifications and work efficiency such as supporting disease diagnosis, medical imaging diagnosis, assisting surgeons, collecting, storing and managing medical records (Sở Y tế TP. HCM, 2020). For education, AI is applied to research, developing computer software, automating and performing administrative activities to improve teaching and learning (Đinh Thị Mỹ Hạnh & Trần Văn Hưng, 2021). The advent of AI has helped commercial banks and businesses detect fraud, forecast market trends and make smart investment decisions; analyze customer data, manage credit risks. Thanks to that, credit institutions can improve customer experience, increase operational efficiency and reduce costs (Võ Lê Phương Khách & Trương Quang Vinh, 2023).

In Vietnam, since 2014, artificial intelligence has been is included in the list of high technologies prioritized for investment and development. The Vietnamese government identifies this as one of the technologies breakthrough, the spearhead of the Fourth Industrial Revolution. In early 2021, the Prime Minister issued the National Strategy on research, development and application of artificial intelligence by 2030 in Decision nº 127/QD-TTg dated January 26, 2021. In Vietnam, AI has many positive impacts, improving control efficiency in exit and entry management. AI collects, analyzes and processes big data, builds a database system that ensures scientific and accurate nature, helping authorities conveniently manage and improve the efficiency of exit and entry procedures (Nguyễn Mạnh Hùng, 2023). In addition, AI is also applied in a number of other fields such as services, communications, transportation, production and agriculture (Thạch Thị Mỷ Quyên, 2024). Besides, a number of enterprises and corporations have quickly updated the world's artificial intelligence trends and initially had specific products and applied to the production and business process in a number of industries and fields such as finance, banking, information and communication, healthcare,

education, tourism, transportation, e - commerce, restaurant chatbots, etc. Vietnam has important opportunities for research, development and AI applications in the future. As of 2021, Vietnam has strongly developed artificial intelligence technology, up 14 places compared to 2020, becoming the 62nd most developed country in the world and ranked 6th among ASEAN countries in the AI Readiness Index (Khánh Nguyễn, 2022).

In the innovation of science and technology, the use of AI is expected to bring many benefits to society. However, in the process of AI, if the operations of machines, products, services… have errors, it will cause damages, sometimes extremely important, to social life, which is inevitable. In Vietnam, artificial intelligence technology has created audio, image and video technology products that fake real-life objects with very high accuracy. In recent years, the situation of fraud and appropriation of assets in cyberspace has become very complicated, with scammers using messages asking for money transfers, especially using more sophisticated tricks, taking advantage of Deepfake technology to fake video calls in order to appropriate assets and cause damage to victims (Văn Phong, 2025). However, this article only focuses on liability for non-contractual damages caused by artificial intelligence from the perspective of civil law, especially determining the subject status of artificial intelligence, from there, propose the recommendations in order to improve the current Vietnamese legal system.

## II. MATERIAL AND METHOD

A descriptive statutory approach through legal research is the first method applied in this article. In addition, the analysis of regulations related to liability for non-contractual damages caused by artificial intelligence is also used in this study. Moreover, a comparative method is adopted throughout this article in order to compare the provisions of European and Vietnamese legal systems related to the determination of subject of artificial intelligence. Therefore, the article proposes the recommendations related to liability for non-contractual damages caused by artificial intelligence in Vietnam.

The three main sources of law used for description, analysis and comparison are as follows.

*Firstly*, the Artificial Intelligence Act of the European Union was published in the Official Journal of the European Union and entered into force on August 1, 2024.

*Secondly*, the Civil Code in Vietnam was promulgated by Law no 91/2015/QH13 of 24 November 2015 and entered into force on January 1, 2017.

*Thirdly*, the current Draft Law on Digital Technology Industry in Vietnam.

## III. RESULT AND DISCUSSION

### 3.1. Conception of liability for non-contractual damages caused by artificial intelligence

Artificial intelligence is a branch of computer science that deals with the automation of intelligent behavior. Alan Turing's 1950 work Computing Machinery and Intelligence raised the question of whether machines could think, conducted a study known as the "*Turing test*" to determine whether machines had intelligence and thus introduced the concept of machine thinking. In 1956, John McCarthy introduced the term "*artificial intelligence*" into a scientific conception at the Dartmouth conference, marking the birth of this term (Lev Craig, Nicole Laskowski, Linda Tucci, 2024). Currently, the term artificial intelligence is becoming more and more popular thanks to the development of intelligent technology and its usefulness when applied to many different fields. Through research on artificial intelligence, there has not yet been an official, non-standard conception to define AI.

The conception of AI is presented by many authors according to their personal views, showing different perspectives on the nature and purpose of applying AI in many fields. Among them, two authors, Stuart Russel and Peter Norvig, in the famous book "Artificial Intelligence: A modern approach" have many definitions of AI. For exemple, artificial intelligence is the actions of machines associated with human thinking, such as decision making or problem solving; artificial intelligence is the art of creating machines that can perform functions that require intelligence when performed by humans (Trần Minh Tâm, 2019). In another research article in Vietnam, Nguyen Manh Hung also gave the view on AI as a system of machines or application software programs created by humans that can automatically perform intelligent behaviors such as the ability to behave, communicate with humans, can learn and intelligently adapt to many situations (Nguyễn Mạnh Hùng, 2023).

From the above analysis, it can be understood that AI is basically a machine or computer system created by humans and programmed to have logical thinking in order to perform and handle problems similar to humans. In addition, AI's ability to learn and provide optimal solutions is also very important for unexpected situations (Yurii Khodyko, 2024).

Artificial intelligence has been widely applied, so it is inevitable that new challenges will arise for society in many aspects. In particular, in the legal field, the existence of AI has affected many aspects, such as labor, intellectual property, compensation for damages, etc. According to the article 13 of the 2015 Civil Code in Vietnam, compensation for damages is the act of compensating all damages of the party that infringes civil rights to the party whose rights are infringed. From there, it can be understood that compensation for damages is a form of civil liability in which the party causing the damage must be responsible for their illegal acts. Evidence of the responsibility to compensate for damages is the remedy of consequences, through compensation for material or spiritual losses. In Vietnam, compensation for damages is stipulated in the articles 360 and 584 of the 2015 Civil Code in two types, including liability for damages due to breach of contract and liability for damages outside of contract. Compensation for non-contractual damages in the era of artificial intelligence is understood as a type of legal liability, applied when all conditions prescribed by law are met, accordingly, forcing the subject causing damage to compensate for material and spiritual losses caused by artificial intelligence, where that act is an illegal act that infringes upon the life, health, honor, dignity, reputation, property, rights and legitimate interests of another subject.

### 3.2. Meaning of liability for non-contractual damages caused by artificial intelligence

According to the articles 584 and 585 of the 2015 Vietnamese Civil Code, compensation for damages is a form of civil liability that forces the party causing damage to remedy the consequences by compensating for material and spiritual losses to the injured party. Compensation for damages in general and compensation for damages in the era of artificial intelligence in particular have many meanings as analyzed below.

*Firstly*, the liability for damages in the era of artificial intelligence aims to restore the original state. The application and implementation of the liability for damages aims to restore the rights and interests of the injured party that have been violated. However, this restoration is only relative, in some cases, the injured party has had the damage remedied but still cannot return to the original state.

In particular, smart cars are a testament to the incompleteness of the law in this area. When a driverless car causes an accident to a pedestrian, for example leading to death, the responsibility lies with its creator or with the car user. In this case, although the total material and spiritual loss has been compensated, the fatal damage cannot be restored to its original state. The same question is also raised in the medical field, with surgical robots or with AI systems used to detect diseases (Lê Thiên Hương, 2021). In the case of applying AI to surgery but encountering an unexpected incident that causes damage to health or violates life, no matter how large the compensation is, it cannot replace the original health condition or, more dangerously, cannot replace the human life caused by AI. Therefore, in the above cases, compensation for damages is only aimed at restoring the original state, not completely restoring it to the state before the damage occurred. Another example is that recently, a software error by security firm CrowdStrike caused many computers using Microsoft operating systems to freeze, thereby causing more than 5,000 flights to be canceled and affecting a series of industries, from retail, transportation to hospitals. CrowdStrike's security software update caused this system error, causing many businesses to lose revenue, workers to waste time and reduce labor productivity. Even some airlines such as Delta Airlines have had to cancel hundreds of flights to date because they have not recovered (Băng Băng, 2024). Thus, although security firm CrowdStrike has fixed this error, the damage that Delta Airlines has suffered still cannot be restored to its original state.

*Secondly*, the responsibility for compensation for damages in the era of artificial intelligence aims to propagate and educate the awareness of law compliance, while respecting the rights and legitimate interests of other subjects. The application of the responsibility for compensation for damages, in addition to the purpose of restoring the rights and legitimate interests of infringed subjects, also aims to educate the awareness of law compliance, respecting the rights and legitimate interests of other subjects. Moreover, any subject that commits an illegal act that causes damage to others is responsible for compensation. Therefore, the provisions related to the responsibility for compensation for damages will make the subjects in civil relations think carefully about the possible consequences before acting to choose a

behavior in accordance with the provisions of law.

*Finally*, the responsibility to compensate for damages in the era of artificial intelligence also has the meaning of protecting the life, health, honor, dignity, reputation, property, rights and legitimate interests of the victim, which is clearly demonstrated through the economic impact that forces the person responsible for compensating for damages to compensate the victim. The responsibility to compensate for damages in the era of artificial intelligence helps restore the rights and legitimate interests of the victim in order to restore balance in social life.

In Vietnam, the 2015 Civil Code has provided regulations on liability for compensation for damages in order to protect the legitimate rights and interests of other entities. This is a solid legal basis for competent authorities to quickly and accurately resolve disputes related to liability for compensation for damages, thereby ensuring the principle that damages caused must be compensated in full and timely which lawmakers aimed for when drafting the article 585 of the current Civil Code.

In short, compensation for damages in the era of artificial intelligence is extremely important for civil relations between subjects in society through protecting the legitimate rights and interests of people whose lives, health, honor, dignity, reputation, property and other legitimate rights and interests of others are violated; ensuring the fairness of the law, increasing deterrence for subjects to comply with legal regulations correctly and fully. Thereby, the implemention of the provisions of civil law in general and the provisions of other legal documents in particular are increasingly more serious and responsible.

