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Bahaaeddin Alareeni
Allam Hamdan *Editors*

Technology and Business Model Innovation: Challenges and Opportunities

Proceedings of the International
Conference on Business and Technology
(ICBT2023), Volume 1

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Bahaaeddin Alareeni · Allam Hamdan
Editors

Technology and Business Model Innovation: Challenges and Opportunities

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Editors

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Preface

In an age defined by rapid technological advancements and a growing awareness of environmental and societal challenges, the convergence of technology and business sustainability emerges as a pivotal theme. This book, aptly titled “Technology: Toward Business Sustainability,” endeavors to unravel the intricate relationship between technology and the pursuit of sustainable business practices.

The genesis of this book lies in the recognition that technology, when harnessed judiciously, has the potential to act as a catalyst for fostering sustainability across diverse industries. From renewable energy solutions and eco-friendly manufacturing processes to the integration of artificial intelligence for more efficient resource management, the possibilities are vast and transformative.

As we embark on this exploration, the contributors to this volume, a diverse assembly of thought leaders and experts, present a collection of insights, analyses, and case studies that illuminate the intersection of technology and business sustainability. The goal is not only to comprehend the current landscape but also to envision the future trajectory of businesses operating in harmony with the principles of environmental and social responsibility.

The book welcomes a range of perspectives, from theoretical frameworks that underpin the conceptual foundations to practical applications that demonstrate the tangible impact of technology on sustainable business practices. Whether you are an academic seeking a deeper understanding, a business professional navigating the complexities of sustainability, or a policymaker shaping the agenda for responsible business practices, the content within these pages aims to provide valuable insights and provoke thoughtful consideration.

The chapters within this book traverse a broad spectrum of industries and technologies, reflecting the diverse ways in which innovation can contribute to a more sustainable future. By delving into topics such as circular economy models, green technology adoption, and the role of big data in sustainability initiatives, the contributors contribute to a holistic understanding of the multifaceted challenges and opportunities at the intersection of technology and business sustainability.

May this book serve as a source of inspiration for those seeking to integrate technology seamlessly into their sustainability efforts. It is our hope that the collective wisdom contained herein will not only enhance awareness but also catalyze action, encouraging businesses to embark on a path of sustainable practices driven by the transformative power of technology.

Bahaaeddin Alareeni
Allam Hamdan

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EuroMid Academy of Business & Technology (EMABT)

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There is an ever-increasing need for high-quality research in most if not all aspects of twenty-first-century society. Universities are the primary providers of quality research education. Quality research education requires the participation of both established faculty, newly appointed staff, and research students. There is also the requirement for the academic to reach out to the general society as comprehensively as possible. As the university sector becomes increasingly focused on research excellence, there is a need to provide more fora, primarily in the form of peer-reviewed conferences, for academics to exchange ideas, questions, problems, and achievements concerning their personal research activities. These fora provide opportunities to exchange ideas, experience critiques, and obtain some recognition for individuals' progress toward research excellence. The more international the fora the more effective it is. Although publishing in highly rated indexed academic journals is still the most prized form of academic communication, the conference has become a significant outlet for research findings as well as an important facilitator to achieving this goal.

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speakers/experts from many countries. Some of the conferences will have with them master classes in their associated field which will be run on the day before the conference.

Details of this event are contained on our website at <http://www.embta.com/>.

Conference Title

The International Conference on Business and Technology (ICBT2023)

Overview

The 4th International Conference on Business and Technology (ICBT'2023) is organized by EuroMid Academy of Business and Technology, Istanbul, turkey. It will be held on November 01-02, 2023 at Hilton Istanbul Bomonti Hotel, Turkey.

The main objective of the ICBT'2023 Conference is to gather leading academicians, scholars, and researchers to share their knowledge and new ideas as well as to discuss current development in the fields of business, education, society, and technology.

The ICBT'2023 aims to achieve other objectives as the following:

- Highlighting business and technology problems that are faced by institutions in a scientific way, in addition to finding the possible practical solutions for them.
- Encouraging scientific research in business and technology areas which may contribute to sustainable improvements to it.
- The conference also offers opportunities for academicians and industry experts to meet and interact with local and international participants.
- Enable the researchers to publish their contributions in high-ranked journals and indexed proceedings by Scopus.

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Assessing the Impact of Technology Advancement and Foreign Direct Investment on Energy Utilization in Malaysia: An Empirical Exploration with Boundary Estimation

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Abstract. This study delves into Malaysia's energy utilization dynamics. Energy consumption in Malaysia has surged with per capita income during the shift from a primary-sector-driven economy to an industrialized and urbanized sector. Sustainable resource management, particularly in the energy sector, is crucial for achieving long-term sustainability goals. Using Bound Estimation and annual data from 1985 to 2020, this research employs a comprehensive systems approach, considering economic growth, foreign direct investment, urbanization, governance, and innovation to assess energy determinants in Malaysia. The results highlight economic growth, foreign direct investment, rapid urbanization, and technological advancement as the primary drivers of increased energy usage. Corruption indirectly influences energy consumption. These findings highlight tailored energy policies, emphasizing promoting alternative energy sources to align with the

nation's development goals. Understanding the root causes of Malaysia's escalating energy consumption equips policymakers with insights to formulate sustainable strategies, ensuring steady economic growth while addressing energy-related challenges.

Keywords: Technology advancement · foreign direct investment · energy · Bound estimation

1 Introduction

Energy is important to maintain social operation and economic development. Energy consumption has expanded in recent years due to population and economic growth [1]. Malaysia, one of the ASEAN fastest-growing economies, has seen a rise in energy usage alongside the increasing per capita income. Before 1970, energy consumption in Malaysia was low because primary sectors dominated economic activities. However, as secondary sectors replaced the primary sector, energy usage increased with industrialization and urbanization [2]. Population also increases energy use, driven by income levels and energy prices. The energy-intensive industries increased energy consumption, with heavy industries requiring more energy. Developed nations exhibited higher per capita energy consumption. Since the 1970s, global eco-crisis caused by energy and pollution have garnered attention [3]. Reducing energy usage has become a global imperative, as reflected in the United Nations' 2030 Agenda's sustainable development goal number seven: "Affordable and clean energy" [4]. The Industrial Revolution during the current eco-crisis exacerbated environmental damage through energy resource overuse. Discerning the key factors influencing the energy sector's sustainability is vital.

Foreign direct investment (FDI) offers advantages to key infrastructure sectors, particularly in energy-related services. Researchers emphasize FDI's role in financing energy-efficient solutions [5] through the acquisition of energy-consuming products. As energy demand rises and natural resource availability declines, energy prices will rise, driving more efficient technology development. [6] showed that technological progress affects energy use, as seen in China, which reduced energy intensity through advanced equipment imports. Hence, technological innovation is crucial for energy conservation. Measuring technical progress is challenging in numerous nations, with patent applications used as a proxy [7]. [7] confirmed that technological development enhances energy productivity. However, energy demand has increased in most countries, known as the 'rebound effect.

Therefore, this study uses Bound Estimation to examine the short-term and long-term relationship between selected variables and energy used in Malaysia. By identifying the underlying causes of increasing energy use in Malaysia, policymakers can develop sustainable initiatives to address the issue and maintain stable economic growth. The following section focuses on the literature review. Next, Sect. 3 explains the methodology of this study, followed by analysis and discussion in Sect. 4. The last section highlights the conclusion and policy recommendations.

2 Literature Review

DV: Energy Use Impact Climate Change

Energy is indispensable for modern society, serving as resource for all nations. Population growth and economic development drive the demand for dependable and affordable energy. Energy sources encompass non-renewable options such as coal, natural gas, uranium, and fossil fuels, and renewable alternatives like hydropower, geothermal, solar, tide/wave/ocean energy, wind, solid biofuels, biogas, and liquid biofuels [8]. Over the past decade, global energy demand has surged, with a 2.3% increase reported in The World Energy Outlook 2018. The United States, China, and India accounted for 70% of this rise. Other regions like ASEAN, the Middle East, and North Africa are expected to follow. Over 80% of the world relies on non-renewables, primarily fossil fuels [9]. The heavy use of non-renewable energy has severe environmental repercussions like climate change and greenhouse gas emissions [10]. Fossil fuels cause climate change, air pollution, global warming, and greenhouse gas emissions. Their consumption depletes finite resources, exacerbating environmental concerns [11]. Thus, reducing CO₂ emissions is vital. Energy is vital for economic growth [12], but climate crisis is caused by excessive reliance on fossil fuels and non-renewable sources [13]. Malaysia also seeks alternative energy sources to lessen this dependence [14]. Malaysia revised its energy policy continuously, such as the Five Fuel Diversification Act (1999), the Renewable Energy Act (2011), and the 11th Malaysia Plan (2016–2020) to promote renewable energy and green technology [14]. Research supports the environmental benefits of sustainable renewable energy to minimize pollutants [13–15].

(1) LNFDI - Foreign Direct Investment

Foreign direct investment (FDI) serves as a conduit for knowledge, technology, and management systems transfer to host countries [16]. FDI can wield a dual impact on energy consumption, potentially affecting climate change. [17] found that FDI and financial development in 59 BRI countries between 1990 and 2016 contributed to pollution and environmental degradation. [18] also highlighted FDI's role in stimulating economic growth while exacerbating environmental issues. Some developing countries strategically attract foreign companies through relaxed environmental regulations, causing environmental problems. [19] introduced the concept of a “pollution haven hypothesis,” suggesting that developing countries benefit from FDI but experience pollution and environmental degradation through lax environmental laws. Conversely, Solarin et al. [20] proposed the “pollution halo hypothesis,” when developed countries suffer negative environmental impacts from FDI's stringent environmental regulations. [21] supported the halo hypothesis by showing that FDI reduced pollution and environmental deterioration. [22] distinguished two FDI effects: the augmentation effect, linked to increased total investment and societal and economic growth, and the efficiency effect, with positive externalities like better technological innovation and managerial skills improving energy efficiency and competitiveness [21, 22]. FDI can introduce energy-saving technologies to host nations, promoting sustainable development. [23] highlight FDI's role in spreading technology in developing countries through cleaner technology and management practices. ASEAN countries, including Malaysia, have received advanced, cleaner technology through FDI from developed nations.

(2) LNURB – Urbanization

Urbanization, defined by [24], concentrates permanent residents into densely populated areas, usually from rural to urban areas. Malaysia's urbanization has surged in the last decade. The urban population increased from 66% in 2004 to 74% in 2014, expected to reach 77% by 2020 [25]. The IEEJ [26] predicted a rising energy consumption due to population and economic growth in India, ASEAN, the Middle East, and North Africa, driven by better opportunities, healthcare, and job prospects in urban areas. Udemba et al. [25] and Khan [27] highlighted that urbanization brings greater industrial activities, transportation, household consumption, and energy demand, negatively affecting Malaysia's environment and economy. Shahbaz et al. [28] noted rising costs and social inequalities exacerbating energy consumption. Globally, Lafrance [29] found low energy use rates per capita in Canada's most urbanized regions. Pachauri [30] revealed that inefficient solid fuel usage in rural areas outpaces urban areas in China and India. Ke et al. [31] stressed the context-dependent nature of urbanization's energy effects, which vary with a country's economic growth level.

(3) LNCOR – Governance

In Malaysia, the government plays a pivotal role in influencing energy consumption through energy policies [32]. Government ideology is a significant determinant of energy and environmental policies. Left-wing governments prioritize renewable energy sources like solar, wind, hydroelectric, and geothermal power to reduce fossil fuel dependency and climate change [33]. Right-wing governments support energy deregulation, favoring non-renewable fossil fuels such as coal, oil, and natural gas. They promote domestic fossil fuel production and incentivize the fossil fuel industry [34]. Right-wing parties prioritize business and economic growth, while left-wing parties focus on environmental protection. However, the implementation varies based on national priorities, available resources, and the political landscape.

(4) LNINV – Innovation

The government plays a vital role in shaping energy usage in Malaysia, and technological innovation is crucial for improvement. Innovation involves generating and integrating new ideas to address future problems, and promoting global economic significance [35]. Technological innovation is essential for industrial energy efficiency and curbing emissions. While it may initially increase energy use through rebound effects, where efficiency gains reduce costs, [36] research highlights China's significant energy efficiency improvements, saving over 10 EJ of energy in 2017 across various sectors. When technological innovation does not reduce energy consumption, efficiency is gained through better energy structure. However, Murad [37] showed that technological innovation can increase energy consumption, as higher economic growth demands higher energy supply. Thua, effective government policies, pricing controls, and taxation are essential for enhancing energy efficiency, reducing consumption, and environmental protection.