**3.3. Determining the subject of liability for non-contractual damages caused by artificial intelligence**

In Vietnam, the 2015 Civil Code stipulates a separate regime for the subject responsible for compensation for damages when damage occurs, which can be an individual or a legal entity (Thúy Hiền, 2022). According to article 13 of the 2015 Vietnamese Civil Code, individuals and legal entities whose civil rights are violated are entitled to full compensation for damages. However, the provisions on the subject of compensation for damages are only general and are mainly mentioned in a few areas. In addition, when being drafted, the 2015 Civil Code did not foresee the case where products in social life using AI technology infringe upon the life, health, honor, dignity, reputation, property, rights and other legitimate interests of civil law subjects. In particular, in the context of applying high-level technology and science to social life, to perform the function of compensation for non-contractual damages, the injured party must request compensation for damages and that request must be accepted by the Court, the injured party must identify the person causing the damage, then file a lawsuit, moreover, have to prove that the person causing the damage caused the loss. Therefore, the cost is quite large while it is not always possible to prosecute the person responsible for compensation for damages even if a lawsuit is filed in the Court. In addition, in cases where many people commit acts causing damage, filing a lawsuit is not simple and even if a lawsuit is filed, establishing evidence to prove the causal relationship between the harmful act and the loss is not easy.

Nowadays, even though it is called an AI product, the program unit (pre-programmed) is not considered an independent physical entity. In most cases, AI is understood as a robot equipped with artificial intelligence or in other words, robot = artificial Intelligence + machine science. With that reasoning, it is said that an AI program itself cannot be discussed as responsible for its negative impact on society and artificial intelligence only when combined with machine science with an appearance like a robot can be discussed as responsible for compensation for damages (Nguyễn Thị Phương Châm, 2024).

Self-driving cars use AI, in case of a traffic accident due to AI operations being mistaken during the process of collecting self-learning and self-operating data, the question is who is responsible for compensating for the damage. Even when AI operations are mistaken, there are many situations that lead to damage to both businesses in general and individuals in particular. AI makes mistakes in judging traffic conditions due to errors in data collection (big data), along with that judgment leading to wrong behavior and causing accidents. In other situations, AI recognizes that the situation is beyond its control and returns control to the driver, but the driver is not paying attention, leading to an accident...

The next situation is that an exceptional traffic situation arises that is not foreseen in the programming and design of AI, leading to the inability to judge, handle and cause accidents. In many cases, such as self-driving cars, satellites

are used to take pictures or transport goods, but due to incorrect judgment, the satellite AI causes damage to people and property (Phóng viên, 2021)... In addition, a pharmaceutical or medical device manufacturing company signs a purchase contract with a robot design and manufacturing company. Then, the robot manufacturing company signs a contract with an AI manufacturing company, designing the AI program to install on the robot. During use, the AI makes a manufacturing error that creates pharmaceuticals or medical devices that cause damage to the health and property of consumers (Sở Y tế TP. HCM, 2019)... Furthermore, in the case of businesses using AI to collect data, analyze data and then give advice to investors in stocks, real estate…, in the case of AI making an error, giving unsatisfactory advice, causing damage to investors (Thảo Vân, 2024). Finally, nursing homes use robots to act as nurses to take care of the elderly such as feeding and giving injections. In cases where robots misjudge the elderly's injection status or at the wrong time or overdose, leading to death, etc (Phương Vũ, 2020).

Compensation for non-contractual damages in the era of artificial intelligence is an issue related to a third party that is not a party to the contract such as the relationship between the AI designer and the AI machine manufacturer or the relationship between the seller of AI-based products and the buyer of the product when one or more parties in the contractual relationship violate the obligations arising from the agreement of the parties. Therefore, all issues arising in the relationship of compensation for non-contractual damages are not foreseen by the parties and resolved in the terms related to the contract. For these cases, there must be direct provisions of the governing law. In addition, when being formulated, Vietnamese law has not foreseen the case of products in social life using AI technology that infringe upon the property, life, health and other legitimate rights and interests of civil law subjects, so it is not yet certain whether the application of current regulations is completely appropriate and brings positive value.

First of all, from the above situations, it can be seen that the legal relationship on compensation for non-contractual damages in cases of applying AI technology becomes very complicated due to the participation of many subjects. *Firstly*, the enterprise providing data and programs; the enterprise designing artificial intelligence. *Secondly*, the enterprise manufacturing products using artificial intelligence or the enterprise providing services using artificial intelligence. *Thirdly*, the user of machines and services with artificial intelligence design. Fourthly, the injured party, the person receiving damage and loss or the third party through the use of machines and services with artificial intelligence design by others. According to Ms. Le Thi Van Anh, Deputy Director of the Department of Criminal and Administrative Law, Ministry of Justice, there are four related subjects related to AI, including (i) the subjects that create AI, the programmers and authors who design the software, (ii) the owners of AI, the manufacturers and investors, (iii) the users, the people who put AI into operation, monitor the operation process and finally (iv) the AI entity itself (Đỗ Mến, 2024).

While advances in AI technology have had a positive impact on human life, there are still risks and accidents caused by robot errors. This reminds us that AI technology still has many limitations. In 1981, a robot killed a worker at the Kenji Urada motorcycle factory in Japan because it mistook him for a danger (Larry Alton, 2017). In 2015, a 22-year-old engineer working at a Volkswagen factory in Germany was in the process of finishing parts for a robot when he was lifted up by the robot and thrown against metal plates, resulting in his death due to serious injuries (Mỹ Loan, 2015). Also in 2015, a worker named Ramji Lal was killed at the Haryana Manesar factory in India when he approached the robot from behind (Nguyễn Thị Thu Vân, 2023). While adjusting a metal plate, he was pierced by the robot's welding rods (Trung Nguyễn, 2017). On March 18, 2018, the first fatal accident involving a self-driving car occurred when Elaine Herzberg was hit by an Uber self-driving car while crossing the street (Bảo Duy, 2018). In April 2021, another accident killed two people while driving a Tesla Model S self-driving car (Bằng Hưng, 2024). From the above damages, it can be seen that although AI technology brings many benefits to human life, it also poses unforeseen risks. Accidents caused by robots and self-driving cars not only raise questions about the safety of the technology but also emphasize the need to improve and perfect these systems. This affirms the urgent need to research, develop and apply safety solutions to protect people, while ensuring that AI technology is deployed effectively and reliably in the future.

The Artificial Intelligence Act of the European Union (hereinafter referred to as AIA) is considered the world's first legal framework on AI until now. AIA was adopted with the aim of protecting fundamental rights, democracy, the rule of law, promoting innovation and making Europe a leading region in the field of AI (Hùng Tuấn, 2024). AIA

provides regulations and guidelines on some AI applications that threaten citizens' rights and will be prohibited in order to protect their rights and minimize the risk of AI systems causing unintended consequences for people and society. At the same time, AIA also helps shape a common standard on AI, ensuring unity and integration in the management and development of AI technology in the EU region. Although the AIA of the European Union does not have specific provisions on compensation for damages caused by the behavior of AI systems, if manufacturers, suppliers and user importers violate AIA regulations, they are obliged to pay a fine depending on the severity of the violation (Matt Kosinski & Mark Scapicchio, 2024). Similar to the AIA of the European, Russian law is very cautious in granting legal status to AI, because regardless of the robot's autonomy, the country imposes all responsibility on the developer, operator or manufacturer of the robot. Accordingly, the Robot Agent acts as a party to legal relations and the owner will be liable for damage caused by activities that create an increased danger to the community, regardless of the fault (Đặng Lê Phương Uyên, 2023).

In Vietnam, in the liability for compensation for non-contractual damages, according to the clause 3 of the article 584 of the 2015 Civil Code, if property is the subject causing damage, the owner of this property or the possessor of the property must be responsible for compensation for damages, except in cases of force majeure, due to the fault of the damaged party or in cases where there is another agreement or the law provides otherwise. It can be seen that property here, according to the article 105 of the 2015 Civil Code, is objects, money, valuable papers and property rights. Therefore, in this case, is artificial intelligence considered as property or not, if AI is considered as property, who will compensate for the damage caused by AI? (Đỗ Giang Nam, Đào Trọng Khôi, 2022). The current Vietnamese civil law still does not have any specific regulations recognizing the legal subject to be responsible for compensation for damages or not.

According to the Draft Law on Digital Technology Industry in Vietnam, the bill dedicates a chapter to regulate AI with the orientation that this is one of the most core digital technologies. The bill also dedicates a section on digital assets. Pursuant to the clause 1 of the article 10 of the Draft Law on Digital Technology Industry, digital assets are digital technology products created, issued, transferred and authenticated by blockchain technology, with value and property rights according to the provisions of civil law and relevant laws. In addition, the regime of compensation for non-contractual damages is stipulated in the clause 3 of the article 584 of the 2015 Civil Code, accordingly, in case property causes damage, the owner or possessor of the property must be responsible for compensating for the damage. Thus, if considered as a type of property (Nguyễn Mỹ Linh, 2024), when AI causes damage to the life, health, honor, reputation, dignity, property, rights and legitimate interests of others, the subject responsible for compensating for the damage belongs to the owner or possessor of the AI.

## IV. CONCLUSION

With the rapid development of scientific and technological advances, a society where humans and AI entities that are no different from humans live together is no longer a fantasy. At that time, many regulations will no longer be appropriate, current standards of legal responsibility will not be sufficient in cases where damage is caused entirely by decisions made by robots independently or if machines are designed to choose partners themselves, agree on contract terms, sign and decide how to implement those agreements, it is clear that the usual principles will not apply to them. According to current Vietnamese law, damages caused by illegal acts of others must be compensated. However, the problem is that up to now, Vietnamese law does not recognize AI as a legal subject. This means that AI cannot be personally responsible for the damages it causes (Dương Quỳnh Hoa, 2020). Determining the subject of compensation for damages in the era of artificial intelligence is very necessary. It is thought that the current trend in the world is to expand the scope of subjects of rights instead of just for the traditional subjects of human individuals. Therefore, Vietnam needs to prepare for the above demands of society in order to ensure that AI can be protected and controlled by law. Recognizing AI as a digital asset in the current Draft Law on Digital Technology Industry in Vietnam, thereby determining the status of subjects in the relationship of compensation for damages outside the contract in the era of artificial intelligence is in line with the current trend of countries.

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# LEGAL FRAMEWORK FOR APPLYING ARTIFICIAL INTELLIGENCE TO PROMOTE SUSTAINABLE INNOVATION

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**ABSTRACT**

Artificial Intelligence (AI) is currently a core technology across various sectors of social life with its capacity to optimize performance, mitigate risks, conserve resources, and protect the environment, thereby promoting sustainable innovation globally. However, alongside its significant advantages, AI also presents potential risks and impacts on human rights. Therefore, a legal framework for AI not only serves to regulate effective AI development but also ensures its safe, ethical, and responsible application.