(5) LNGDP - Economic Grow

High energy demand contributes significantly to economic growth from increased input and productivity. Efficient energy use is essential for economic growth, although excessive energy output can harm the environment. Energy consumption must be maximized

for efficiency to drive economic expansion, as seen in South Asian countries like Pakistan, India, Nepal, Sri Lanka, and Bangladesh [37]. While renewable and non-renewable energy consumption positively influences economic growth, non-renewable energy is more pronounced [38]. Low levels of renewable energy consumption in developing countries can hinder economic growth. Crossing a certain threshold of renewable energy usage becomes critical for avoiding negative growth. In some countries, including Belgium, Italy, Israel, Morocco, Romania, Portugal, South Africa, Thailand, and the United States, renewable energy policies caused reduced output and energy conservation [39]. Thus, developing countries should invest in renewable energy to exceed the threshold and boost energy output. Turkey, for example, is investing in renewable energy to achieve its National Renewable Energy Action Plan goals by 2023 [39]. It requires increased investment in renewable energy development, incentives, public-private partnerships, and grants to promote its use efficiently.

3 Methodology

3.1 Theoretical Framework

In energy economics, standard energy demand is intrinsically tied to the dynamics of income and energy prices [40]. This relationship has been explored and substantiated in various studies [41]. A robust framework shows the energy demand function when we contemplate the equilibrium market point, wherein energy demand aligns perfectly with energy consumption. This function is rooted in the classic Marshallian demand theory [42], particularly when considered within a specific moment in time, denoted as “t.” The energy demand equations can be written as follows:

$$E_{Dt} = f(Y_t, P_{et}) \quad (1)$$

In Eq. (1), E_{Dt} , Y_t , and P_{et} stand for, respectively, energy demand, income, and energy cost at time t.

This study considers the influence of FDI, urbanization, corruption, and technological innovation on energy use, as discussed in the introduction.

$$E_{Dt} = f(Y_t, P_{et}, FDI_t, URB_t, COR_t, INV_t) \quad (2)$$

In Eq. (2) FDI_t denotes Foreign Direct Investment, URB_t for urbanization, COR_t for corruption, and INV_t for technological innovation.

Hence, the energy demand function for Malaysia can be expressed as an empirical model:

$$ENC = f(GDP_t, FDI_t, URB_t, COR_t, INV_t) \quad (3)$$

where, ENC is used to denote energy use.

The Econometric version of Eq. (3) can be written as:

$$ENC_t = \beta_0 + \beta_1 GDP_t + \beta_2 FDI_t + \beta_3 URB_t + \beta_4 COR_t + \beta_5 INV_t \quad (4)$$

Equation (4), β_1 to β_5 , is used as a slope coefficient of explanatory variables.

We transformed all variables into logarithmic form in Eq. (5). Logarithmic variables are a valuable tool in data analysis and modelling.

$$LENC_t = \beta_0 + \beta_1 LGDP_t + \beta_2 LFDI_t + \beta_3 LURB_t + \beta_4 LCOR_t + \beta_5 LINV_t \quad (5)$$

3.2 Data and Description

The analysis encompasses annual data series from Malaysia between 1985 and 2020. Energy Use is the dependent variable, while the independent variables consist of Foreign Direct Investment, GDP per capita, Technological Innovation, Urbanization, and Corruption. All data is extracted from World Development Indicator except for corruption which is extracted from Transparency International database.

3.3 Empirical Framework and Method of Estimation

3.3.1 Unit Root Test

In econometrics and time series analysis, a unit root test is a statistical procedure to determine whether a time series dataset follows a stationary or non-stationary process. Numerous studies recommend multiple stationarity tests because their efficiency varies with sample size when determining the classification of series integration. The Augmented Dickey-Fuller unit root and Philips Perron unit root tests were employed to check stationarity.

3.3.2 Autoregressive Distributive Lag Model (ARDL)

The investigation utilized the ARDL model, established by Pesaran et al. [43], as an efficient estimating tool to reveal both short- and long-term interactions among the model's parameters. The Autoregressive Distributed Lag (ARDL) method has an advantage over other cointegration approaches due to its flexibility and versatility in analyzing relationships between non-stationary time series variables. Unlike traditional cointegration methods, ARDL accommodates cases where the variables have different orders of integration, applicable to a wider range of economic and financial datasets.

Equation 6 illustrates the ARDL limits test:

$$\begin{aligned} \Delta LENC_t = & \varphi_0 + \pi_1 LENC_{t-1} + \pi_2 LGDP_{t-1} + \pi_3 LFDI_{t-1} + \pi_4 LURB_{t-1} + \pi_5 LCOR_{t-1} \\ & + \pi_6 LINV_{t-1} + \sum_{i=1}^w \varphi_1 \Delta LENC_{t-i} + \sum_{i=1}^w \varphi_2 \Delta LGDP_{t-i} \\ & + \sum_{i=1}^w \varphi_3 \Delta LFDI_{t-i} + \sum_{i=1}^w \varphi_4 \Delta LURB_{t-i} + \sum_{i=1}^w \varphi_5 \Delta LCOR_{t-i} \\ & + \sum_{i=1}^w \varphi_6 \Delta LINV_{t-i} + \epsilon_t \end{aligned} \quad (6)$$

The absence of cointegration, which serves as the null hypothesis, is juxtaposed with the presence of cointegration, representing the alternative hypothesis. When the F-statistic surpasses the predetermined threshold values for both the upper and lower

limits, it becomes untenable to embrace the null hypothesis. The null and alternative hypotheses are presented in Eqs. 7 and 8, respectively.

$$H_0 = \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 \quad (7)$$

$$H_1 = \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq \varphi_6 \quad (8)$$

H_1 stands for the alternative hypothesis and H_0 for the null hypothesis.

The ARDL method was used after establishing the co-integration of the parameters. Engle and Granger's [72] error correction model (ECM) evaluated short-term correlations and the "Error Correction Term". After that, the long-term associations were established. Equation 9 was employed for the long-run ARDL estimation.

$$\begin{aligned} \Delta LCO_{2t} = & \varphi_0 + \sum_{i=1}^w \varphi_1 \Delta LCO_{2t-i} + \sum_{i=1}^w \varphi_2 \Delta LGDP_{t-i} + \sum_{i=1}^w \varphi_3 \Delta LPOP_{t-i} + \sum_{i=1}^w \varphi_4 \Delta LFDI_{t-i} \\ & + \sum_{i=1}^w \varphi_5 \Delta LREN_{t-i} + \sum_{i=1}^w \varphi_6 \Delta LFOS_{t-i} \\ & + \ell ECT_{t-i} + \epsilon_t \end{aligned} \quad (9)$$

where speed of adjustment is denoted by ℓ .

4 Empirical Findings

4.1 Unit Root Test

The findings reveal the stationarity characteristics of the variables under investigation. Thus, supporting using the ARDL model.¹

4.2 ARDL Bound Test

Pesaran et al. [66] used ARDL modeling to explore the long-term association between variables. The null hypothesis suggests no significant correlation, indicating a long-term co-integration relationship. The F-test statistic (5.301) in Table 1 exceeded critical F-values (1%, 5%, 10%), rejecting the null hypothesis and confirming co-integration among the studied variables. Eviews software facilitated the Pesaran et al. (2001) test.

4.3 ARDL Short-Run and Long-Run Estimation

Table 2 presents the comprehensive long-term findings from the ARDL model, offering insights into the relationships between key factors and energy utilization in Malaysia. Economic growth, measured by LNGDP, exhibits a strong positive link with energy consumption, with a coefficient of 0.864. Thus, a 1% increase in GDP per capita leads to approximately a 0.864% rise in energy usage, underscoring that economic development increases energy demand. Foreign Direct Investment (FDI) and urbanization

¹ The Unit Root result is available upon request.

Table 1. Bound test

F-statistic	5.301***	
Critical value	Lower bound	Upper bound
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Note: *** denotes significance at 1%.

positively impact energy consumption, with LNFDI and LNURB coefficients of 0.070 and 0.943, implying that a 1% increase in FDI and urbanization corresponds to energy consumption increases of 0.070% and 0.943%. Foreign investment and urban growth contribute to Malaysia's energy demands. Conversely, corruption exhibits a significant negative relationship with energy use, as the LNCOR coefficient (-1.074) suggests that a 1% increase in corruption levels leads to a 1.074% reduction in energy consumption. Good governance and anti-corruption measures promote energy efficiency. Technological advancement, represented by LNINV, positively influences energy utilization, with a coefficient of 0.139, indicating that a 1% increase in technological innovation causes a 0.139% rise in energy consumption. Innovation drives energy demand, possibly through energy-intensive technology adoption.

Table 2. Long-run ARDL estimation result

Variable	Coefficient	Std. Error	t-Statistic	Probability
LNGDP	0.864	0.132	6.519	0
LNFDI	0.07	0.016	4.358	0
LNURB	0.943	0.229	4.117	0
LNCOR	-1.074	0.199	-5.392	0
LNINV	0.139	0.045	3.067	0.006
C	-0.129	0.891	-0.145	0.885

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively

Table 3 summarizes short-term ARDL results, offering insights into energy consumption dynamics in Malaysia. In the short run, LNGDP, LNURB, LNCOR, and LNINV show no significant impact on energy use. However, Foreign Direct Investment (FDI) positively correlates with short-term energy consumption, with an LNFDI coefficient of 0.060, indicating a 1% increase in FDI leads to a 0.060% rise in energy consumption, highlighting FDI's role in stimulating immediate energy demand. These findings showed how various factors influence short-term energy consumption, aiding policymakers in aligning short-term and long-term energy goals.

Table 3. Short-run estimation results

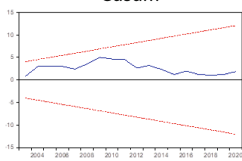
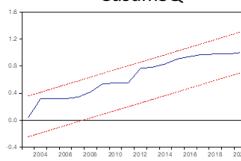
Variable	Coefficient	Std. error	t-statistic	Prob.
D(LNGDP)	-0.098	0.229	-0.428	0.673
D(LNFDI)	0.06	0.017	3.436	0.002
D(LNURB)	0.213	0.155	1.371	0.187
D(LNCOR)	-0.301	0.235	-1.281	0.216
D(LNINV)	-0.016	0.037	-0.447	0.66
D(LNINV(-1))	-0.072	0.023	-3.101	0.006
D(LNINV(-2))	-0.074	0.016	-4.456	0
D(LNINV(-3))	-0.069	0.015	-4.385	0
CointEq(-1)	-0.868	0.156	-5.559	0

4.4 Diagnostic Test Results

As illustrated in Table 4, the methodology employed in this study has undergone rigorous diagnostic scrutiny, revealing its robustness in handling potential statistical issues. The analysis indicates an absence of concerns related to serial correlation, non-normality, or heteroskedasticity, bolstering the model's reliability. Additionally, the Ramsey RESET test showed no missing variables within our meticulously constructed model, affirming its completeness. The model's stability and predictive power were strengthened by the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ). These plots, firmly positioned within the 5% significance threshold, provide compelling evidence of the model's consistency and reliability over time.

Table 4. Diagnostic tests results

Test statistic	F-statistic	Probability
BG Serial Correlation LM	1.465	0.260
Ramsey RESET stability	1.344	0.262
Heteroscedasticity	1.133	0.394
Jarque-Bera	7.138**	0.028
CUSUM and CUSUMSQ	Cusum	CusumSQ

5 Conclusion and Policy Recommendations

This study focused on finding the macroeconomic determinants of energy consumption in Malaysia, using Bound estimation from 1985 till 2020. The main variables were the level of technology advancement captured by total patent per capita and the second variable was foreign direct investment. To complete the modelling, other macroeconomic variables such as degree of urbanization, corruption level and economic growth were included. The analysis showed that all variables are positive and significantly affected energy use except for corruption, which negatively relates to energy use in Malaysia. These results may provide several practical policy implications. First, higher economic growth will result in higher energy use. As the economy expands, higher energy is needed to support the industry. Thus, leaders would advise a new policy emphasizing more renewable energy. Strategic urbanization planning is crucial to integrate clean energy in the new housing area through solar panels. Higher FDI also leads to higher energy use in the country. Policymakers must focus on attracting investors from advanced countries to bring their clean energy into the nation and renewable energy. Higher levels of technology cause higher levels of energy consumption. When the country benefits from green technology, a higher demand for renewable energy will happen. This research should help the current government that depends on polluted energy and halting sustainable development.

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Leveraging Soft Power: A Study of Emirati Online Journalism Through Arabic Topic Modeling

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Abstract. This study examines Emirati soft power strategies based on Arabic online journalism by analyzing and categorizing posts and comments on the Facebook pages of Arabic newspapers. This study focuses on the Facebook pages of five Emirate journals, encompassing 60,619 posts and comments. Applying Arabic topic modeling, this study identifies prevalent themes and sheds light on how the United Arab Emirates (UAE) employs digital media to influence global perceptions. This analysis enriches the discourse on digital diplomacy by offering insights into modern diplomatic practices and the role of media in international relations. It underscores the synergy between Emirati soft power efforts and Arabic online journalism, contributing to the current understanding of contemporary diplomacy's digital dynamics.

Keywords: Arabic Topic Modeling · Digital Diplomacy · Emirati Online Journalism · Global Influence · Soft Power

1 Introduction

In today's interconnected world, nations increasingly recognize the potential of soft power as a formidable tool for shaping international perceptions and influencing global affairs. The term "soft power," coined by Joseph Nye, refers to a nation's ability to achieve its objectives through attraction and persuasion rather than through coercion or force <https://chat.openai.com/?model=text-davinci-002-render-sha> [1]. Central to this concept

is the notion that a country's culture, values, and ideals can be projected to resonate across borders, cultivating positive relationships and enhancing the country's global standing. The United Arab Emirates (UAE) has embraced this paradigm. Renowned for its ambitious pursuit of soft power, the UAE has harnessed various communication channels to convey its narrative on an international stage [2]. Online journalism, a powerful platform through which the UAE can disseminate its perspectives and values to global audiences, is particularly interesting in this context. This study offers a comprehensive analysis of the UAE's soft power strategies, focusing on online journalism as a conduit of influence. To this end, this study employs the innovative approach of Arabic topic modeling, a computational technique that reveals latent themes within a vast collection of texts <https://chat.openai.com/?model=text-davinci-002-render-sha> [3]. We explore the nexus between Emirati soft power aspirations and the digital domain by applying this method to posts and comments on Arabic newspapers' Facebook pages. Accordingly, this study analyzes and classifies posts and comments on the Facebook pages of Arabic newspapers. The Facebook pages of five Emirates journals are investigated, and 60,619 posts and comments in Arabic are studied and analyzed. This study aims to uncover the dominant themes in Emirati online journalism and shed light on how the UAE strategically employs digital media to shape international perceptions. By grounding our analysis in actual data from the digital landscape, we contribute to a broader discourse on modern diplomacy, media influence, and the convergence of these dynamics in the UAE's soft power strategy. This exploration enriches the current understanding of the contemporary landscape of diplomacy. It has practical implications for policymakers, media practitioners, and scholars interested in the intricate interplay between digital media and international relations. The structure of the paper is outlined as follows. Section 1 provides a concise background. Section 2 reviews the research in this field. Section 3 describes the research methodology. Our primary findings are detailed in Sect. 4. Section 5 explores the implications of the study's results on the UAE's Soft Power. Finally, Sect. 6 concludes and discusses future implications and research directions.

2 Literature Review

Soft power has emerged as a pivotal concept in international relations, emphasizing the significance of influence through attraction and persuasion rather than traditional power dynamics [4]. Joseph Nye's seminal work introduces the notion of soft power and highlights its role in shaping global politics and diplomacy [1]. Countries' application of soft power strategies to enhance their international standing and promote value has gained prominence. With its dynamic economy and strategic geographic location, the United Arab Emirates (UAE) has proactively adopted soft power strategies to project its image onto the world stage [2, 5, 6]. A notable aspect of the UAE's soft-power arsenal is its apt use of media and communication channels. The UAE has sought to position itself as a hub of culture, innovation, and modernity, often utilizing platforms such as Dubai TV to disseminate narratives. In the digital age, online journalism has become a powerful tool for countries to amplify soft power messages to global audiences. In particular, social media platforms offer unprecedented reach and engagement. The UAE's adoption of online journalism aligns with the broader trend of countries leveraging digital

platforms for diplomatic communication [7]. The Facebook pages of Arabic newspapers, a meaningful source of online news consumption in the Arab world, provide an intriguing arena for studying the UAE's soft power strategies. Computational techniques such as Arabic topic modeling have gained traction in understanding the nuances of the UAE's soft power endeavors in the context of online journalism. Arabic topic modeling enables researchers to uncover latent themes within large volumes of textual data, offering insights into prevailing narratives and discourse patterns [3]. This methodology has been increasingly employed to study digital content across diverse domains, including politics [8, 9], culture [10–12], and society [13, 14]. Building on this foundation, our study aims to explore the synergy between Emirati soft power strategies and online journalism through Arabic topic modeling. By analyzing posts and comments on Arabic newspapers' Facebook pages, we intend to reveal the dominant themes that encapsulate the UAE's efforts to shape international perceptions and project cultural values.

3 Methodology

3.1 Data Collection

The approach adopted in this study was methodological and encompassed distinct stages of data gathering, refinement, and interpretation. We constructed our analysis on an extensive dataset of 60,619 posts sourced from the Facebook pages of five UAE newspapers. We filtered out insubstantial posts or posts with inconsistent content to improve the dataset's quality. Using a precise query configuration, we leveraged the Facepager software to retrieve the necessary URLs for data acquisition. The data were then organized into a local database, allowing convenient export in a CSV format. This selection criterion led us to focus on Facebook posts in five prominent Arabic newspapers. We prudently omitted non-essential attributes when importing the dataset into Google's "Colab" environment to heighten data accuracy and simplify the ensuing analysis. During analysis, we addressed and rectified the presence of incomplete attributes. Notably, our dataset exhibits empty fields and unique characteristics. Guided by the findings in [15], we applied well-known preprocessing techniques to purge the dataset of these anomalies. Such procedures align with established results and ensure the reliability and uniformity of the dataset. The proposed methodology adopted a comprehensive approach, from data extraction to refinement and subsequent analyses. This process was strengthened by modern software applications and was grounded in time-tested preprocessing strategies.

4 Results and Discussion

4.1 Data Analysis

In the digital era, extracting meaningful information from vast volumes of unstructured text data [16–19], particularly in languages such as Arabic, has become imperative [20, 21]. Topic modeling offers a pathway to distill vast textual landscapes into discernible thematic segments. Utilizing Google's "Colab" environment and Python, we delved into the intricacies of topic modeling tailored for Arabic content. We explain our methodological approach below.

Table 1. Identified Topics with Arabic and English Keywords

Topic #	Topic in Arabic	Topic in English
Topic 1	دبي، شرطة، امان، موقع، اجهزة	Dubai, police, security, website, devices
Topic 2	التواصل، العين، برج، صورة، الإماراتية	Communication, Al-Ain, tower, image, the Emirates
Topic 3	اليوم، مدينة، فيسبوك، تعرف، الشباب	Today, the city, Facebook, you know, young people
Topic 4	الدولة، رئيس، تنمية، مجلس، ابتكار	Governance, President, development, Council, innovation
Topic 5	جرائم، مستجدات، الأحداث، جديد، المحلية	Crimes, developments, events, new, local
Topic 6	روسيا، صحيفة، وحدات، الأسد، سنوات	Russia, newspaper, units, Alassad, years
Topic 7	العالم، المال، اقتصاد، أفضل، العربي	World, money, economy, best, Arab
Topic 8	الإمارات، رأس، العربية، العالمي، الفجيرة	Emirates, Ras, Al Arabiya, international, Fujairah
Topic 9	تطور، سوريا، سلاح، الإرهاب، منظمات	Development, Syria, weapons, terrorism, organizations
Topic 10	الجديد، العام، دولة، الأولى، الإمارات	New, General, State, first, UAE
Topic 11	الوطني، صور، مركز، العرب، طفل	National, photos, center, Arab, child,
Topic 12	شاهد، فيديو، الخير، الخاصة، مشروع	Watch, video, good, special, project
Topic 13	تصوير، رصد، وفاة، بالصور، سيارة	Filming, monitoring, death, pictures, car
Topic 14	البيان، وزارة، رسمية، الحكومية، المستقبل	Al-Bayan, official, governmental, future ministry
Topic 15	تطلق، الأول، عام، عدد، دولية	Launches, first, general, number, international
Topic 16	العالمية، اقرأ، مصر، تفاصيل، الإقليمية	Global, read, Egypt, details, regional
Topic 17	الأعمال، موسم، الإماراتي، مهرجان، تظاهرة	Business, season, Emirati, festival, event

(continued)

Table 1. (continued)

Topic 18	قيادة، بن، محمد، راشد، زايد	Leadership, bin, Mohammed, Rashid, Zayed
Topic 19	تويتر، يوم، انباء، الوطن، المقبل	Twitter, day, news, home, next
Topic 20	أبوظبي، السعودية، مليون، الشارقة	Abu Dhabi, Saudi Arabia, million, Sharjah

Google Colab offers a cloud-based Python notebook environment that eliminates the need for a local setup. The added advantage of GPU support makes it an ideal platform for large-scale text analysis. Our initial step involved importing our Arabic textual dataset into a Colab notebook, usually from Google Drive or direct uploads [22]. Arabic, characterized by its distinct script, diverse dialectal variations [23], and profound morphology [24]. This step required a specialized preprocessing approach [25]. Our methodology involved tokenizing the text and filtering using a rigorously curated list of Arabic stop words [26]. Another intricate facet of Arabic scripts is diacritics [27], which, although vital for linguistic clarity, can introduce redundancy in text analysis. Hence, they were prudently eliminated [28]. To extract coherent topics from the dataset, we opted for the renowned Latent Dirichlet Allocation (LDA) technique facilitated by the **gensim** library [29]. In this model, each topic is visualized as a collection of words, while each document is perceived as an amalgamation of topics. For an intuitive visual understanding of these topics and their interrelations, we employed the **pyLDAvis** library, which offered a comprehensive graphical representation of the topics and their relative importance [30].

After processing and analyzing the dataset, we successfully extracted several prominent topics that frequently emerged in the discourse. Using the LDA method, we categorized the data into 20 primary topics. Table 1 shows the topics identified from the topic-modeling analysis, with their corresponding top keywords in both Arabic and English.

From the perspective of our dataset, these topics provide comprehensive insight into the key subjects and themes that dominate digital discussions within the Arabic community. Each topic sheds light on a particular conversation facet, clarifying the concerns, interests, and priorities that dominate this digital space.

5 Implications for UAE's Soft Power

The present analysis offers intriguing insights into how the UAE leverages its soft power in Arabic digital discourse. As posited by Joseph Nye, soft power denotes a nation's ability to shape the preferences of others through attraction rather than coercion. The recurring topics in the discourse provide us with an improved understanding of how the UAE positions itself in culture, governance, and global presence.

- **Geographic and Institutional Focus:** The discussions surrounding "دبي" (Dubai), "شرطة" (police), and "الإمارات" (the Emirates) in Topics 1 and 8 showcase the UAE's efforts in projecting its governance and institutional robustness. The frequent mention and focus on Dubai, in particular, highlights its role as a symbol of modernity and development.
- **Media and Communication:** The frequent mentions of media, especially platforms such as Facebook, underline the UAE's recognition of the power of digital communication in shaping perceptions and narratives.
- **Societal Concerns:** Dialogues around the youth and governance, evident from terms like "العالم" and "العالمية", suggest an active engagement with societal issues, portraying the UAE as a nation that values its people and their concerns.
- **Global Perspective:** The global outlook, as indicated by topics centered around "الشباب" and "الدولة", reaffirms the UAE's aspirations for a pronounced global footprint and influence.
- **Cultural and Current Events:** Emphasis on cultural elements, such as festival "مهرجان" and "تظاهرة" (in the sense of an event), may bolster the state's soft power. Cultural, artistic, and scientific events held in the UAE or sponsored abroad enhance the country's image and cultural and scientific status internationally. These events highlight the progress, innovation, and cultural diversity witnessed by the UAE, which positively reflects its soft power and influence on the international community.
- **Prominent Figures:** Discussions around influential figures such as "راشد, محمد" and "زايد" amplify the UAE's leadership narrative, underscoring their role in the country's vision and development.
- **Economic and Business Discussions:** The economic discussions centered around "السعودية", "أبوظب" and "مليون" illustrate the UAE's vision as a hub for business and trade, reinforcing its position as a critical player in the global economy.

Digital discourse portrays the UAE's multifaceted strategy for enhancing its soft power. By intertwining cultural heritage with modern aspirations, the nation effectively positions itself as a guardian of tradition and a beacon of progress in the Arab world and beyond.

6 Conclusions

This study delves into Emirati soft power strategies by analyzing Arabic online journalism, based on the Facebook pages of five Emirati newspapers, encompassing over 60,000 posts and comments. Through Arabic topic modeling, the prevalent themes highlight the UAE's use of digital media to shape global perspectives, emphasizing the media's growing role in modern diplomacy. The scope of the study, restricted to selected Facebook pages and a specific timeframe, may introduce biases or may not fully capture the entire spectrum of Emirati soft power strategies. It is also worth noting that the inherent bias and selective reporting of media entities might not provide a holistic view of the UAE's digital diplomatic initiatives. These limitations suggest the need for extensive future research analyzing a wider array of digital platforms, incorporating longer timeframes, and possibly integrating qualitative analyses to gain deeper insights. Additionally, leveraging

advanced methodologies and machine learning algorithms may offer a more comprehensive understanding of the nuances and intricacies of the UAE's digital diplomatic endeavors. Top of Form.