At present, countries worldwide adopt different approaches to building an AI legal framework, which creates challenges in regulating cross-border AI activities. This paper clarifies the requirements and role of a legal framework in applying AI to foster sustainable innovation. It delves into key legal aspects of AI application and governance, social responsibility policies, and data security. Additionally, it provides solutions to improve this legal framework to promote sustainable innovation in the digital era.

*Keywords*: “Legal framework”; “Artificial Intelligence”; “AI governance”; “innovation”...

## I. INTRODUCTION

### 1.1 Background of the study

In the digital era, AI has transformed from a mere supporting tool into a key driver of societal change. With its advancements in performance optimization, risk mitigation, and environmental sustainability, AI is reshaping modern operational paradigms. From smart factories to medical diagnostic systems, from autonomous vehicles to sustainable energy solutions, AI has firmly established itself as a cornerstone for fostering global innovation. However, alongside these substantial benefits, AI raises critical legal and ethical challenges that demand comprehensive regulatory assessment[3].

In this context, A well-defined legal framework is essential for fostering responsible and ethical AI deployment, ensuring both innovation and accountability. Nations around the world are adopting diverse approaches to AI regulation, ranging from stringent provisions such as the European Union's AI Act to advisory guidelines prevalent in many developing countries. While this diversity reflects the unique characteristics of various legal systems, it also creates considerable challenges in managing cross-border AI activities.

In the context of Vietnam's efforts to implement the National Strategy on Artificial Intelligence by 2030, developing an appropriate legal framework is not merely a technical requirement but an urgent necessity to ensure sustainable development. Challenges such as limited resources, inconsistencies among legal documents, and the rapid pace of technological advancement demand a multidimensional and comprehensive approach.

Therefore, clarifying the role and requirements of a legal framework for applying AI to promote sustainable innovation becomes particularly crucial. By analyzing key legal aspects of AI governance, including social responsibility policies and data security measures, this paper not only provides an overview of the current state of AI-related legislation but also proposes specific solutions for enhancing the legal framework governing AI. Ultimately, the goal is to strike a balance between fostering innovation and ensuring safety and ethical compliance in AI applications, thereby contributing to the achievement of sustainable development objectives within the digital era.

[3] Rashid, A. B., & Kausik, M. A. K. (2024). AI revolutionizing industries worldwide: A comprehensive overview of its diverse applications. *Hybrid Advances, 7*, Article 100277.

### 1.2. The Importance of a Legal Framework in AI Governance

As AI continues to integrate into all facets of society, the establishment and refinement of a legal framework for AI governance has become an urgent necessity. A comprehensive legal framework creates a secure and accountable environment for AI development, establishing clear standards and rules that stakeholders are obliged to adhere to. This framework not only protects users' rights and interests but also fosters responsible AI innovation among businesses and organizations4.

In the realm of human rights protection, the legal framework plays a pivotal role in mitigating the potential adverse impacts of AI. For instance, regulations addressing personal data protection, privacy rights, and anti-discrimination in AI algorithms ensure that this technology serves human interests without infringing upon fundamental rights. Moreover, the framework establishes mechanisms for oversight and accountability, enabling the clear allocation of responsibility in cases of incidents or violations related to AI.

From the perspective of fostering innovation, the legal framework provides certainty and trust for investors and businesses. When rules are clearly defined, market participants can confidently allocate resources to AI research and development, assured that they are operating within a predictable and equitable environment. Furthermore, the legal framework encourages fair competition and prevents monopolistic practices in the AI sector, thereby promoting diversity and creativity in technological advancement.

In the context of globalization, the legal framework is equally vital in facilitating international cooperation on AI. Harmonizing legal regulations across nations helps reduce barriers to technology exchange and promotes cross-border collaborative projects. This is particularly crucial in addressing global challenges such as climate change, cybersecurity, and public health issues, where AI can make significant contributions to finding solutions. For example, the European Union's AI Act, with its stringent standards for safety and accountability regarding high-risk AI applications, serves as a benchmark. Similarly, countries like Singapore and Japan, with their AI-friendly legal policies, have created favorable environments for AI startups to thrive. Conversely, legal ambiguity or excessively restrictive regulations can dampen innovation incentives, potentially resulting in setbacks in the global technological race5.

In Vietnam, the National Strategy for Research, Development, and Application of AI by 2030 aims to position AI as a driving force for socio-economic development6. However, to maximize its effectiveness, the legal framework must be designed with flexibility and adaptability to keep pace with the rapid advancements in AI technology. This necessitates a careful balance between ensuring safety and fostering innovation, as well as protecting user rights while promoting technological growth. Additionally, the effective implementation of legal regulations requires close collaboration among regulatory agencies, businesses, and the scientific and technological community.

## II. MATERIAL AND METHODOLOGY

### 2.1. Research Theories

#### 2.1.1. Legal Regulation Theory for AI

This theory examines the relationship between law and the development of AI technology, developed by numerous authors through diverse perspectives yet sharing certain commonalities.

According to Calo (2015)[7], law plays a pivotal role in guiding and regulating AI through the establishment of rules and standards. Meanwhile, Brownsword and Yeung (2019)[8] emphasize that the legal framework must ensure a balance

[4] Kinney, M., Anastasiadou, M., Naranjo-Zolotov, M., & Santos, V. (2024). Expectation management in AI: A framework for understanding stakeholder trust and acceptance of artificial intelligence systems. *Heliyon, 10*(e28562)

[5]https://www.navex.com/en-us/blog/article/the-evolving-ai-regulatory-landscape-in-asia-what-compliance-leaders-need-to-know, accessed on November 12, 2024.

[6] https://en.baochinhphu.vn/national-strategy-on-rd-and-application-of-artificial-intelligence-11140663.htm, accessed on November 13, 2024.

[7]Calo, R. (2015). Robotics and the lessons of cyberlaw. California Law Review, 103(3), 513-563.

[8] Brownsword, R., & Yeung, K. (2019). Regulating technologies: Legal futures, regulatory frames and technological fixes. Hart Publishing.

between fostering innovation and protecting core societal values.

However, scholars have generally agreed on three foundational principles in the legal regulation of AI as follows: transparency and explainability of AI systems, accountability and allocation of legal responsibility in cases of damage, and the protection of legitimate rights and interests. Transparency and explainability are fundamental requirements to ensure that users can comprehend how AI makes decisions (Wachter et al., 2017)9. Accountability mechanisms establish clear processes to determine the liability of relevant parties when an AI system causes harm (Kingston, 2016)10. Lastly, protecting legitimate rights and interests, particularly safeguarding user privacy and personal data in the AI environment, remains a crucial element of the regulation (Giovanella & Duarte, 2019)11.

Building on this theoretical foundation, the study systematically analyzes and evaluates the effectiveness of existing legal frameworks governing AI in various countries. Specifically, by applying the three foundational principles mentioned above, the research preliminarily identifies specific criteria to assess the comprehensiveness of legal frameworks, providing a basis for proposing suitable solutions to construct and refine a scientific and effective legal framework for AI regulation in Vietnam.

**2.1.2. Theory of Responsible AI Governance**

The theory of responsible AI governance focuses on integrating ethical principles throughout the entire lifecycle of AI systems, from design and development to deployment.

In this context, Floridi and Cowls (2019)[12] proposed a unified framework comprising five core principles for AI in society: beneficence, non-maleficence, fairness, explainability, and human autonomy. These principles were synthesized from an analysis of 84 global documents on AI ethics. Furthermore, Dignum (2020)[13] emphasized that responsible AI governance should be founded on three pillars: ethical responsibility, legal responsibility, and social responsibility. Additionally, Hagendorff (2020)[14] highlighted that implementing ethical principles in AI requires a combination of technical tools and an appropriate legal framework.

This theory not only provides an analytical framework for evaluating the effectiveness of current legal regulations but also helps to identify management gaps. It facilitates the proposal of suitable monitoring mechanisms to ensure that AI development complies with ethical principles and meets its social responsibilities.

**2.1.3. Techno-Legal Theory**

The Techno-Legal Theory examines the dialectical relationship between technological development and the evolution of legal systems.

Brownsword (2018)[15] identified three key challenges that technology presents to the legal system: aligning existing regulations with emerging technologies, ensuring enforceability, and devising mechanisms to effectively regulate new and emerging technologies. Similarly, Hildebrandt (2015)[16] introduced the concept of "smart law," proposing three approaches for adapting legal frameworks to technological advancements: revising existing regulations, creating new specific regulations, and developing technology-neutral principles.

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[9] Wachter, S., Mittelstadt, B., & Floridi, L. (2017). Why a right to explanation of automated decision-making does not exist in the General Data Protection Regulation. International Data Privacy Law, 7(2), 76-99.

[10] Kingston, J. K. C. (2016). Artificial intelligence and legal liability. International Conference on Innovative Techniques and Applications of Artificial Intelligence, 269–284.

[11] Giovanella, F., & Duarte, L. (2019). Algorithmic decisions and transparency: Designing remedies in view of the requirements of the GDPR. Journal of Intellectual Property, Information Technology and Electronic Commerce Law, 10(3), 3-14.

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[15]Brownsword, R. (2018). Law, technology and society: Re-imagining the regulatory environment. Routledge.

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Furthermore, Veale and Edwards (2018)[17] emphasized the necessity of establishing flexible legal mechanisms capable of accommodating the rapid advancements in AI technology.

Incorporating this theory into the study facilitates the identification of suitable approaches for developing a flexible and adaptive legal framework for AI in Vietnam. It ensures that the legal system evolves in alignment with technological advancements while establishing a solid foundation for sustainable development in the future.

**2.1.4. Institutional Innovation Theory**

This theory explores the role of institutions in driving innovation and fostering technological development. North (2005)[18] formulated an analytical framework emphasizing how institutions—defined as sets of rules, norms, and enforcement mechanisms—shape economic and technological advancements by regulating societal behavior. Acemoglu and Robinson (2012)[19] highlighted the critical function of inclusive institutions in safeguarding property rights, promoting competition, and creating equitable opportunities for innovation. Building on this, Etzkowitz and Zhou (2017)[20] introduced the "Triple Helix" model, which underscores the collaborative dynamics among three primary actors in the innovation ecosystem: governments, businesses, and research institutions.

In the context of developing a legal framework for AI, this theory serves as a fundamental foundation for understanding how institutions can establish an enabling environment for technological progress. It also stresses the need to develop institutional frameworks that encourage the responsible growth of AI technologies. By leveraging the Triple Helix model, this study aims to propose actionable solutions to strengthen stakeholder collaboration in the development and regulation of AI. These efforts will significantly contribute to refining the legal framework that governs this transformative technology.

**2.2. Research Methods**

This study employs a combination of research methods to comprehensively address the research questions outlined by the author, emphasizing three primary approaches:

Firstly, the documentary research method is applied to collect and analyze legal texts, policies, and academic studies on AI regulatory frameworks worldwide. This method provides the foundation for selecting and integrating relevant theoretical perspectives while creating a robust database to support the formulation of informed recommendations.