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Prototype of Spherical Wrist and Curved Scissors

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Abstract. This paper covers a design study of a support ring in deployable reflector antenna. Following type of antennas commonly used in open space, orbiting on earth, to provide satellite services such as radiocommunication, data exchange, networking, satellite imagery, global positioning, navigating earth observation. Satellite antennas often have parabolic shapes. That shape is achieved using a support ring and its ability to provide proper tension for geodesic mesh. Beside tension, the support ring is a structure which provides the ability of deployment for reflector antennas. Ability of deployment is important for an object to maintain the smallest possible volume during transportation and on the other hand achieve the large diameter while unfolding, once it's placed on orbit. Deployment is provided from joint connections in structure and geometrical shapes of nodes. Set of curved scissors paired with spherical wrist used to achieve desired ring geometry. Study represents optimized concepts for structural nodes and joint connections for pantograph systems. Research is funded by Shota Rustaveli National Science Foundation of Georgia (PHDF-22-1064) SRNSFG.

Keywords: Large Deployable Reflector Antenna · Deployable Structures · Geodesic Mesh

1 Introduction

Following paper gives a description of the research process, intended to improve the technical parameters of the artificial satellite object. It splits in two directions. First is to reduce the mass and volume. Usually, rocket launching and spaceflight requires lowest possible values for payload mass which have to be accelerated. Second is the ability of structure to resist excessive loads caused by forces which provides proper tension to the mesh of the reflective surface. Those forces have to be transferred efficiently to maintain the parabolic surface of the reflector mesh body and to stretch it before performing a desired geometry.

2 Problem Area

Transformable constructions have connection joints with a limited movement and with a defined degree of freedom. Therefore, choosing the individual component, the solution of their connection nodes, the manufacturing technology and the types of materials are very critical.

Materials which would be used in the assembly can be divided into two groups:

- Processable (Raw materials) - such as aluminum sheet, round or square tubes and other semi-finished products, which need some machining to get them into functional condition;
- Finished materials - such as bolts, clamps, gaskets, bearings ropes, etc.

In the first case, the machines are used to achieve the final shapes and because of that, their physical and mechanical properties must have to be considered at all stages of the drawing, while the second group of materials can be selected during the design process.

In addition to the functionality of the deployment technique and the development of control concepts, lightweight aspects and their technical implementation play a key role in future research missions.

Orbital spaceflight requires a satellite or spacecraft payload to be accelerated to very high velocity. In the vacuum of space, reaction forces must be provided by the ejection of mass, resulting in the rocket equation. The physics of spaceflight are such that rocket stages are typically required to achieve the desired orbit. That brings additional requirements for structure - the center of its mass has to be a geometrical center of construction to properly maintain a balance.

Usually, deployable antennas are stored in a cylindrical package with a folded state during transportation with a rocket launcher, before it's placed on orbit. After placing the device on desired orbit, the geodesic mesh body needs to be tensioned with the proper amount of force to unfold and to provide parabolic shape for a reflective surface.

Based on a general requirement, truss structure has to be with a transformable shape. It has to maintain a smaller possible shape during the transportation and then it has to grow in size to achieve a desired condition. Larger size on deployed state means more gain (G) for reflector antenna, which is the main indicator of its performance [1]. Antenna Gain, with measuring unit in dB could be provided with following Eq. (1):

$$G = 10 \times \log_{10} k(\pi/D\lambda)^2 \quad (1)$$

where:

k - Is factor of efficiency and is given from 0.5 to 0.6, as unitless coefficient,

D - Is the diameter of the parabolic reflector, unit with meters,

λ - Is signal wavelength, unit with meters.

At first, high value for antenna gain could be achieved with a large diameter for the reflector mesh body. Larger is the size of the antenna, higher would be the value of - D, which directly increases overall gain - G.

Second, G - is dependent on the overall quantity of surfaces in geodesic mesh. That quantity could be summarized in the efficiency factor of k. It's given as unitless coefficient and varies between 50% and 70% dependent upon the actual antenna [2]. k - is a set of factors. Those factors multiplied together give the overall value of efficiency. For a given case, it's outside of our scope and research, but we have to put on display the importance of surface quantity in geodesic mesh which gives parabolic shape and geometry of reflective surface.

With given equations, the focus of research is to maintain large diameter and rigid stability for truss structure of reflector antenna in unfolded state, to develop new combinations of connections for components and to keep smallest possible dimensions for system in folded state.

3 Solution for Deployable Structures

With a point of view, a parabolic reflector antenna can achieve high gain levels with large size and on the other hand it's capable of providing the same value of gain with smaller size of diameter and increased quantity of reflecting surface in geodesic mesh.

For summation, if we take the k - efficiency factor and λ - as a constant then only variable with G - indicator is depended on, would be given as a D - diameter of parabolic reflector. Larger diameter needs larger truss structure to support proper geometrical shape. For the same time structure has to maintain smaller possible dimensions on folded state, shown in Fig. 1.

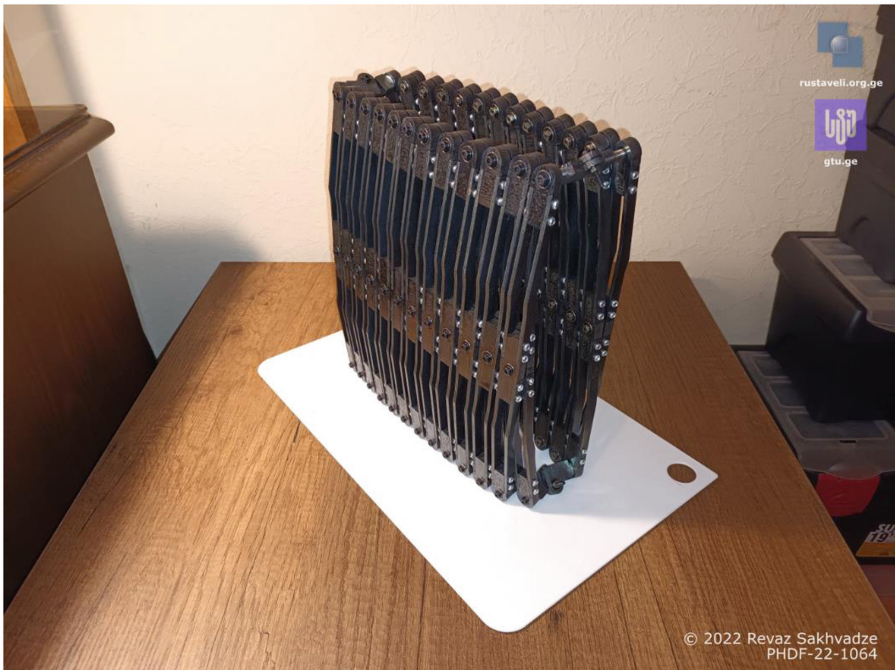


Fig. 1. Truss structure in folded state.

Given support ring is a set of curved scissors, combed with 24 segments in construction. 24 segments are divided in 2 half circles, so each division includes 12 sets of curved scissors. Set of curved scissors had a constant shape of circle with a fixed diameter. This means that it could not rise in diameter but it could be increased as an arch with a length, shown in Fig. 2.

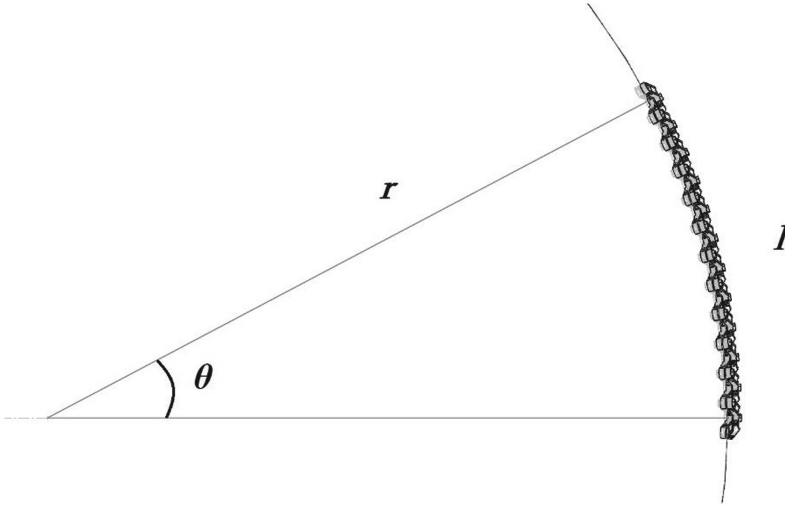


Fig. 2. Arch length and radius with set of curved scissors.

Diameter of the support ring is given as:

$$D = 2r,$$

l - Is length of arch,

θ - Angle, which varies up to 180° in deployed state and intends to 0° when it's folded.

With given variables arch length could be calculated with the following Eq. (2).

$$l = (\theta/360)2\pi r. \quad (2)$$

In the upper case, the value of θ - angle is given when the support ring is divided with 2 half circles. It could be noted with the following Eq. (3).

$$\theta = 2\pi/n. \quad (3)$$

where n - is the number of divisions. Diameters of divided circles have to be equal to each other to properly maintain a circular shape in deployed condition, shown in Fig. 3.

Arch structures need to be connected with specifically designed joint connections; for 2 division support ring 4X joint connection is needed, shown in Fig. 4.

If we need to provide connection for 3 divisions then the number for joints would be 6. As we see, the number of connections is dependent on divisions and it could be noted as $2n$.

The movement of pantographs can be written in the following form by means of the rotating matrix equation:

$$R_z(\theta) = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad (4)$$

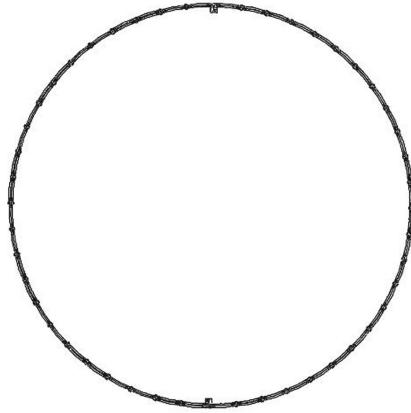


Fig. 3. Support ring with 2 division in deployed condition.

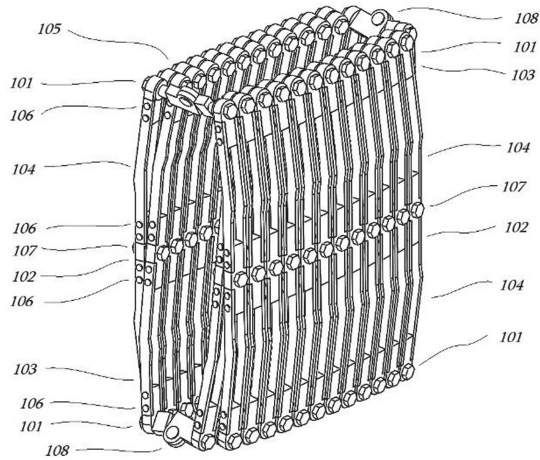


Fig. 4. Support ring with 2 division and 4 joint connections (component 108) in folded state.

The rods are connected on the Z - axis, and the mutual rotation is indicated by the magnitude of the θ - angle. The minimum value of the mentioned angle also depended on the geometric shapes, for instance on the diameter of selected bearings and its placement. Therefore, in a pantograph of curved scissors, if any section of set A - is rotated with respect to Z , the transformation through the matrix will have the following form:

$$A' = Rz(\theta) \times A \tag{5}$$

For the set of - A , we will have a 3×3 matrix multiplied by 1×3 on, which could be written as the following equation:

$$A = \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} \Rightarrow$$

$$\Rightarrow A' = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} X(\cos\theta) + Y(-\sin\theta) + Z \times 0 \\ X(\sin\theta) + Y(\cos\theta) + Z \times 0 \\ X \times 0 + Y \times 0 + Z \times 1 \end{bmatrix} = \begin{bmatrix} X' \\ Y' \\ Z \end{bmatrix} \quad (6)$$

The rotation about the Z - axis is shown in following picture (see Fig. 5) and marked on the pantograph model. According to the scheme, the joint axes of the rods intersect in the center of the system, while their movement on the Z - axis does not change in value.

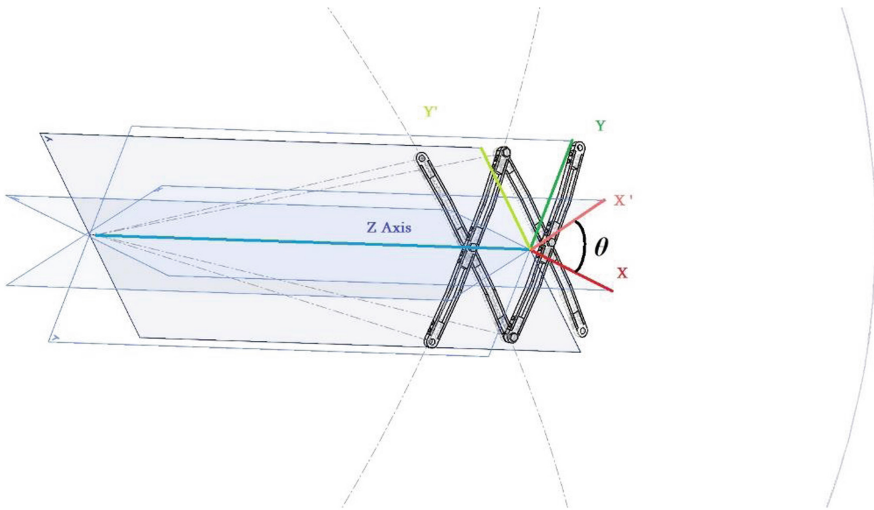


Fig. 5. Visual representation of the rotation matrix in the pantograph of curved scissors.

We have an angle θ , between $X - X'$ - axes, which is equal to the magnitude of the similar angle between Y and Y' - axes. Movement is given in a counter-clockwise direction. The system does not move on the Z - axes, which represents the radius, and is transformable - increasing in size as part of the overall diameter of the structure.

4 Conclusion

Given a solution for reflector support truss construction could be a base of new research and development processes for deployable structures.

Worth to mention that all geometrical shapes could be provided with a 2-dimensional CNC cutting machine. It gives the ability to use a variety of composites or lightweight metals as a material, to maintain a lower weight and proper performance in stiffness.

The small weight of the structure is also important. Optimizing the weight of structural components, developing new joint connections in deployable objects, overall can save cost and reduce the number of rocket launches.

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Effect of Different Types of Teacher Support on Students' Academic Procrastination – Testing the Mediating Effect of Students' Mastery Orientation and Learned Helplessness

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Abstract. Data on students' assessment of teacher support, their academic procrastination and perceptions of mastery orientation and learned helplessness were collected from a sample of 311 undergraduate students. The purpose of current study is to examine the effect of different types of teacher support on students' academic procrastination. Students' perceptions of their mastery orientation and learned helplessness are hypothesized as intervening variables of the relationship between different types of teacher support and academic procrastination. Results support that teachers emotional and instrumental support negatively affect feeling of learned helplessness while informational support positively affects the mastery orientation of students. Indirect effect of teachers' informational support on students' academic procrastination was supported via mastery orientation while the indirect effects emotional support on academic procrastination was supported via perceptions of learned helplessness. These findings highlight the importance of different types of teacher support on students' academic procrastination behaviors. Theoretical and practical implications of these findings are discussed.

Keywords: Academic procrastination · types of teacher support · mastery orientation · learned helplessness · undergraduate students · UAE

1 Introduction

Procrastination is defined as a decision “to voluntarily delay an intended course of action despite expecting to be worse off for the delay” (Steel, 2007, p. 66). Past research suggests that approximately 30–60% undergraduate students regularly report procrastination, and this behavior is linked with higher stress, poor sleep, and low academic performance (Johansson et al., 2023; Kelly & Walton, 2021). Recent studies examining the causes and consequences of this phenomenon suggest that both situational factors and student's self-regulation failure accounts for this behavior (Keerthana, 2023; Zhang et al., 2023). Social support from multiple sources (e.g., peers, parents, teachers) is previously examined as one of a situational factor that has significant effect in the experience

of procrastination. However, the independent role of teacher support is rarely examined and even less is known about the specific supportive behaviors and how these behaviors can affect the academic procrastination of students. Drawing on Tardy's (1985) model of social support, we conceptualize four different types of teacher support, and we expect that teachers' emotional, informational, appraisal and instrumental support encompass different types of behaviors which can influence students' attitudes and behaviors in unique ways. These behaviors can influence students' evaluative beliefs about their abilities, more specifically different types of teachers' support may elicit mastery orientation (a challenging mindset to improve skills) (Sorrenti, Filippello, Orecchio, & Buzzai, 2016) or reduce the feeling of helplessness (intention to give up when faced with challenging tasks) (Filippello, Larcan, Sorrenti, Buzzai, Orecchio, & Costa, 2017). Both mastery orientation and learned helplessness can directly influence students' academic procrastination.

Research on academic procrastination has consistently reported the negative consequences for students' well-being and performance and this phenomenon is pervasive, however little is known about the interventions to control this behavior. Our study aims to contribute toward this line of research by identifying the role of specific types of teachers' behavior which can help students in the development of beliefs about their abilities which can reduce their procrastination. In academic settings, students sometimes are not aware of long-term consequences of procrastination behavior, as they may not seek help and this can become a part of their nature and affect them even in their professional careers (Stead, Shanahan, & Neufeld, 2010). Thus, the findings of this study can help the students as well as the instructors who experience students' procrastination behavior on daily basis and want to help them to overcome this problematic tendency. Specific supportive behaviors can help the students in developing their competence and overcome the fears, the main reasons of procrastination. In the following sections, conceptual framework, literature review, results and discussion are presented. Research model is presented in Fig. 1

Teacher Support

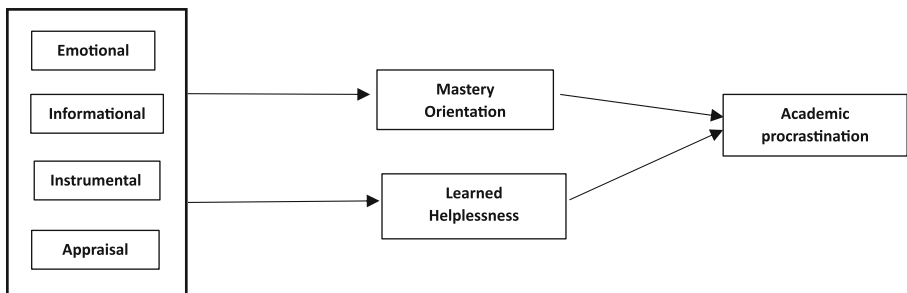


Fig. 1. Research model.

2 Conceptual Framework and Literature Review

2.1 Academic Procrastination

Academic procrastination refers to a tendency to delay the completion of academic tasks despite experience of negative consequences (Simpson & Pychyl, 2009). Procrastination is prevalent in the academic settings among both undergraduate and graduate students, across different racial backgrounds and between genders (Ozer & Ferrari, 2011). Academic tasks prone to procrastination include preparing for exam, writing term paper, submitting weekly assignments, and volunteering for activities (Onwuegbuzie & Jiao, 2000). Studies examining the antecedents of procrastination suggest that individuals procrastinate more when the likelihood of success in performing the task is low, perceive benefit or enjoyment is low or there is a long delay between performing the task and receiving the cost or benefit (Steel, 2010).

Drawing on Klingsieck's (2013) situational perspective, we contend with previous findings that academic procrastination is a failure in self-regulated learning, and this involves both internal and external factors. Both students and teachers need to work together to overcome this problem.

2.2 Teacher Support

Prior research has stressed the importance of positive student-teacher relationship and emphasized the emotional aspect of teacher support as a significant predictor of students' social skills and competence (Brewster & Bowen, 2004). Very few studies examined the different types of teacher support as predictors of students' academic success, and this has never been examined with students' academic procrastination. Concept of teacher social support include broader, distinct collection of behaviors such as informational, instrumental, appraisal and emotional behaviors. As mentioned in Tardy's (1985) model, emotional support refers to caring concern for student needs. Informational support relates to having access to information when student needs advice. Instrumental support refers to providing material support, for example providing extra time to help the student, and appraisal support relates to constructive criticism and positive reinforcement. Past studies examining the effect of teacher support on students' social and emotional outcomes provide support for positive outcomes (Murray & Greenberg, 2000; LaRusso, Romer, & Selman, 2008).

2.3 Mastery Orientation and Learned Helplessness

The mastery orientation refers to a behavioural pattern aims to achieve the challenging goals and persistence in achieving those goals without any fear of failure. Students having mastery orientation believe in the link between their effort and outcomes (Reeve, 2014). To summarize mastery-oriented students, believe in constant learning and they change the strategy if they face failure, they interpret failure as a challenge rather than evidence of their inability. The commitment to challenging tasks, belief in effort leads to success, self-control and high motivation are some of the differentiating characteristics of high versus low mastery-oriented students (Sorrenti, Filippello, Buzzai, Butto, & Costa, 2018).

Learned helplessness refers to beliefs about lack of control on academic activities, no connection between effort and performance and experience of multiple failures is considered evidence of inability and these situations are treated as unavoidable and overwhelming leading to feeling of helplessness (Filippello et al., 2017). Thus, learned helplessness is a complex configuration of dysfunctional attributions which students make when they face failure and challenging task, and these beliefs lead to sense of helplessness and that directly affect academic outcomes (Schleider, Velez, Krause, & Gillham, 2014).

2.4 Effect of Teacher Support on Mastery Orientation and Learned Helplessness

Supportive relationships with teachers and feeling connected with the school can help students in managing the challenging tasks. According to social control theory (Hirschi, 1969), a sense of belongingness and connectedness helps in achieving social skills and mastery orientation (Quratulain et al., 2021). Previous studies have utilized the attachment theory (Ainsworth, Blehar, Waters, & Wall, 1978) explanations to highlight that teacher support (emotional, informational, instrumental and appraisal) can provide open communication, enhance involvement, and provide accessibility to students through distinct behaviors. Supportive teachers' behaviors provide confidence and security to students to approach difficult and novel tasks without fear of failure, thus providing a reliable support system (Bretherton & Munholland, 2008). Thus, we hypothesize.

H1: Teachers' emotional support positively affects students' mastery orientation.

H1a: Teachers' emotional support negatively affects students' learned helplessness.

H2: Teachers' informational support positively affects students' mastery orientation.

H2a: Teachers' informational support negatively affects students' learned helplessness.

H3: Teachers' instrumental support positively affects students' mastery orientation.

H3a: Teachers' instrumental support negatively affects students' learned helplessness.

H4: Teachers' appraisal support positively affects students' mastery orientation.

H4a: Teachers' appraisal support negatively affects students' learned helplessness.

2.5 Mastery Orientation, Learned Helplessness and Academic Procrastination

Self-regulated view suggests that procrastination is a result of cognitive and motivational factors affecting students' academic behavior (Zimmerman & Schunk, 2001). Research on goal theory has emphasized the role of mastery and performance orientations in students' academic achievement (Anderman & Maehr, 1999; Elliot, 1999). Students' mastery orientation and learned helplessness are two distinct motivational and behavioural tendencies. Mastery orientation focuses on motivation to improve one's ability, proficiency, and adaptive outcomes, while learned helplessness is manifested in avoidance behavior. Limited research attention has been devoted to understanding the effect of these orientations on academic procrastination. Although, not tested directly but previous research shows that students procrastinate less under the conditions that foster mastery orientation and procrastinate more when situation strengthens work avoidance orientation. Thus, drawing on these theoretical and empirical findings, we hypothesize.

H5: Students' mastery orientation negatively affects academic procrastination.

H6: Students' learned helplessness positively affects academic procrastination.

Conceptual model is presented in Fig. 1.

2.6 Methodology

Participants were undergraduate students at different universities in the United Arab Emirates. 450 students were invited to participate in an online survey. 311 complete responses were received. Participation was voluntary, and anonymity of responses was ensured.

2.7 Measures

Academic procrastination – was assessed with a six items scale of Solomon and Rothblum (1984).

Learned helplessness and mastery orientation – assessed with Sorrenti et al., (2018) scales. Six items were used for learned helplessness and seven items were used to assess mastery orientation.

Teacher's support was assessed with 12 items scale of Tennant et al., (2015).

Students age, gender and national background were used as control variables.

2.8 Data Analysis and Hypotheses Testing

Descriptive statistics and correlations are present in Table 1.

Table 1. Descriptive Statistics and Intercorrelations among the measures used in the study.

Variables	Mean	Std. D	1	2	3	4	5	6	7	8	9	10
1. Age	20.29	2.14										
2. Gender	1.75	0.43	-.28**									
3. Nationality	2.84	4.32	.10	-.19**								
4. Emotional Support	3.71	0.99	.16**	.01	.08							
5. Informational Support	3.85	1.06	.07	.05	.12*	.84**						
6. Instrumental Support	3.63	1.03	.17**	.01	.07	.83**	.81**					
7. Appraisal Support	3.55	1.08	.14**	.01	.04	.84**	.77**	.86**				
8. Learned helplessness	3.01	0.98	-.06	.02	-.13*	-.37**	-.34**	-.37**	-.33**			
9. Mastery orientation	3.96	0.79	-.06	.02	.15**	.24**	.30**	.19**	.18**	-.02		
10. Academic procrastination	31.87	8.4	-.03	.13*	-.10	-.18**	-.13*	-.19**	-.20**	.24**	-.17**	1

*N = 311. Cronbach's α coefficients are displayed on the diagonal. * $p < .05$, ** $p < .01$.*

Mediational analysis was conducted using SPSS process macro model 4 to test the direct and indirect effects of different types of teacher support on academic procrastination via learned helplessness and mastery orientation. Emotional support was a significant predictor of learned helplessness and its effect on procrastination via learned helplessness is significant, as shown in Table 2 below.