Secondly, the comparative legal analysis method evaluates diverse approaches to constructing AI regulatory frameworks across nations, with a focus on the experiences of the European Union, the United States, Japan, and China (Migliorini, 2024)21. This comparative perspective facilitates the derivation of lessons applicable to Vietnam, considering the nation’s socio-economic development level and legal infrastructure.

Thirdly, the analytical method is employed to examine international and domestic legal provisions, assess the effectiveness of existing legal instruments in managing AI technologies, and foster sustainable innovation (Comunale & Manera, 2024)22.

The integration of these methods allows the study to conduct a comprehensive evaluation of the legal landscape in the AI domain. This systematic approach ensures the formulation of scientifically grounded and contextually relevant

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[18]North, D. C. (2005). Understanding the process of economic change. Princeton University Press.

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[21] Migliorini, S. (2024). China's Interim Measures on generative AI: Origin, content and significance. Computer Law & Security Review, 49, 105985.

[22] Comunale, M., & Manera, A. (2024). The economic impacts and the regulation of AI: A review of the academic literature and policy actions. IMF Working Paper No. WP/24/65. International Monetary Fund.

solutions for refining Vietnam's AI regulatory framework.

## III. RESULT AND DISCUSSION

### 3.1. Vietnam's Current Legal Framework for Artificial Intelligence and AI Governance

With efforts to promote digital transformation and technological development, Vietnam has made significant progress in establishing and improving its legal framework for AI governance. Numerous AI-related legal documents have been enacted, laying the foundation for AI regulation, development, and application across various sectors, leading to notable achievements.

Fundamentally, the most recent and highly regarded legal document in Vietnam's current AI governance is the "National Strategy for Artificial Intelligence Research, Development, and Application through 2030," approved by the Prime Minister in Decision No. 127/QD-TTg dated January 26, 2021[23]. This document establishes fundamental principles and orientations with the vision of transforming the country into an ASEAN innovation and AI development hub. Additionally, several other legal documents play crucial roles in creating a legal framework for AI development and application, including the 2018 Cybersecurity Law, the 2023 Personal Data Protection Law, and various decrees on digital identification and authentication. These have initially addressed fundamental issues in AI governance, such as personal data protection, cybersecurity assurance, and the establishment of inter-agency coordination mechanisms in the state management of AI[24].

However, compared to advanced legal frameworks in the EU, United States, Japan, and China, Vietnam's AI governance system remains underdeveloped, lacking systematic structure and facing notable limitations.

*Firstly*, Vietnam's absence of specialized AI legislation means that clear legal definitions of AI and related technologies, as well as specific regulations on legal responsibilities for AI development and application entities, have not been transparently and consistently established. Meanwhile, AI possesses unique technological characteristics and high-risk potential requiring safe, transparent, and responsible governance. This has resulted in AI development enterprises struggling to determine their rights and obligations, limiting certain investments in this sector.

*Secondly*, although current legal documents can be applied to address basic issues in AI development and application, these regulations are dispersed across various legal documents and lack uniformity, creating implementation challenges. This leads to overlapping management and supervision, causing resource waste and reduced enforcement effectiveness. In the future, as AI development and application investment continue to grow, the need to improve and standardize AI governance regulations becomes increasingly urgent with higher standards.

*Thirdly*, the absence of regulations on technical standards, quality assurance procedures, and risk management mechanisms for AI systems poses potential safety risks for users, diminishing the competitiveness of Vietnamese AI products in the international market. Notably, the lack of a specialized state management agency for AI not only limits effective legal monitoring and enforcement but also reduces foreign investment attraction due to the absence of an official focal point for investor consultation and support[25].

In the coming period, improving the legal framework for AI governance will not only help resolve current limitations and contribute to domestic AI development but also enhance Vietnam's position in the international AI community, advancing toward the goal of becoming a regional innovation and AI development hub.

### 3.2. AI Governance Models and International Lessons

#### 3.2.1. The European Union

The European Union is a pioneer in establishing a comprehensive legal framework for AI, centered on the AI Act – the world's first legislative document that classifies AI applications based on risk levels. The Act categorizes AI

[23] Prime Minister's Decision No. 127/QD-TTg dated January 26, 2021, on the National Strategy for Artificial Intelligence Research, Development and Application through 2030.

[24] Le, M. T. (2024). Artificial intelligence law in Vietnam: Current status and solutions. *Journal of State and Law*, 2(410), 45-60.

[25] Pham, H. L., & Do, T. M. (2023). Challenges in state management of artificial intelligence in Vietnam. *Journal of State Management*, 327, 35-40.

applications into levels ranging from "unacceptable" risks, such as facial recognition for public surveillance, to "high-risk" areas such as healthcare, education, and finance, which require stringent control and transparency. Minimal-risk applications, like chatbots, only need to provide clear information, while low-risk applications are exempt from strict compliance requirements26. The framework is further reinforced by the General Data Protection Regulation (GDPR), which ensures privacy and accountability in all AI operations, safeguarding human rights. However, this approach presents challenges, particularly in terms of high compliance costs, which may burden small and startup businesses and potentially slow down innovation. The EU provides valuable lessons on risk classification and the construction of a comprehensive legal framework. However, to be effective in Vietnam, adjustments are necessary to align with the country's emerging AI ecosystem and limited resources27.

**3.2.2. The United States**

The United States is progressively establishing a comprehensive legal framework for artificial intelligence (AI) through the issuance of several significant federal-level documents. Beginning with the American AI Initiative in 2019, followed by the National AI Initiative Act of 2020, this framework was further reinforced by the Executive Order on Safe, Secure, and Trustworthy AI issued in October 2023. Notably, to implement this Executive Order, the Biden administration introduced two critical documents: the Office of Management and Budget Memorandum (M-24-10) governing AI use in the civilian sector and the National Security Memorandum on AI (NSM) applicable to national defense and security[28].

Fundamentally, the U.S. AI legal framework is structured around three main pillars: fostering innovation and maintaining leadership in AI development, ensuring the safe and responsible use of AI, and protecting the rights and interests of citizens. To realize these objectives, the U.S. government has established several specialized agencies, such as the Office of Science and Technology Policy (OSTP) and the AI Safety Institute under the National Institute of Standards and Technology (NIST), while also creating inter-agency coordination mechanisms.

Importantly, this framework not only emphasizes the regulation of technical standards but also prioritizes privacy protection, combating discrimination, and ensuring transparency in AI systems. Additionally, the United States actively promotes international collaboration in AI governance through initiatives such as the Hiroshima AI Statement and the International Framework for Trustworthy AI, aiming to establish global norms for the responsible development and use of AI.

**3.2.3. Japan**

Japan has developed a comprehensive legal framework for AI under the vision of "Society 5.0"[29] positioning AI as a key technology to address social challenges. Beginning with its first *National AI Strategy* in 2017, Japan has continuously refined this framework through updates in 2019, 2022, and the most recent advancements in 2024. Notably, the *2024 AI Strategy* emphasizes fostering responsible AI development to address pressing societal issues, such as an aging population, natural disasters, and the digital transformation of public services. This strategy reflects Japan’s ambition to be a global leader in responsible AI innovation.

Institutionally, Japan has established the *AI Strategy Council* under the Cabinet Office to coordinate AI policies across various ministries. The *Ministry of Economy, Trade, and Industry (METI)* has also played a pivotal role by issuing the *AI Quality Management Guidelines* in 2019, which provide technical standards and quality assurance procedures for AI systems. These guidelines continue to evolve to incorporate emerging best practices and international standards.

Japan has been a pioneer in embedding ethical considerations into AI governance. The *Social Principles of Human-*

[26] Article 3, Artificial Intelligence Act 2024 (EU).

[27] https://www.orrick.com/en/Insights/2024/10/The-Artificial-Intelligence-Act-of-the-European-Union, accessed on November 12, 2024.

[28] https://www.whitehouse.gov/briefing-room/presidential-actions/2024/10/24/memorandum-on-advancing-the-united-states-leadership-in-artificial-intelligence-harnessing-artificial-intelligence-to-fulfill-national-security-objectives-and-fostering-the-safety-security/

[29] Study Group on New Governance Models in Society 5.0. (2021). *Governance Innovation: Redesigning Law and Architecture for Society 5.0*. Tokyo: Ministry of Economy, Trade and Industry (METI), Japan.

*Centric AI*, introduced in 2019, emphasize values such as respect for human dignity, transparency, and accountability. In the area of data protection, the *Act on the Protection of Personal Information (APPI)* was amended in 2020 and further revised in 2024 to address challenges posed by AI technologies. The updated provisions include stricter requirements for handling personal data in AI systems, user rights over AI-driven decisions, and enhanced safeguards against misuse of data.

Following the *G7 Hiroshima Summit* in 2023, Japan has intensified its efforts in promoting international cooperation on AI governance through the *Hiroshima AI Process*. This initiative aims to establish global principles for the safe and responsible development of AI, aligning with broader international norms such as those outlined by the OECD and UNESCO. Japan's leadership in this area underscores its commitment to fostering both technological innovation and ethical stewardship in the AI era.

**3.2.4. China**

China has developed a comprehensive legal framework for artificial intelligence (AI) with a clear strategic direction through the issuance of several key regulations. A significant milestone was the promulgation of the Interim Measures for the Management of Generative AI Services in July 2023, which took effect on August 15, 2023. This regulation is the world's first specifically aimed at regulating generative AI. Following this, in October 2023, China released a draft Measures for the Administration of Internet Recommendation Algorithms, expanding regulatory coverage to AI systems used in Internet services. Most notably, starting March 1, 2024, China officially enforced the Measures for the Administration of Content Generated by Artificial Intelligence, the nation's first comprehensive legal document governing AI-generated content[30].

In terms of institutional structure, the Cyberspace Administration of China (CAC) serves as the primary authority responsible for overseeing and regulating AI-related activities. China's AI legal framework places a strong emphasis on national security requirements, content control, intellectual property protection, and personal data security. Providers of generative AI services are required to register with regulatory authorities, conduct security assessments, and comply with content review regulations before releasing their products or services. Additionally, China mandates the clear labeling of AI-generated content and establishes a complaint mechanism for users.

This regulatory framework reflects China's focus on balancing the promotion of technological innovation with strict oversight to ensure safety, accountability, and alignment with national interests.

**3.2.5. Key Lessons and Recommendations for Vietnam**

The study of AI legal frameworks in Europe, the United States, Japan, and China highlights several key features:

– EU: A pioneer in establishing a comprehensive AI legal framework with a risk-based classification system, ranging from "high risk" to "low risk."

– United States: Emphasizes public-private partnerships to promote AI research in areas such as defense and healthcare.

– Japan: Focuses on integrating ethical principles into AI governance.

– China: Implements strict control over AI-generated content to ensure national security.

To ensure a scientifically grounded and effective AI legal framework, Vietnam must actively study, evaluate, and learn from international legal systems and the experiences of developed nations. For instance, adopting the EU's risk-based classification model could enable Vietnam to allocate resources more efficiently to critical sectors such as healthcare and finance. Additionally, leveraging public-private investment strategies, as implemented in the U.S., could catalyze AI development across various industries. Furthermore, integrating ethical principles akin to Japan’s governance model and employing content moderation strategies similar to those of China would empower Vietnam to establish a highly adaptable and effective AI governance framework. This multidimensional approach would position Vietnam to balance innovation with accountability and responsibility, paving the way for sustainable AI growth.

[30] Migliorini, S. (2024). **China's Interim Measures on generative AI: Origin, content and significance**. *Computer Law & Security Review*, 49, 105985.

### 3.3. Legal Risks in the Development of AI

The rapid advancement of AI has brought significant opportunities to foster innovation and improve the quality of life. However, these opportunities are accompanied by complex legal risks that necessitate comprehensive management measures to mitigate negative impacts. According to the author, these legal risks primarily revolve around four key issues: human rights, personal data security, ethical responsibilities, and ensuring fairness.

#### 3.3.1. Artificial intelligence poses serious risks to human rights, particularly in applications related to surveillance and the collection of personal data

In the context of AI's unprecedented and unpredictable developments, this technology presents significant challenges to the protection of human rights, especially in areas involving surveillance and the collection of personal data. Specifically, AI systems possess the capability to collect and analyze data on an unprecedented scale, including information about geographic locations, online behavior, biometric data, and even personal interactions. This creates a substantial risk of severe invasions of individual privacy[31]. Notably, facial recognition technology and intelligent surveillance systems equipped with AI can track and identify individuals in real-time, not only in public spaces but also in private environments. This undermines citizens' rights to freedom of movement and anonymity. Particularly concerning is the use of AI in social surveillance systems, where the technology could be employed to control and restrict fundamental freedoms such as the right to freedom of expression, assembly, and speech.

Moreover, the lack of transparency in how AI collects and processes personal data, combined with the absence of effective oversight and control mechanisms, exacerbates these risks to human rights. These circumstances create an urgent need for the establishment of a comprehensive legal framework to regulate the development and use of AI. Such a framework must strike a balance between the benefits of technological innovation and the protection of fundamental human rights. Importantly, it must uphold the principle of being "human-centered" whereby technology is developed to enhance human quality of life. This ensures that AI development does not become solely driven by economic interests at the expense of human rights.

#### 3.3.2. The risks related to personal data in the era of AI manifest in complex and multifaceted dimensions

Foremost, the integration of AI into data processing systems introduces new challenges to information security. As algorithms increasingly connect and cross-analyze data from various sources, there is a heightened risk of AI reconstructing and re-identifying personal information, even when the data has been anonymized. Additionally, AI systems typically require large volumes of data for training and improving performance, leading to a tendency to accumulate and indefinitely store user data, which significantly increases the potential for data breaches and misuse.

Moreover, the complexity of modern AI models complicates the traceability and control over data usage, particularly when data is transferred through multiple intermediaries or applied across different AI applications. Looking ahead, as AI continues to evolve with self-learning and self-improving capabilities, it is conceivable that AI systems could autonomously generate detailed digital profiles of individuals by aggregating and analyzing digital footprints. Such profiles could predict user behavior, preferences, and even future decision-making trends with remarkable precision—all without explicit consent.

On the other hand, the lack of unified technical standards for safeguarding personal data in AI applications, coupled with the disparities in legal regulations among nations, may create significant gaps in the protection of user rights on a global scale. This underscores the necessity for robust international cooperation in establishing standards and regulations for personal data protection within the AI environment, as well as enhancing the capacity for monitoring and enforcement of data protection laws in this domain.

#### *3.3.3. The ethical challenges in the development of artificial intelligence are becoming increasingly prominent*

The rapid and powerful advancement of AI, while creating groundbreaking opportunities that revolutionize human life, also raises profound and complex ethical issues in contemporary society. Firstly, the ability of AI to self-learn and

[31] Williamson, S. M., & Prybutok, V. (2024). Balancing privacy and progress: A review of privacy challenges, systemic oversight, and patient perceptions in AI-driven healthcare. *Applied Sciences*, *14*(675)

make autonomous decisions poses questions about the boundaries of moral autonomy, especially when machine-made decisions can directly impact human rights and lives, particularly in critical fields such as healthcare, autonomous transportation, and national security.

Furthermore, AI's ability to generate sophisticated fake content (deepfakes) undermines societal trust and creates severe ethical challenges regarding the authenticity of information and accountability in its dissemination. By nature, AI systems are tools, machines, and algorithms devoid of human-like morality, emotions, and humane values. Unlike humans with ethical reasoning, AI lacks the capacity to weigh actions based on considerations of empathy, fairness, and reasonableness when making decisions.

Notably, with AI's increasing role in specialized tasks, education, and research, and as more decisions are entrusted to automated algorithms without thorough consideration of ethical and humanistic values, concerns arise about the potential dependency on AI and the erosion of human independent thinking. Additionally, the development of AI raises questions about fairness in the distribution of benefits and social burdens, as this technology might exacerbate existing inequalities or create new forms of inequity.

Therefore, it is imperative to establish a clear ethical framework with guiding principles to ensure that AI is developed and utilized for the common good of humanity, respecting fundamental ethical values and human dignity.

#### 3.3.4. The development of artificial intelligence carries inherent risks of unfairness and lack of transparency

While AI possesses a certain degree of objectivity and independence in decision-making, avoiding the subjective biases often associated with human actions, it still harbors risks that could lead to unfair outcomes and opaque practices.

First and foremost, AI algorithms are typically developed based on data provided by humans. This data may inherently carry long-standing societal biases or reflect the subjective intentions of those approving the input data, inadvertently reinforcing and amplifying existing inequalities in automated decision-making processes. A particularly critical issue arises with AI models that incorporate "black box" algorithms, where the reasoning process is neither clear nor explainable. This characteristic makes it extremely challenging to evaluate fairness and address potential biases.

Additionally, disparities in AI development levels, resources, and access to technology among nations, regions, and social groups can create significant divisions. Marginalized communities are at a heightened risk of being left behind in this technological revolution. Moreover, the concentration of power in the hands of a few major tech companies—organizations capable of developing and controlling advanced AI systems—could lead to monopolies that shape the future of technology and society, further exacerbating divisions and inequalities between these entities.

Furthermore, a lack of transparency in AI development not only undermines public trust but also introduces safety and security risks. Undetected vulnerabilities or errors in the system may remain unresolved, potentially leading to significant harm. In practice, the complexity of modern AI models makes independent verification and evaluation increasingly difficult, posing challenges for regulatory oversight and intervention. This highlights the need for robust legal frameworks to ensure transparency, fairness, and accountability in AI development and deployment.

### 3.4. Proposed Solutions for Transparent, Safe, and Sustainable AI Development

#### 3.4.1. The Need for a Specialized and Comprehensive AI Legislation

Currently, the existing legal provisions governing AI are scattered across various legislative documents, lacking cohesion and posing significant challenges in practical application. This fragmented approach not only complicates the management and oversight of AI activities but also creates barriers to the development of this technology. Moreover, the unique characteristics and rapid advancements of AI necessitate a distinct legal framework capable of adapting to new changes and challenges. Therefore, from the perspective of enhancing the legal system, the establishment of a specialized and comprehensive AI law serves as a foundational step in creating a robust legal framework for the sustainable development of this technology.

This specialized legislation should be designed with a clear scope of regulation, comprehensively encompassing activities related to the research, development, and application of AI. It must also delineate fundamental principles and mandatory standards to be adhered to throughout these processes.

To achieve practical effectiveness, the proposed legislation should fulfill several essential requirements to ensure

that AI is developed and applied transparently, safely, and sustainably.

Firstly, in terms of comprehensiveness, the legislation must address critical aspects of AI, ranging from defining and classifying AI systems based on risk levels to establishing detailed provisions regarding the rights and obligations of stakeholders involved. Secondly, regarding enforceability, the provisions should be sufficiently specific to enable practical application while remaining flexible enough to avoid stifling innovation within the sector. Additionally, the law should ensure compatibility with international standards and best practices for AI governance, thereby facilitating cross-border cooperation and technological exchange.

Enacting a dedicated AI law not only provides significant benefits to stakeholders but also serves as an effective legal instrument to regulate and monitor AI activities, thereby enhancing state management capabilities in this emerging technological domain. For businesses, a clear and predictable legal framework builds investor confidence, encouraging research and development in the AI sector. Notably, for the general public, such a law will establish mechanisms to protect their rights and legitimate interests when using AI applications, while simultaneously enabling access to safe and reliable AI technologies.

In the context of deepening international integration, having specialized AI legislation will further elevate the nation's position in AI governance and facilitate the harmonization of domestic laws with international standards. This is especially critical given the trend among developed countries to actively refine their AI legal frameworks, as evidenced by the European Union's Artificial Intelligence Act and similar initiatives in the United States, Japan, and Singapore.

#### 3.4.2. The Legal Framework Must Establish Mandatory Standards for Transparency and Explainability in AI Systems

As AI systems increasingly undertake critical decision-making roles that significantly impact human lives, the establishment of mandatory regulations on AI transparency and explainability has become more urgent than ever. These requirements play a pivotal role in fostering trust and ensuring accountability in the development and deployment of AI technologies. Such standards must be designed to ensure that the decision-making processes of AI systems can be understood, examined, and evaluated by stakeholders.

The necessity of these mandatory standards arises from the reality that many AI systems currently function as "black boxes," where decision-making processes remain opaque or incomprehensible to end users. This lack of clarity raises legitimate concerns about fairness, reliability, and the controllability of AI systems. Particularly in sensitive fields such as healthcare, finance, and justice, a lack of transparency can lead to severe consequences for the rights and interests of individuals[32].

To address these challenges, the legal framework must define specific core standards for transparency and explainability. First, it must mandate the disclosure of training data, including its sources, collection methods, and processing procedures. Second, developers should be required to provide detailed descriptions of AI algorithm structures and operational principles, especially the criteria and logic employed in decision-making processes. Furthermore, mechanisms for monitoring and evaluating the real-world performance of AI systems must be established, including capabilities for detecting and rectifying biases or errors.