Table 2. Direct and indirect effects of Emotional Support on students' Academic Procrastination

Direct Effect	se	t	p	LLCI	ULCI
-0.4253	1.05	-.04	.68	-2.4962	1.6456
	Indirect Effect	BootSE	BootLLCI	BootULCI	
TOTAL	-.6159	.2968	-1.2352	-.0644	
Mastery Orientation	-.1654	.1903	-.5954	.1680	
Learned helplessness	-.4504	.2269	-.9337	-.0573	

Informational support was a significant predictor of mastery orientation and its effect on procrastination via mastery orientation is significant, as shown in Table 3 below.

Table 3. Direct and indirect effects of Informational Support on students' Academic Procrastination

Direct Effect	se	t	p	LLCI	ULCI
1.6662	.9071	1.8369	.0672	-.1188	3.4513
	Indirect Effect	BootSE	BootLLCI	BootULCI	
TOTAL	-.4436	.3094	-1.1061	.1281	
Mastery Orientation	-.5038	.2612	-1.1191	-.1080	
Learned helplessness	.0603	.2234	-.3750	.5254	

Instrumental support was a significant predictor of learned helplessness however its effect on procrastination via learned helplessness was not supported, as shown in Table 4 below.

Table 4. Direct and indirect effects of Instrumental Support on students' Academic Procrastination

Direct Effect	se	t	p	LLCI	ULCI
-.5740	1.005	1.8369	-.571	2.5522	1.404
	Indirect Effect	BootSE	BootLLCI	BootULCI	
TOTAL	-.2177	.2775	-.7791	.3276	
Mastery Orientation	.1782	.1873	-.1363	.6074	
Learned helplessness	-.3958	.2436	-.9427	.0075	

Appraisal support was not a significant predictor for both mastery orientation and learned helplessness and its effect on procrastination via both mastery orientation and learned helplessness were not supported, as shown in Table 5 below.

Table 5. Direct and indirect effects of Appraisal Support on students' Academic Procrastination

Direct Effect	se	t	p	LLCI	ULCI
-1.3101	.9137	-1.4339	.1527	-3.1081	.4879
	Indirect Effect	BootSE	BootLLCI	BootULCI	
TOTAL	.1997	.2191	-.2254	.6466	
Mastery Orientation	.1056	.1404	-.1602	.4175	
Learned helplessness	.0942	.1661	-.2202	.4448	

3 Discussion and Conclusion

These findings suggest that different types of teacher support have different influences on students' academic procrastination via their motivational beliefs of learned helplessness and mastery orientation. Students experiencing emotional and informational support report less helplessness and enhanced mastery orientation which directly influences their procrastination behaviors. These findings suggest implications for educational practice, particularly interventions can be designed incorporating teacher support to address the prevalent issue of procrastination. This can also help in building a more supportive educational environment (Quratulain, 2020) where innovative teaching methodologies and different type of teachers' supportive behaviors can help students' academic journey (Nagadeepa et al., 2023; El Dandachi et al., 2023; Taha et al., 2023).

3.1 Limitations

Although our sample is large and results align with the previous findings, data was collected from three universities in the United Arab Emirates (UAE), thus results may have limited generalizability. Future research should replicate this research in different countries and both graduate and undergraduate student sample should be included. In addition, the sample included a significant number of female students (75%) and UAE nationals (78%). Future research can examine the effect of gender and other motivational and attitudinal variables as outcomes of different types of teacher support.

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Business and Optimization Applications Using AI Chatbots

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Abstract. These systems, sometimes known as smart robots, are intended to accomplish jobs with a high level of intelligence. Applying this intelligence can proficiently gather, analyze and, assess complex business data that comes from multiple sources, including financial reports, sales data, and consumer feedback. The utilization of natural language processing capabilities in AI systems, such as, ChatGPT, enables the rapid acquisition of critical information. The usage areas of AI-based Chat bots have started to increase also in business. The aim of this study is to examine three different business application in AI-based chatbots. First case study shows how can we utilized the feature of text summarization, and the second and third are dependent on mathematical techniques which are optimization and project management.

Keywords: AI Chatbots · Business Applications · Digital transformation

1 Introduction

AI systems, commonly referred to as smart robots, are designed to perform tasks with a level of intelligence and autonomy. Given that computers designed for human interaction are equipped with specific components, they consequently provide users with the opportunity to engage in such interaction [1]. The computer application known as Chatbot provides users with the option to engage in learning through the utilization of “natural language” conversation [2]. Chatbots are utilized not only for user interaction, but also find application in other fields including business, finance, and e-commerce [3, 4].

There are so many fields to implement natural language-based AI conversational technology. First of all, during the implementation of these programs, it is vital for the user to determine the specific goal that requires these chatbots are being utilized. In accordance with this objective, various advantages are provided to users. As an illustration, AI-powered chatbots can briefly summarize extensive documents. By employing this approach, questions related to the content can be easily answered. This feature offers users quick access to information. Simultaneously, the finding of information associated with a particular subject within an extensive text is facilitated in a more practical manner.

Other fields that can be implemented in the chatbots are business optimization problems. Describing the problem at a specific and understandable level is a crucial initial step in developing an optimization model that will have an impact on the efficiency or performance of business organizations. By using this approach, it is possible to enhance the operational effectiveness of businesses, boost efficiency levels, and obtain optimal solutions [5]. Chatbots can develop desired modeling by engaging in mutual interactions with users through the utilization of natural language features, particularly when hard optimization problems are entered into these bots. Users of chatbots also utilize AI-powered chatbots as a means of optimizing time efficiency. Given the numerous benefits associated with easy and rapid information Access, it has been becoming more important to put emphasis on this approach in recent times [6].

Another subject that can be used in association with the field of business is project management. An AI-powered conversational agent can be employed to share knowledge related to effective time management and contribute to the development of awareness in this field. Additionally, due to its capability of dealing with complex structures, it may also provide specific recommendations for resolving complicated project networks. By adopting this approach, it can provide various perspectives to the project manager and increase the effective and optimal utilization of resources throughout the completion of the project.

2 History of Chatbots

Previous studies have usually concluded that the invention of robots improved artificial intelligence. As a science fiction writer, Isaac Asimov immortalized the term “robot”, which was inspired by the work “Rossum’s Universal Robots” by Czech author Karel Capek [7]. The growing popularity and development of chatbots based on artificial intelligence, which is among the digital transformations that have experienced a significant increase in recent years, can be traced back to earlier decades. In 1950, Alan Turing who is mathematician and computer scientist asked a question “Can a computer communicate in a way indistinguishable from human?” [8]. The attempt to interact with the utilization of computer programs by humans launched in the 1960s through the act of investigating this question. In 1966, Joseph Weizenbaum developed the “ELIZA” program, an initiative aimed at enhancing reciprocal communication abilities and imitating human intelligence. In the following year, of 1972, psychiatrist Kenneth Colby developed a conversation robot named “Parry” with the intention of simulating the behaviors shown by those diagnosed with schizophrenia. Another significant chatbot that maintains an important place in the academic literature is “Jabberwacky”, which was developed by Rollo Carpenter, a programmer from the United Kingdom. The most significant noteworthy characteristic that distinguishes this chatbot from earlier version is the utilization of a machine learning system to provide the conversation panel. Therefore, the system performs an analysis of the input provided by users, subsequently generating a comprehensive database, and delivering responses to the user based on these interactions [9–11].

After that, in the year 1995, the ALICE program, designed by Wallage and referred to as “Artificial Linguistic Internet Computer Entity”, emerged. A unique characteristic of this program is its ability to recognize the difference between a “chatbot” and a “language information model”. This feature enables the development and utilization of alternative language information models [12]. ALICE, a conversational agent, was developed as a system utilizing the artificial intelligence markup language and was designed to exhibit similarities to ELIZA. One notable characteristic that sets apart the systems of the two programs is that ELIZA employs a method of dividing the inputs into two distinct sentences and subsequently merging them in the response process. This aspect holds significant importance within the field of language processing [13, 14]. According to Molnár and Szüts [15], chatbots are commonly employed for the purpose of optimizing business processes. Chatbots are often used for the aim of simulating complex problems in business applications. The first attempt in this context began in 2001 through the establishment of the Smarter Child program. This program enables users to ask questions to computers related to their areas of interest and then receive answers supported by databases integrated inside the chatbot. This development has been documented in studies as a crucial advancement that improves the field of human-computer interaction to a remarkable level [16].

Overtime, there has been significant improvement in the design and functionality of chatbots. Typically, chatbots can be categorized into two primary forms: those that operate through speech and those that operate through text-based interactions. Following the development of speech-based chat systems such as Apple’s Siri and Amazon’s Alexa, another generation of text-based chatbots emerged [17, 18]. The development of ChatGPT, a text-based chatbot, by Open AI in November 2022 has significantly contributed to the rise in popularity of this technology. Since its launch, this program has gained significant popularity and had user over 100 million within only two months of its release [19, 20]. The primary characteristic of this conversational AI system is its capacity to store computer-generated information up until the year 2021, while also exhibiting a capability for learning through user interactions. Additionally, it has the capacity to respond quickly to complex requests [21]. Following the establishment of ChatGPT, subsequent improvements in artificial intelligence led to the development of comparable structured chatbots, like YouChat and ChatSonic. One distinguishing characteristic of these chatbots in comparison to ChatGPT is their ability to utilize internet resources [22].

The year 2023 has shown the development of ChatGPT-4, an advanced version that included a neural network capable of processing a wider range of data. This program exhibits advanced machine learning approaches and superior problem-solving capabilities, distinguishing itself by its incorporation of text-based, visual, and multimedia creative functionalities. In response to the widespread popularity of this program, a significant number of renowned corporations have simultaneously produced “Chatbots AI” equipped with expanded language models. Bard AI, developed by Google, and Claude AI, produced by Anthropic, which was once part of Open AI, serve as illustrative examples of these kind of systems [20]. In addition to ChatGPT, a conversational-based artificial intelligence program, Microsoft’s Bing AI and Perplexity AI have emerged as the most popular and widely utilized AI programs since their introduction in 2023.

The accuracy of information collected from AI-powered chatbots can be increased when users pick and interact with these trending robots according on their requirements or interests. The AI system known as Perplexity generates text related to information by including citations from a bibliography. In addition to providing information to users, this increases their overall experience. On the other hand, whereas Perplexity AI demonstrates an increased preference towards research tools, Bing AI offers the potential to engage with users adopting a more conversational and natural language approach [22, 23].

The utilization of chatbots has shown an important rise particularly following the development of ChatGPT, leading to an accelerated growth in their implementation [24]. For this reason, various industries are now employing an artificial intelligence driven software or chatbot, facilitated by the coming of age of digital transformation. The employment of the ChatGPT-4 chatbots, for example, has been observed in health-related studies [25–27]. Aside from healthcare, the use of chatbots has increased in industries such as education, finance, marketing, and software engineering. While chatbots in education make students' learning or research more practical, teachers also prepare questions or case studies for students. Additionally, it seems that such an event has a beneficial effect on overall learning outcomes [28, 29]. The learning capacity of a chatbot designed to handle large volumes of data, such as ChatGPT, is an essential component of its utility, particularly within the context of business applications. For example, when performing market research, a survey can be produced, trend for element that should not be included can be identified, or consumer feedback can be analyzed, because of the clear and accurate data offered [30]. In the field of finance, it is possible to employ machine learning techniques to store commonly requested questions from consumers and provide responses through chatbots. Additionally, machine learning can be utilized to offer potential strategies to the customers of companies [31]. In the e-commerce sector, this technology can be used to quickly respond to requests from client, thereby minimizing the need for additional human resources and which ultimately decreases operational expenses [32].

In this context, the utilization of AI-powered chatbots in the field of business has not been adequately explored in comparison to their application in other fields. Therefore, while the existing literature extensively discusses the advantages of this trend in the fields of education and health, there is a noticeable lack of studies related to its use in business applications. While organizations may have a desire to enhance efficiency, there are existing gaps in the literature regarding the practical implementation of this objective. According to the study conducted by Raj et al. [33], the rapid, informative, and more natural response qualities given by ChatGPT promote maintaining Customers and help expand business operations. Table 1 summarizes studies that have illustrated Chatbot AI in the field of business. Prior studies indicate that it is more beneficial to integrate chatbot AI into business applications rather than utilizing them in research paper. As a result of this factor, there exists a lack of research related to this application.

Table 1. Studies using Chatbot AI in the field of business.

Authors	Years	AI Chatbots	Goals
Nugroho et al. [34]	2023	ChatGPT	to investigate to improve the efficiency of business communication in management science
Sudirjo et al. [35]	2023	ChatGPT	to examine the potential of ChatGPT in improving the communication efficiency of micro, small medium sized businesses
Subagja et al. [36]	2023	ChatGPT	Improving the customer service quality
Harahap et al. [37]	2023	ChatGPT	to examine ChatGPT's potential in improving tourism information services
Ayinde et al. [38]	2023	ChatGPT	to guide managers and stakeholders in effectively incorporating ChatGPT into their organizational processes

3 Chatbots AI Applications

Chatbot AI has quickly found its application in daily life, thanks to the convenience it provides in business life. In this study, the solutions that chatbot AI brings to problems in business and optimization fields are examined. In this regard, the approaches of Chatbot AIs to 3 case studies were examined. In the first case study, the text summarization feature of Chatbot AIs was tested. In the second case study, the transformation of linear programming problems into mathematical models was examined. Finally, it was requested to make project scheduling and calculate the critical path for a project containing many activities.

Case Study 1: In the first application, the text summarization feature of Chatbot AIs was tested. In this regard, “The Global Risks Report 2023 18th Edition” report published by the World Economic Forum [39] was selected. The pdf file of the 98-page report was uploaded to Perplexity and asked to analyze it. Answers were received from Perplexity by asking the following questions.

Question 1: Summarize the report.

Answer of Perplexity: “The report titled “Global Risks Report 2023” highlights the potential global shocks that we may face over the next decade. The report emphasizes that the crises of today are eroding the resilience and stability of the global system, leading to emergent risks that can be reduced through collective attention and action today. The report presents a figure that shows progressive tipping points and persistent crises leading to catastrophic outcomes, which are consistently volatile across economies and industries with multiple shocks accentuating divergent trajectories. The report also presents short- and long-term global outlooks, which are slightly volatile with occasional localized surprises over the next two years and limited volatility with relative stability over the next ten years. The report cites sources such as IMF Blog, UBS, and Federal Reserve Bank of New York to support its findings.”

Question 2: What is the biggest risk for Turkey?

Answer of Perplexity: “According to the Global Risks Perception Survey 2022–2023, the biggest risk for Turkey over the next two years is the cost-of-living crisis, which is ranked as the most severe global risk in the short term. Other risks that are also viewed as severe and could impact Turkey include rising inflation, food supply crisis, cyberattacks on critical infrastructure, and failure to meet national net-zero targets. These risks are being amplified by the persistent health and economic overhang of the global pandemic, geopolitical tensions, and an increasingly volatile global system. The report suggests that much-needed attention and resources are being diverted from newly emerging or rapidly accelerating risks to natural ecosystems, human health, security, digital rights, and economic stability that could become crises and catastrophes in the next decade.”

Case Study 2: In the second application, the ability of Chatbot AIs to create mathematical models of linear programming problems was tested. Accordingly, a pollution problem was chosen and asked to Chat GPT.

Question: First problem on page 71 of Winston book [40] has been asked to create a linear model.

Answer of Chat GPT: “To formulate a linear programming (LP) model to minimize the cost of reducing pollution by the desired amounts, we need to define the decision variables, objective function, and constraints.

Decision Variables: Let’s define the decision variables:

- x_1 : The number of tons of factory 1 waste to be processed.
- x_2 : The number of tons of factory 2 waste to be processed.
- x_3 : The number of tons of factory 3 waste to be processed.

Objective Function: The objective is to minimize the total cost of processing the waste from the three factories.

Minimize: $15x_1 + 10x_2 + 20x_3$

Constraints:

1. Pollution reduction constraints:
 - $0.10x_1 + 0.20x_2 + 0.40x_3 \geq 30$ (Pollutant 1 reduction)
 - $0.45x_1 + 0.25x_2 + 0.30x_3 \geq 40$ (Pollutant 2 reduction)
2. Non-negativity constraints: $x_1, x_2, x_3 \geq 0$

This LP model can be solved using standard linear programming techniques to find the optimal values of x_1, x_2, x_3 that minimize the cost of reducing pollution by the desired amounts while satisfying the given constraints.”

Case Study 3: In the third application, Bard is used to calculate the completion time of a project with seven activities and find the critical path. In this regard, Bard was asked a house building problem [40].

Question: Consider the list of activities and predecessors that are involved in building a house. Determine the critical path, find the total float for each activity, and find the free float for each activity with the information in Table 2.

Answer of Bard: The critical path is the longest path through the project network. In this case, the critical path is:

$A \rightarrow B \rightarrow C \rightarrow G$

Table 2. Activities with Predecessors and Durations.

Activity	Description	Immediate Predecessors	Duration (Days)
A	Build foundation	–	5
B	Build walls and ceilings	A	8
C	Build roof	B	10
D	Do electrical wiring	B	5
E	Put in windows	B	4
F	Put on siding	E	6
G	Paint house	C, F	3

This is because the total duration of this path is 26 days, which is longer than any other path in the network.

The following Table 3 shows the total float and free float for each activity in the project network:

Table 3. Total Float and Free Float for Each Activity

Activity	Duration	Early Start	Early Finish	Late Start	Late Finish	Total Float	Free Float
A	5	0	5	0	5	0	0
B	8	5	13	5	13	0	0
C	10	13	23	13	23	0	0
D	5	5	10	18	23	13	3
E	4	5	9	18	22	13	3
F	6	9	15	22	28	13	3
G	3	23	26	23	26	0	0

Answers to your questions:

- The critical path is: A - > B - > C - > G.
- The total float for each activity is:
A: 0 days, B: 0 days, C: 0 days, D: 13 days, E: 13 days, F: 13 days, G: 0 days.
- The free float for each activity is:
A: 0 days, B: 0 days, C: 0 days, D: 3 days, E: 3 days, F: 3 days, G: 0 days”.

4 Conclusion

The integration of artificial intelligence technology has grown widespread in every aspect of our lives to the extent that it has the potential to transform many different areas, including the area of business management. An obvious example relates to the utilization

of language models, such as Chat GPT, which was been developed by Open AI. ChatGPT is an exemplification of an AI application that employs natural language processing (NLP) modeling technology to enhance the efficacy and efficiency of communication within a business environment.

Chatbot AIs can proficiently gather, analyze and, assess complex business data that comes from multiple sources, including financial reports, sales data, and consumer feedback. The utilization of natural language processing capabilities in AI systems, such as, ChatGPT, enables the rapid acquisition of critical information. This, in turn, empowers managers to make informed and sophisticated strategic choices that affect organizational performance. The results obtained from these analyses have the potential to improve and optimize the decision-making procedures of organization dealing with complicated big data. In the context of Project management, there exists a component that serves to indicate timely awareness of deadlines and facilitates continuous collaboration within the team. This approach has the potential to reduce some risks that may occur throughout the execution of the Project, while also presenting new perspectives to the Project manager [34].

The ability of chatbot AIs to summarize content and answer queries regarding the text was first evaluated in this study. Chatbot AI swiftly and accurately summaries lengthy messages and competently responds to questions. Secondly, mathematical modeling abilities of linear programming problems were tested. Although they correctly build the mathematical model of the problem in the case study, they may wrongly construct the mathematical model of some other problems. Chatbot AIs are fast evolving these days, and it is expected that these faults will be addressed in a short period of time. Finally, an application was created to determine project completion timelines and critical paths. Chatbot AI gives solutions swiftly and accurately in this case as well.

Previous studies have primarily recommended the utilization of ChatGPT in the context of business applications. Currently, in the year 2023, there has been an increased number of chatbots that are based on AI. This study will also contribute to future research by comparing the characteristics of various chatbots and offering guidance on selecting the most suitable chatbot for a given purpose.

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The Moderating Impact of Cybersecurity Risks on the Relationship Between Artificial Intelligence (AI) and Internal Audit Quality (IAQ): Evidence from Jordan

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Abstract. This research pinpoints the relationship between artificial intelligence and the internal auditing quality in Jordanian commercial banks, and whether this relationship is impacted by cybersecurity risks as a moderating variable. A questionnaire is designed and distributed to the research population consisting of 13 ASE-listed banks between (2016) and (2022) to achieve the research objectives. Quite a few statistical methods have been used that are commensurate with the research objectives. The findings indicate that the elements of artificial intelligence represented by expert systems (ES), knowledge-based systems (KBS), inference (I), and machine learning (ML) positively affect the internal auditing quality. The results also show that cybersecurity risks affect the internal auditing quality. However, the findings demonstrate that cybersecurity risks have no significant effect on the relationship between artificial intelligence and the internal auditing quality in commercial banks. Given these findings, the research recommends that banks should pay more attention to artificial intelligence tools thanks to their significance in improving and developing internal auditing quality and work hard to find mechanisms that limit cybersecurity risks.

Keywords: artificial intelligence · ASE-listed Jordanian banks · cybersecurity risks · internal audit quality

1 Introduction

Cybersecurity risks are among the most significant challenges facing the digital world and impact several sectors, together with the banking sector. Cybersecurity risks might affect the relationship between artificial intelligence and the internal auditing quality, as cybersecurity risks can affect the characteristics of accounting information on which the artificial intelligence system relies, affecting the internal auditing quality. Companies and banks, thus, strive for ensuring the security of their data and digital systems to

maintain the internal auditing quality and enable artificial intelligence to work properly (Qatawneh & Makhlouf, 2023). As a general rule, cybersecurity risks must be taken into account when reviewing the relationship between artificial intelligence and the internal auditing quality in banks, requiring banks to work on improving their cybersecurity to achieve the essential internal auditing quality for fear of the presence of any negative concerns and issues on banks (Ali, 2019).

In the same vein, the banking sector is regarded as a main pillar in the growth of the domestic product and the development that is concerned with all various fields (Nour, Alsufy & Makhlouf, 2022). The application of artificial intelligence enables the banking sector to achieve a competitive advantage and complete audit procedures, as banks are considered a fertile and attractive environment for exposure to problems, threats, and cybersecurity risks that suffer from their effects and consequences (Al-Abdalat, 2020). In line with (Al-Zyoud, 2020), Jordanian commercial banks disclose cybersecurity risks in their annual reports, which demonstrates their exposure to these risks. Likewise, Ali (2019) shows that cybersecurity risks negatively affect the banking sector in the economies of the countries of the Gulf Cooperation Council (GCC). At the international level, Stafford et al. (2018) indicate that the characteristics of the internal audit function have a positive impact on the cybersecurity audit process.

Thus, the research problem is reflected in the extent of the correlation and compatibility between artificial intelligence and the internal auditing quality and awareness of the risks of cybersecurity on the relationship between artificial intelligence and the internal auditing quality thanks to its importance in reducing the risks and threats facing banks through answering the following research questions:

1. Is there a relationship between artificial intelligence and the internal auditing quality in ASE-listed commercial banks?
2. Do cybersecurity risks have an impact as a moderating variable on the relationship between artificial intelligence and the internal auditing quality in ASE-listed commercial banks?

At the local level, this is the first research paper that links artificial intelligence, internal auditing, and the domain of cybersecurity risks together, as cybersecurity risk management has a significant role in the domain of auditing and development in banks and its connection to artificial intelligence (Makhlouf, 2022). Accordingly, Puthukulam et al. (2021) recommend that the complete replacement of humans by artificial intelligence and machine learning should be cautiously considered. Hence, auditing should be done with the help of artificial intelligence and machine learning along with human intervention in improving the efficiency of the auditing. On the other hand, Al-Abdalat, (2020) asserts the significance of the expansion of banks in Jordan in the applications of artificial intelligence thanks to their importance in achieving the competitive advantage of banks, especially reducing the costs of banking offered services, which contributes to increasing their profits.

2 Theoretical Framework and Previous Studies

Definitions relating to artificial intelligence in business organizations and commercial institutions are various. Most researchers, however, unanimously agree that it is a field of study that studies how to create computers and computer programs capable of intelligent behavior (Copeland, 2018; Al Qtaish & Makhlouf, 2019). The issue of audit quality has recently attracted the attention of writers, researchers, accounting standards setters, and users of financial statements, especially in light of the great developments witnessed by many international banks.

International banks are interested in the great development and progress as a result of technological development, as it is now using the so-called artificial intelligence, which performs most of the accounting tasks through information and communication technology tools, which include audit toolkits, checklists, audit programs capable of analyzing and testing data accurately, integrated audit control units “Software procedures that continuously monitor real data and processing conditions”, and expert systems and internal control templates commonly used to identify strengths and weaknesses in a system (Al-Jaber, 2020).