The establishment of such standards in the AI legal framework not only safeguards users' rights but also enables developers and businesses to build trust with users and stakeholders while minimizing legal risks and reputational damage. Additionally, transparency standards in the legal framework provide regulators with the tools needed to monitor and assess the compliance of AI systems, ensuring their alignment with public interest objectives.

On a global scale, the development of specific regulations on transparency and explainability standards contributes to harmonizing AI governance across nations. As leading countries, such as the European Union, spearhead the adoption of stringent transparency requirements for AI, aligning with and adhering to similar standards will enhance

[32] Longo, L., Brcic, M., Cabitza, F., Confalonieri, R., Del Ser, J., Guidotti, R., Hayashi, Y., Herrera, F., Holzinger, A., Jiang, R., Khosravi, H., Lecue, F., Malgieri, G., Páez, A., Samek, W., Schneider, J., Speith, T., & Stumpf, S. (2023). Explainable Artificial Intelligence (XAI) 2.0: A Manifesto of Open Challenges and Interdisciplinary Research Directions. *arXiv preprint*.

international cooperation and promote the responsible development of AI technologies worldwide[33].

### 3.4.3. The Necessity of Establishing Strict Regulations for Data Collection, Processing, and Protection in AI Development and Operation

In the current digital age, data serves as the backbone of AI systems, making the establishment of stringent regulations on data collection, processing, and protection an urgent requirement. This process transcends technical rule-setting and involves ensuring privacy and information security for individuals and organizations as AI applications become increasingly widespread.

The necessity for these regulations arises from the growing challenges and risks associated with the data lifecycle in AI development. As AI systems grow more complex and demand massive datasets for training, the risks of data breaches, privacy violations, and misuse intensify. This is particularly critical in sensitive sectors such as healthcare, finance, and national security, where data breaches can have far-reaching consequences.

Effective data protection regulations for AI must cover the entire data lifecycle, from initial collection to processing, storage, and eventual disposal. During the collection phase, regulations should mandate clear requirements for obtaining user consent, ensuring that data subjects are fully informed about the purpose and scope of data use. In the processing phase, advanced technical measures such as data encryption, anonymization, and access control must be implemented to safeguard sensitive information[34].

Another critical aspect is the establishment of monitoring mechanisms and accountability frameworks for data management. This includes requiring AI developers to maintain robust systems for logging and tracking data processing activities, conducting periodic privacy impact assessments, and having contingency plans to address data breaches. Additionally, there should be clear provisions for reporting and mitigating data violations, ensuring transparency and accountability among stakeholders.

The development of robust regulations for data collection, processing, and protection in AI development will serve as a cornerstone for safeguarding user privacy and information security. Such regulations will foster user trust in AI applications, mitigate risks for businesses, and enhance their competitive edge in a market increasingly focused on security. Furthermore, these regulations will contribute to building a trustworthy and sustainable AI ecosystem.

### 3.4.4. Promoting International Cooperation and Actively Participating in Global AI Governance Initiatives and Forums

In the era of globalization and the rapid advancement of AI technology, fostering international cooperation and actively engaging in global AI governance initiatives have become imperative. This need is particularly pressing given the cross-border nature of AI applications and the shared challenges nations face in managing this transformative technology.

The necessity for strengthening international collaboration in AI governance stems from several critical reasons. First, challenges associated with AI, such as privacy protection, cybersecurity, and ethical AI practices, cannot be effectively addressed by any single nation. These issues require a collective, coordinated response to ensure uniform standards and practices globally. Moreover, the divergent approaches to AI regulation among countries could create barriers to the development and deployment of AI technologies on a global scale. The lack of international coordination might also lead to a "race to the bottom" in establishing safety and ethical standards for AI.

To promote effective international cooperation in AI governance, nations must actively engage in international forums and initiatives dedicated to this field. This includes participation in organizations such as UNESCO, OECD[35], and G20 working groups on AI. Furthermore, countries should contribute constructively to the development of international principles and guidelines for the responsible development and application of AI. This proactive

[33] Burkart, N., & Huber, M. F. (2021). A survey on the explainability of supervised machine learning. *Journal of Artificial Intelligence Research*, 70, 245–317.

[34] Paul, A. L. (2024). The role of artificial intelligence in enhancing data security. *Cybersecurity Advances*, May 2024

[35] OECD. (2024). *AI, Data Governance, and Privacy: Synergies and Areas of International Co-operation.* OECD Artificial Intelligence Papers, No. 22. Retrieved from OECD AI Papers.

involvement not only strengthens global governance mechanisms but also ensures that diverse perspectives and experiences inform the creation of comprehensive, inclusive standards.

Another essential aspect of international cooperation is the harmonization of domestic AI regulations with global standards. This involves studying and adapting best practices and emerging trends in AI governance, particularly groundbreaking initiatives such as the European Union's AI Act. The harmonization process must be approached with careful consideration of each country's unique legal and technological environment, ensuring that the integration of international standards is practical and contextually relevant. Such alignment not only facilitates international collaboration but also enhances the effectiveness and credibility of domestic AI governance frameworks.

## IV. CONCLUSION

The rapid advancement of AI technology presents unprecedented challenges to existing legal frameworks, necessitating timely adjustments and updates to meet emerging practical requirements. The establishment of a comprehensive and effective legal framework for AI is not merely an urgent requirement but a prerequisite for ensuring the sustainable development of this technology.

The proposed legal framework must be designed based on the principle of balancing innovation promotion with safety and ethical considerations. This requires active participation and close coordination among various stakeholders, including regulatory bodies, businesses, research institutions, and end-users. Furthermore, the framework must maintain sufficient flexibility and adaptability to accommodate the continuous evolution of AI technology.

To effectively implement this legal framework, several key solutions must be executed simultaneously. The establishment of a specialized AI regulatory and oversight body with sufficient authority and resources plays a pivotal role. Concurrently, developing high-quality human resources, particularly experts with integrated knowledge of legal and AI technology, along with raising community awareness about legal and ethical aspects of AI, are indispensable elements for ensuring the framework's success.

Looking forward, as AI continues to evolve rapidly, the legal framework will require continuous refinement and updating to address new challenges. This demands ongoing efforts in research, evaluation, and adjustment of legal regulations, coupled with enhanced international cooperation in this field. Only with a robust and effective legal framework can we fully harness AI's potential in promoting innovation and sustainable development while minimizing potential risks and adverse impacts.

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# CHALLENGES FOR VIETNAM WHEN IMPLEMENTING THE EUROPEAN-VIETNAM INVESTMENT PROTECTION AGREEMENT

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**ABSTRACT**

The European - Vietnam Investment Protection Agreement (EVIPA) and the European - Vietnam Free Trade Agreement (EVFTA) has been expected that bring great economic achievements to Vietnam. However, EVIPA has not exerted its full influence due to many reasons. This has caused certain delays in Vietnam's socio-economic development plans when important legal agreements are signed when Vietnam and European Union (EU) got engaged. With recent domestic and world fluctuations, the current challenges that Vietnam faces in effectively implementing EVIPA are unforeseeable circumstances. By clarifying some of the difficulties that Vietnam is facing when implementing commitments in EVIPA, the author gave some solutions for Vietnam to resolve them.

*Key words*: "investment protection"; "EU", "EVIPA"; "Vietnam"

## I. INTRODUCTION

Despite Vietnam's efforts to speed up the ratification of EVIPA, some EU Member States are distracted by other major issues, delaying the time for investors from both sides to fully enjoy the incentives. EVIPA is one of the best solutions to increase European investment in Vietnam. Although signed in 2019 and ratified by the European Parliament and the Vietnamese National Assembly in 2020, EVIPA is still subject to ratification procedures by EU members. To date, the parliaments of 17 EU Member States have ratified the Agreement. According to the European Affairs Department of the Ministry of Foreign Affairs, the remaining countries have not yet done so due to reasons such as the ongoing efforts to deal with the Russia-Ukraine conflict and the complicated procedures in their parliaments, in which some parties do not support trade liberalization because they want to protect domestic production from unforeseen challenges (Khoi Nguyen, 2022).

To make the most of the investment attraction and expected benefits that EVIPA brings, Vietnam is identifying obstacles and ways to remove them in the process of bringing into effect and implementing this Agreement. The issues studied in this article have not been mentioned in previous works from the perspective of analyzing difficulties and finding solutions to improve the implementation of EVIPA from Vietnam.

## II. MATERIAL AND METHODOLOGY

This section is to review the main contents of EVIPA along with the ratification process of the signatories and the current difficulties for Vietnam in implementing this Agreement. The analysis and synthesis method will be the main method used for this article.

In the initial negotiation phase (from 2012 to May 2017), the EVFTA included contents on investment protection, liberalization and investment dispute settlement. However, within the European Union (EU), some new issues arose related to the division of authority to ratify free trade agreements (FTAs) between the EU and each Member, so some of the above contents were separated into EVIPA. Specifically: EVFTA (under the approval authority of the EU Parliament) regulates trade issues and all contents on direct investment liberalization previously agreed upon by the two Parties; EVIPA (under the approval authority of the European Parliament and the Parliaments of the Member States) regulates investment protection (including direct investment and indirect investment) and dispute settlement between the state and investors.

EVIPA, when it comes into effect, will replace 21 existing bilateral investment promotion and protection agreements that Vietnam has signed with EU members. The agreement consists of 4 Chapters, 92 Articles and 13 Annexes. EVIPA is mainly an investment promotion agreement based on a number of principles to ensure that Vietnam

develops relations with the EU in the spirit of respecting each other's independence, sovereignty and territorial integrity. These principles are consistent with the objectives agreed upon by the parties in the Vietnam - EU Comprehensive Partnership and Cooperation Agreement (PCA). The issues focused in the 4 chapters of EVIPA include: i) Chapter 1 stipulates the objectives and concepts used in the Agreement (to strengthen economic, trade and investment relations between the Parties in accordance with the development objectives in other FTAs); ii) Chapter 2 stipulates the scope of the Agreement and each Party's commitment to investment protection for investors who have legally invested in the territory of the other Party (except for investors' market access rights during the investment approval stage because they have been regulated in the EVFTA); iii) Chapter 3 stipulates the dispute settlement mechanism during the implementation of the Agreement (including the dispute settlement mechanism between the Parties on the interpretation and application of the Agreement and the settlement of disputes between one Party and the other Party's investors according to the standing mechanism); iv) Chapter 4 stipulates the mechanism for organizing the implementation of the Agreement (EVIPA).

EVIPA and EVFTA are expected to contribute to strengthening economic, trade and investment ties between Vietnam and the EU; contributing to enhancing Vietnam's position in ASEAN and the international arena. Complying with the commitments in EVIPA means that Vietnam must continue to improve its institutional and policy systems to make the investment and business environment increasingly favorable, equal, safe, transparent and friendly for partners and investors. This is the basis for Vietnamese leaders to believe that the implementation of the agreement will create momentum for Vietnam to promote investment attraction from the EU in industries such as processing industry, high technology, clean energy, banking and financial services, etc. and Vietnamese investors will have easier access to the EU market. During the period of accelerating the negotiation of EVIPA, investment capital from the EU has increased dramatically from 2017 to present compared to the previous period. It seems that expectations for EVIPA have been one of the driving forces attracting investment from the EU to Vietnam, with the average total investment capital in the period 2017-2021 increasing by 86% compared to the period 2015-2016. Specifically, in the period 2015-2016, FDI capital from the EU to Vietnam only reached $841.12 million while this figure increased significantly to $1,508.77 million (2017) and even in 2021, which was affected by the pandemic, it still reached $1,405.27 million (VCCI, 2023,1).

Although EU FDI in Vietnam is still modest compared to its partners in the Asian region, it is classified as high quality, with high technology content and transfer rate, advanced management methods and high added value creation, contributing significantly to the development of Vietnam. A positive sign of EU FDI in Vietnam after Vietnam ratified EVIPA is that the scope of investment is no longer focused on high-tech industries but has actively shifted to expand to services, clean energy, supporting industries, food processing and high-tech agriculture, etc.

EVIPA was directly signed by the representatives of the parties on June 30, 2019 in Hanoi, and ratified by the Vietnamese National Assembly on June 8, 2020, at the 9th Session of the 14th National Assembly with 95.45% of the total number of National Assembly deputies in favor (Training Center for Elected Representatives, 2020). On the European Parliament side, since February 12, 2020, it has ratified this Agreement along with EVFTA. However, while EVFTA has come into effect and has had positive impacts on Vietnam's economy, the implementation of EVIPA has been delayed because the EU Member States' parliaments have not completed the ratification procedures. Up to now, 10/27 EU Member States have not ratified EVIPA for various reasons. This causes certain difficulties for Vietnam in the process of integrating into the world economy in a new position as well as realizing its economic - political - social goals. And so far, the implementation of EVIPA has not been able to proceed as expected when it was signed. That is why Vietnam is making efforts to promote the ratification of the remaining EU members to be able to take advantage of the effectiveness of EVIPA as soon as possible. But perhaps, with the domestic fluctuations of the Signatories and the current world situation, this effort will be a challenging "journey" for Vietnam at present.

## III. RESULT AND DISCUSSION

### 3.1. Challenges for Vietnam in the implementation process of EVIPA

Currently, the challenges for Vietnam in implementing EVIPA mainly focus on two issues: how to speed up the implementation of this Agreement; and, the difficulties in complying with EVIPA when this Agreement comes into

effect for the Parties.

**On the first issue**, accelerating the implementation of EVIPA means promoting the ratification process of the Parliaments of the remaining EU Members. The EVIPA is under the ratification authority of the Vietnamese National Assembly (Article 29, Law on International Treaties 2016 of Vietnam) and the EU Member States also stipulate that this right belongs to their respective agencies. The Vietnamese National Assembly's ratification of EVIPA at the same time as the EVFTA aims to create an important premise for the 27 EU Member States to soon complete internal legal procedures for EVIPA to come into effect. However, as mentioned above, this is not easy, although since 2020, Vietnam has shown many efforts to influence this process. The reasons why Vietnam's efforts have not achieved the desired results can be attributed to the following reasons:

Firstly, the world political situation, especially recent armed conflicts, have dominated and negatively affected the diplomacy, military and socio-economics of EU Member States. The armed conflict between Russia and Ukraine has not only polarized the world political map but also comprehensively affected the activities and performance of global trade, especially with EU countries. The energy and food crisis in Europe due to the prolonged war, combined with recent natural disasters, has had a chain reaction on other manufacturing industries. Since the beginning of 2022, the parliaments of EU Member States have mainly focused on discussing issues to minimize the possibility of the above conflict causing damage to their countries as well as preventing the war from escalating by introducing compatible foreign policies in intra-bloc or extra-bloc meetings in the EU. Therefore, the ratification of EVIPA from the EU has also been delayed. Most Western countries, including the EU, have quickly imposed sanctions on Russia in response to the armed developments in Ukraine. These sanctions against Russia had a significant impact on the global economy, and the Vietnamese economy would not escape the consequences. Russia has been removed from the international payment messaging system SWIFT, Western countries have effectively frozen $630 billion of Russia's foreign exchange reserves, and many major banks and financial institutions have frozen Russian overseas assets worth a total of about $3 billion. Russia's removal from the SWIFT system in particular has created a crisis for businesses exporting goods to Russia, as they are now having difficulty making and receiving payments from Russian entities (VCCI, 2022). The war also caused world oil prices to rise, causing difficulties for agricultural production and the import and export of agricultural, forestry and fishery products of countries. In particular, businesses that depend on raw materials from Russia or Ukraine face the risk of direct supply shortages due to the war. This conflict has caused shortages and price increases for many commodities such as oil, gas and grain, of which Ukraine is one of the world's largest exporters. Therefore, inflation would increase and EU businesses that depend on imported raw materials but could not increase selling prices to offset increased raw material costs will face difficulties. Inflation risks are also likely to slow down consumption and FDI flows from the EU to Vietnam. The Russia-Ukraine conflict has worsened inflation and disrupted supply chains, causing the global economy to stagnate and making the international investment environment more difficult for many businesses. It can be seen that the Russia-Ukraine war has had a negative impact on both the Vietnamese economy in practice and the progress of ratification of EVIPA by EU members.

Second, the EU has not recognized Vietnam as a market economy, leading to many concerns among its members about the risks to their investors when accessing the Vietnamese market. And these countries have been waiting for further changes in Vietnam's trade mechanisms and policies to ratify the Agreement. Although it has been a member of the WTO since January 2007 and has had more than 17 years to improve the domestic trade environment according to global rules, many countries in the WTO have not yet recognized Vietnam as a market economy, including the EU. Up to now, only 72 countries out of more than 200 countries and territories have recognized Vietnam as a market economy. Political and commercial ties have led many EU members to agree with the United States in saying that Vietnam's economy has not yet achieved the elements of a true market economy. In 2015, while negotiating the EVFTA, the representative of the EU delegation noted to the press that the signing did not mean recognizing Vietnam as a market economy. Non-market economy refers to economies where the government has a monopoly or near-monopoly on trade and the state sets domestic prices. If an exporting country is considered non-marketable, the normal principles of price calculation will not be used. The importing country may use such other methods as it deems reasonable. This creates some major disadvantages for producers and exporters from economies that are considered non-market. The United States has 6 criteria to consider recognizing any country as having a market economy, including: the level of currency

conversion; wage and salary negotiations between employees and employers; the level of foreign investment in economic activities; the issue of state ownership, private ownership; the level of government control over some resources and prices; other factors (Phan Minh Hoa, 2024). With the EU, this recognition is considered based on 5 criteria: the level of government influence in allocating resources and business decisions (Vietnam has done so, according to the EU's assessment in 2015); no state intervention that distorts the daily operations of businesses; corporate governance, accounting and auditing; the existence and enforcement of some legal regimes, respect for intellectual property rights, bankruptcy and competition as well as judicial systems; financial sector (Duc Minh, 2023). Over the past 20 years, it went on, Vietnam's economy has undergone remarkable changes and development with signing and putting into practice 17 FTAs, including new-generation and high-standard FTAs with EU, the countries of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), and the UK, with many extensive and comprehensive commitments from the reduction of duties to the raising of labour standards, environmental protection, sustainable development, government procurement, and transparency (Nhan Dan Newspaper, 2024). The EU is the third most important import market for Vietnamese goods from 2020. Therefore, being recognized as a market economy by US and EU is of great significance to Vietnam's manufacturing and export industries.

Third, Vietnam's economic ties with China make many EU countries not ready to shift their investment flows to Vietnam. Due to geographical and historical factors, whether we like it or not, Vietnam's economy cannot be separated from China's economy, especially since Vietnam's production depends heavily on Chinese raw materials. Meanwhile, Western countries, especially the United States and its EU allies, are not very sympathetic to China when they cooperate "moderately" in trade and are trying to "Escape from Chinese influence" by finding alternative partners. This is really a disadvantage for Vietnam in its strategy of promoting trade cooperation out of Asia. The majority of Vietnam's export products are still heavily dependent on supplies from China - a barrier to the origin of goods when accessing the EU market. While the controversy over forced labor has not subsided, raw materials from China are still subject to carbon emission standards during production or harvesting, which is also a major obstacle for Vietnamese manufacturing industries, causing negative feelings among Western trade partners. According to statistics from the Ministry of Industry and Trade, from the fourth quarter of 2022, Vietnam's economic growth has slowed down, making it difficult to achieve the target for the whole year of 2023 of about 6.5% according to the Resolution of the National Assembly. In the first 9 months of 2023, the total export turnover of goods still decreased compared to the same period last year, estimated at 259.67 billion USD, down 8.2%. Of which, the domestic economic sector reached 68.86 billion USD, down 5.7%, accounting for 26.5% of total export turnover; the foreign-invested sector (including crude oil) reached $190.81 billion USD, down 9.1%, accounting for 73.5% (Tran Thi Thu Trang, 2023).

**Regarding the second issue**, when EVIPA comes into effect for all signatories, Vietnam will face a lot of pressure for compliance. Some of the burdens that Vietnam faces include: pressure on governance if many domestic enterprises do not have enough capacity and will go bankrupt when foreign investors with stronger competitiveness appear in the Vietnamese market; pressure on time to perfect the institutions, legal system as well as improve the capacity of the operating team to be compatible with the commitments in the Agreement. These pressures are not entirely caused by EVIPA when it comes into effect but mainly come from the somewhat passive and unsynchronized preparations and reforms when participating in the international environment as well as the ability to respond to fluctuations. Vietnam's passivity and ineffective implementation preparation are reflected in a number of significant manifestations such as:

Regarding mechanisms and policies, policy changes in Vietnam are still not really synchronous and frequent changes in policies will make foreign investors hesitant about their ability to adapt to Vietnam's unstable and unpredictable legal environment. Currently, the Investment Law and the Land Law of Vietnam have been amended, while the 2015 Civil Code is about to be reviewed and amended. If the regulations on assets, ownership, contracts, etc. in the current Civil Code have any changes in the future, it will certainly affect the provisions in the Land Law or Investment Law to some extent and it is not excluded that these documents will have to be amended and supplemented again. When doing business in a country with such constant changes in policies, the psychology of foreign investors will become more shaky and withdrawal from the unstable environment is inevitable.

In terms of the speed of production technology transformation, most EU countries are pioneers in environmentally friendly production techniques in the strategy of integrating sustainable development criteria into the commercial

sector. A series of global conferences initiated and held in Europe during the past time have all had representatives from Vietnam with commitments to reduce greenhouse gases, promote green production, limit coal power and methane emissions in industrial processes. Among these conferences, the 26th Conference of the Parties (COP26) of the United Nations Framework Convention on Climate Change aims to promote countries to strengthen the implementation of socio-economic development policies in the effective and long-term use of clean energy sources (green energy, alternative energy). COP26 took place from November 1 to 12, 2021 in Glasgow, Scotland, UK with the participation of representatives from nearly 200 countries. Within the framework of this Conference, in order to optimize emissions reduction, Vietnam and 39 other countries committed to eliminating coal power - a fuel source that is considered to be a major contributor to climate change globally today. However, coal power is the main fuel source for factories, especially factories specializing in exporting high-value products to Vietnam's economy (COP26: The Glasgow Climate Pact, page 3). Up to now, Vietnam currently lacks many foundations to implement these commitments and at the same time makes EU partners feel that investment and Vietnam will find it difficult to quickly achieve economic and environmental goals.

Regarding the stability of Vietnam's financial system, this can be considered the most doubtful aspect for EU partners at the present time. With the fluctuations of economic groups whose leaders have been prosecuted and brought to trial or are awaiting trial in recent times such as FLC, Tan Hoang Minh, Van Thinh Phat... have caused serious crises for the entire financial system along with related banks and individuals participating in financial products issued by these enterprises. Up to now, Vietnam has not yet resolved all the serious consequences caused by the violations caused by the above groups, leaving many serious consequences for society. Due to the slow detection of violations, the consequences left for society are too great with extremely serious damage, which also creates some negative effects. In particular, EU partners have the right to raise concerns about Vietnam's governance capacity and the possibility of similar risks in the future that may directly or indirectly affect the investment efficiency of their businesses when coming to Vietnam. If these violations recur in other companies or the consequences are prolonged, it is inevitable that foreign investors will withdraw capital from Vietnam. The level of implementation of commitments on remittance protection and compensation in case of instability in EVIPA is not guaranteed. And potential investors from the EU will be able to choose safer countries in terms of financial stability to promote investment. In the Southeast Asian region, competitors in attracting investment from the EU to Vietnam include Indonesia, the Philippines, Malaysia, etc., while in Asia, there are many other countries that can replace Vietnam in this field.

Thus, in order not to lose the opportunity to other countries, Vietnam needs effective solutions to speed up the ratification of EVIPA from EU partners and must quickly resolve domestic backlogs to complete the implementation process of EVIPA as effectively as possible.

**3.2. Some recommendations for Vietnam in responding to current challenges**

By identifying current difficulties in the implementation of EVIPA, the author proposes some compatible solutions for Vietnam to deal with the above problems, specifically as follows:

**For the first issue, accelerating the ratification of EVIPA by the remaining EU countries**, Vietnam needs to proactively make efforts first in diplomatic solutions. In the recent past, representatives of Vietnam, Government and National Assembly have increased their visits to urge the parliaments of EU member countries to soon ratify the EVIPA and consider this an important task of the National Assembly's foreign affairs in the coming time. Best of all, Vietnam should organize a conference in Vietnam with the participation of leaders of the 27 EU members to directly lobby the remaining countries in the Union to accelerate the ratification of the Agreement. Within the framework of such a meeting with all Parties, Vietnam will receive the advantage of support from the countries that have ratified and directly address the concerns of the countries that are hesitating. Furthermore, a multilateral meeting like this will save Vietnam time and money compared to traveling to lobby each partner as it does now.

In addition, Vietnam needs to speed up the process of achieving recognition as a market economy by the United States and the EU - important trade partners today. The advantage for Vietnam to achieve this important step is that Vietnam and the United States have upgraded their relationship to a comprehensive strategic partnership in 2023 after the US Secretary of State's visit to Vietnam. And on the EU side, the EVFTA has come into effect and is also greatly

contributing to the EU's re-evaluation of the criteria for a market economy for Vietnam. In the case the United States recognizes Vietnam as a true market economy, the EU will make a similar move in the near future. Achieving this achievement will improve the speed of ratification of EVIPA compared to the current situation of being treated as a non-market economy by important partners. In the coming time, the competent authorities of Vietnam shall be continued to study and analyze the arguments in the EU's economic assessment report of Vietnam to continue to supplement and complete the summary and related dossier to propose reconsideration of the recognition of Vietnam's market economy status. In parallel with this, Vietnam needs to promote the comprehensive strategic partnership with the EU, thereby promoting economic, trade and investment cooperation.

**Regarding the second issue, what should Vietnam do to effectively comply when EVIPA comes into effect?** Some solutions can help reduce pressures on Vietnam at that stage, such as:

In terms of mechanisms and policies, it is necessary to synchronize the process of amending and supplementing legal regulations related to the implementation of EVIPA. When considering and amending any regulation in the domestic regulatory system, in addition to assessing its consistency with current regulations, the National Assembly and relevant agencies need to consider its compatibility with Vietnam's commitments in EVIPA. In general, the commitments in EVIPA do not contain content contrary to the 2013 Constitution, are basically consistent with Vietnamese law and are consistent through a review of Vietnam's legal system. One of the efforts showing Vietnam's preparation for implementing EVIPA is the issuance of a Resolution recognizing and enforcing in Vietnam the judgment of the investment dispute settlement agency under the Vietnam - EU Investment Protection Agreement (VCCI, 2020). This Resolution stipulates the procedures for recognition and enforcement of the final judgment of the Dispute Settlement Body in Clauses 2, 3, 4, 5 of Article 3.57, Chapter III of EVIPA. For the remaining commitments, the National Assembly and the Government also need to take similar actions to promptly prepare for the implementation of EVIPA. In particular, the Government, as the central executive agency, is responsible for directing relevant ministries and branches to monitor the effective date of the Agreement; develop appropriate plans for synchronous implementation along with improving the capacity of the staff to respond to and handle arising situations to protect the legitimate rights and interests of the country. Since the end of 2024, Vietnam has been undergoing a strong transformation in streamlining the state apparatus in parallel with reforming the legal system so that the State can more effectively perform its domestic and foreign functions. Reforms in mechanisms and policies to serve the implementation of EVFTA and create the premise for EVIPA have been defined, including: i) amending 2/2 Laws (Law on Intellectual Property, and Law on Insurance Business); ii) amending, supplementing, and developing new 5/6 Decrees (including Decrees guiding the Law on Investment, guiding procurement bidding under EVFTA, guiding the Law on Customs, on fragrant rice certification, and issuing special preferential tariff schedules); iii) amending 01 Decision of the Prime Minister (on hiring foreign consultants in construction activities in Vietnam); iv) developing new 2/2 Circulars (including the Circular on trade defense, and the Circular on the time of submitting certificates of origin). On a broader scale, a number of other legal and institutional activities are also mentioned in the above Plans, including: conducting procedures to join 2/4 international treaties (WIPO Copyright Convention - WCT and WIPO Performances and Phonograms Convention - WPPT); develop 03 administrative documents (including the Decision of the Government and the Ministry of Industry and Trade on building a mechanism to establish a Domestic Advisory Group; and the Decision of the Prime Minister on appointing focal agencies to implement EVFTA) (VCCI, 2023,2). These plans need to be further accelerated in the current phase to accelerate the ratification process of the remaining EU members.

Regarding financial stability, Vietnam needs to have specific solutions to address recent financial instability to avoid making EU investors fear risks to their capital. The recent implementation of anti-corruption policies and handling of economic crime groups in Vietnam has created certain aftershocks for domestic and international public opinion. Major cases occurring at large Vietnamese enterprises such as Van Thinh Phat related to the operations of SCB bank, or violations at FLC, Tan Hoang Minh and most recently the violations of Phuc Son Group all involve a number of state officials. There is no guarantee that in the near future, there will be no more large enterprises violating or being discovered to violate because they have or are likely to cause serious consequences for the economy. The strong action of competent authorities in prosecuting and handling individuals who committed these violations has shown Vietnam's

determination to fight corruption in the spirit of transparency and "no forbidden zones", which is worth promoting. However, the point that needs to be improved is that management agencies need to improve their monitoring capacity as well as the ethics of their staff to avoid violations being discovered late, the consequences of which are too serious for the State and the People. This also means improving the management capacity of the Government in the field of maintaining financial stability in the face of other social fluctuations. The handling of major economic cases or corruption crimes must consider the most effective ways to prevent or remedy economic losses for other related entities. Only then can foreign investors' concerns about the safety of their projects in Vietnam be reduced.

Particularly, the transformation of production techniques combined with the search for alternative sources of raw materials will be the key to solving the first and second problems mentioned above. Gradually escaping dependence on raw materials for production that are being criticized by the EU and the West for human rights or environmental friendliness, especially the supply from China, is an urgent need for Vietnam in the face of new regulations in international trade. This is both a solution to promote investment and a solution to deal with the current barriers to Vietnamese exports. To do so, the State must reform the three growth drivers of the economy that are showing signs of reaching a limit due to the lack of fundamental changes in the economic structure: green transformation, reducing energy deficit; controlling carbon emissions; and building a circular economy to become the main forces in promoting economic growth. In the relevant international conferences, Vietnam has participated and made commitments at the macro level, however, the details of implementing those commitments are only at the draft level, not yet completed due to lack of experience. Therefore, the creation of a foundation of mechanisms and policies to implement these progressive economic reforms needs to be promoted by Vietnam in the spirit of learning from experience and calling for support from other countries. Strengthening international cooperation in the aspect of building mechanisms and policies also helps partners see Vietnam's goodwill and efforts towards its commitments.

## IV. CONCLUSION

EVIPA is a comprehensive and high-quality agreement, balancing the interests of both Vietnam and the EU, creating opportunities to promote FDI flows from the EU to Vietnam. When EVIPA is implemented, foreign investment in Vietnam is likely to increase not only from EU member countries seeking opportunities to access the Vietnamese market but also from investors from other countries seeking opportunities through Vietnam to access the EU market. Although considered a negotiation achievement and bringing great expectations for Vietnam in terms of positive impacts, the implementation of EVIPA also poses significant challenges. This requires Vietnam to continue to improve its institutions, policies, and laws; ensure consistency, synchronization, as well as the capacity of the management team and the competitiveness of Vietnamese enterprises. Instead of waiting for the remaining EU countries to ratify the Agreement, Vietnam should take advantage of this time to complete the best preparations for the implementation of the Agreement by improving the existing backlog.

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