Internal audit is considered the tool used by the company to activate the internal control system of the company. Therefore, some elements must be available to obtain an effective internal audit system (Maqled, 2019). Big data and artificial intelligence are the development trend of current IT applications, as their application scope and application strategies constantly expand and deepen which is conducive to improving the enterprise’s internal control system and enterprise operation process and helping enterprises to reduce risks (Zhou, 2021). Likewise, Sana et al. (2017) emphasize that internal audit is a flexible profession that conducts objective assessments and analyzes the efficiency and effectiveness of tasks in the organization on an ongoing basis, avoiding manual errors through the implementation of internal control assessment, improving the internal control system of the institution, enhancing the operation of institutions, and assisting companies to reduce risks.

On the other hand, cybersecurity is considered “The measures taken to protect systems, information networks, and critical infrastructure from cyber security incidents and the ability to restore their work and continuity, whether access to them is unauthorized, misused, or as a result of failure to follow security procedures or exposure to deception” (The Cybercrime Law No. (27), 2019, p. 1). It is also defined as the process that provides protection for information assets that are entered, stored, operated, and transmitted via the Internet to reduce cybersecurity risks and work to address their impact on the organization (Antonucci, 2017). Borky and Bradley (2019) have shown that cyber security is a balanced process to provide an appropriate level of protection against known or unknown cyber threats.

Further, related studies have recommended following up developments associated with cybersecurity and artificial intelligence related to the study of the impact of internal audit in reducing cybersecurity risks in Jordanian commercial banks, aiming to identify the impact of internal audit represented by the efficiency of internal audit, the impartiality of internal audit, the organizational status of internal audit, and internal audit planning in reducing cybersecurity risks in Jordanian commercial banks (Al-Zyoud 2020). A related study by Al-Zyoud (2020) using the analytical-descriptive approach aims at

researching the management of cybersecurity risks in Jordanian banks and the extent of their commitment to cybersecurity policies and the disclosure of cyber security risks and their ability to address them, as its significance is drawn from its processing of an emerging field, which is managing and evaluating cybersecurity risks.

What is more, another related study aimed at identifying the impact of the use of artificial intelligence techniques, "the expert system, knowledge systems, inference, and machine learning" on internal evaluation procedures by assessing internal control systems and documenting the results of audits by the internal auditor (Jaber, 2022). In the same context, Kahyaoglu and Aksoy's 2021 study aims to analyze the effects of artificial intelligence applications on internal auditing and risk assessment, which have recently gained significance.

Given the research problem, research questions, and research objectives, the main research hypotheses can be read as follows:

Hypothesis No. (1) is read: There is a relationship between expert systems and the internal auditing quality among the ASE-listed banks.

Hypothesis No. (2) is read: There is a relationship between knowledge-based systems and inference and the internal auditing quality among the ASE-listed banks.

Hypothesis No. (3) is read: There is a relationship between machine learning and the internal auditing quality in banks among the ASE-listed banks.

Hypothesis No. (4) is read: There is an impact of cybersecurity risks as a moderating variable on the relationship between expert systems and the internal auditing quality among the ASE-listed banks.

Hypothesis No. (5) is read: There is an impact of cybersecurity risks as a moderating variable on the relationship between knowledge-based systems and inference and the internal auditing quality among the ASE-listed banks.

Hypothesis No. (6) is read: There is an impact of cybersecurity risks as a moderating variable on the relationship between machine learning and the internal auditing quality among the ASE-listed banks.

3 Research Population and Sample

The research population consists of the entire ASE-listed 13 commercial banks in Jordan. A questionnaire is developed to identify the impact of cybersecurity risks as a moderating variable in the relationship between artificial intelligence and the internal auditing quality in the ASE-listed commercial banks in Jordan to achieve the research objectives. 120 questionnaires are distributed to bank employees from the internal audit and information technology departments, and 93 valid questionnaires are returned for analysis, i.e. (77.5%) of the number of distributed questionnaires. Figure 1 illustrates the research model and its variables and Table 1 explains the variables.

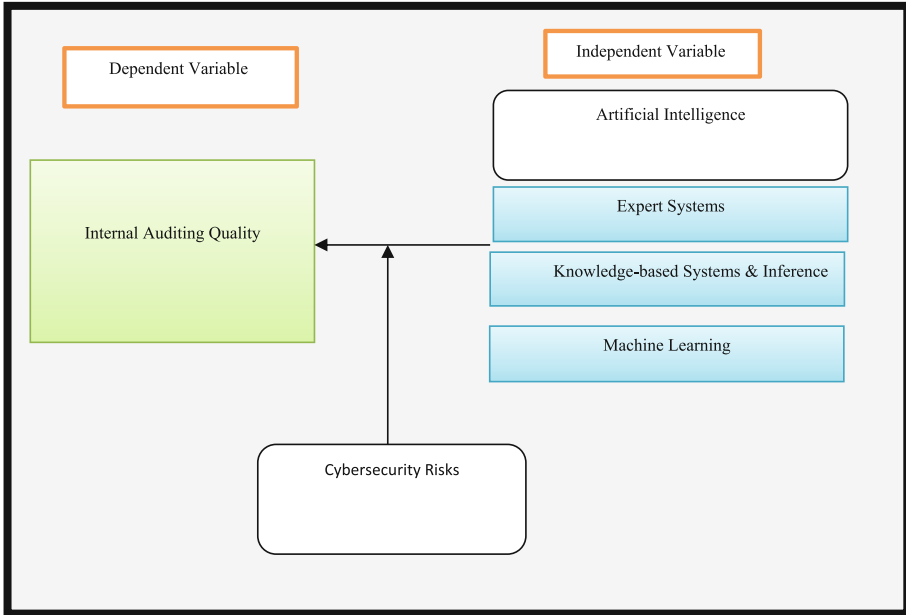


Fig. 1. The Research Model and its Variables

Table 1. The Research Variables and Measurement

Variables	Measurement
Artificial Intelligence	It is an attempt to make the machine think like a human
Expert Systems	It is a set of knowledge and experiences that a person translates in the form of rules to solve the various problems that impede his or her practical life
Knowledge-based Systems and Inference	It means that an artificially intelligent system can adapt to its environment
Machine learning	It is a set of programming techniques that allow a machine to adapt behavior to its environment without, or with partially human intervention
Internal Audit Quality	It is considered an independent supervisory branch affiliated with the Bank, which performs financial and non-financial assessment and advisory tasks provided to all bank departments
Cyber Security Risks	

4 Research Sample Characteristics

Table 2 shows the demographic characteristics of the research sample by calculating the frequencies and their percentages. The following characteristics “gender, academic qualification, number of years of experience, and job position” for the research sample, which is the employees of the ASE-listed commercial banks in Jordan are examined. The results also indicate that the majority of the research sample are males, with a percentage of (80.6%) of the research sample. Regarding academic qualification, it is found that 51.6% of the research sample hold a bachelor’s degree, 38.7% of the sample hold a master’s degree, and 9.7% of the sample hold a Ph.D.

Moreover, as shown in Table 2, 41.9% of the research sample have an experience ranging between 5 and less than 10 years, 35.5% of the sample have an experience between 10 and less than 15 years, and 22.6% of the sample have an experience of more than 15 years. Concerning job positions, the descriptive results demonstrate that 22.6%

Table 2. Research Sample Demographic Characteristics

<i>Gender</i>		
Gender	Frequency	Percentage
Male	75	80.6
Female	18	19.4
Total	93	100
<i>Academic Qualification</i>		
Bachelor’s Degree	48	51.6
Master’s Degree	36	38.7
Ph.D.	9	9.7
Others	–	–
Total	93	100
<i>Number of Years of Experience</i>		
Less Than 5 Years	–	–
Between 5 and Less Than 10 Years	39	41.9
Between 10 and Less Than 15 Years	33	35.5
More Than 15 Years	21	22.6
Total	93	100
<i>Job Position</i>		
Audit Managers	21	22.6
Audit Department Heads	27	29
Auditors	45	48.4
Total	93	100

of the research sample are audit managers, 29% of the sample are audit department heads, and 48.4% of the sample are auditors.

5 Results

Means and standard deviations are calculated to describe the research sample's responses toward the items, as shown in Table 3. The following scale has been adopted to determine the level of approval:

Table 3. The Level of Approval

Category	Level
1–Less Than 2.33	Low
2.33–Less Than 3.66	Medium
3.66–5	High

• Artificial Intelligence

Table 4. The Descriptive Results of the Independent Variables

No.	Text of the Item	M	SD	Level of Approval
1	Expert systems [Expert Systems with artificial intelligence provide financial reports that contribute to the bank's decision-making]	4.129	.846	High
2	Expert systems [Expert Systems with artificial intelligence contribute to giving alternatives to decision-making]	4.129	.670	High
3	Expert systems [Expert systems help in raising the auditing quality and detecting errors in the banking accounting system]	4.258	.575	High
4	Expert systems [Smart applications provide analysis mechanisms for financial data that increase the ability of the auditor to make appropriate decisions]	4.323	.599	High
5	Expert Systems [Expert systems use advanced artificial intelligence techniques to support the audit process]	4.226	.617	High

(continued)

Table 4. (continued)

No.	Text of the Item	M	SD	Level of Approval
6	Expert Systems	4.213	.511	High
7	Knowledge-based Systems and Inference [Knowledge management process contributes to coordinating the various activities in the areas of audit]	4.194	.601	High
8	Knowledge-based Systems and Inference [The control systems within the bank are more efficient with the help of artificial intelligence]	4.290	.643	High
9	Knowledge-based Systems and Inference [Knowledge management enhances the ability to retain organizational performance based on machine learning]	4.161	.638	High
10	Knowledge-based Systems and Inference [Knowledge management helps to compare annual financial reports and other entities in the same field]	4.065	.772	High
11	Knowledge-based Systems and Inference [Banking systems supported by artificial intelligence provide wide dealings with various languages and currencies in a smooth and fast manner]	4.226	.669	High
12	Knowledge-based Systems and Inference	4.187	.467	High
13	Machine Learning [Automated system can repeatedly handle the problems that it may encounter]	3.871	1.024	High
14	Machine Learning [Automated technology contributes to developing solutions to daily routine problems in bank operations]	4.226	.669	High
15	Machine Learning [Machine learning contributes to processing accounting operations in banks]	4.194	.543	High
16	Machine Learning [Smart applications are designed in a way that supports the strategic objectives of the bank]	4.452	.506	High
17	Machine Learning [Intelligent applications provide standard models capable of credit rating of customers]	4.000	.894	High
18	Machine Learning	4.148	.556	High

As shown in Table 4, a high level of approval is high on the expert systems variable with a mean of 4.213. It is also found that the knowledge-based systems and inference variable has a high mean of 4.187. The level of approval of the machine learning variable is also high with a value of 4.148.

• Internal Audit Quality

As shown in Table 5, a high level of approval of the above variable is with a mean of 4.2903. It is also found that item (10) stipulating “The Internal Audit Department documents all the implemented procedures” is the most approved item. However, item (2) stipulating “Artificial intelligence techniques are used to understand the internal control environment and its working mechanisms” is the least approved item.

Table 5. The Descriptive Results of the Dependent Variables

No.	Text of the Item	M	SD	Level of Approval
1	[Artificial intelligence techniques help in ensuring the existence and matching of assets with records by sudden and periodic inventory]	4.35	.661	High
2	[Artificial intelligence techniques are used to understand the internal control environment and its working mechanisms]	4.03	.752	High
3	[The use of artificial intelligence techniques helps in developing internal control systems]	4.16	.735	High
4	[The use of artificial intelligence techniques helps to increase and enhance the separation of tasks and duties among workers]	4.42	.620	High
5	[Artificial intelligence applications reduce the risks of internal audit in the bank]	4.13	.670	High
6	[The use of artificial intelligence techniques increases the accuracy of documenting the results of audits]	4.29	.461	High
7	[The use of artificial intelligence techniques increases the ease of retrieving audited documents]	4.35	.608	High
8	[Analytical audit procedures using artificial intelligence techniques help detect many errors in financial statements]	4.35	.486	High

(continued)

Table 5. (continued)

No.	Text of the Item	M	SD	Level of Approval
9	[The Internal Audit Department applies clear policies and procedures to address detected errors]	4.23	.617	High
10	[The Internal Audit Department documents all the implemented procedures]	4.48	.508	High
11	[The Internal Audit Department identifies the risks facing the company's business activities promptly]	4.32	.653	High
12	[Technical skills and technological knowledge help the internal auditor to carry out his or her work efficiently]	4.35	.551	High
13	Internal Audit Quality	4.2903	.42865	High

● Cybersecurity Risk Management

Table 6. The Descriptive Results of the Dependent Variables

No.	Text of the Item	M	SD	Level of Approval
1	[The level of cyber security risks is monitored periodically and continuously]	4.55	.506	High
2	[The use of artificial intelligence techniques helps in developing risk management processes]	4.29	.693	High
3	[The precautionary measures aimed at limiting the illegal penetration of information are continually built at the time of their occurrence]	4.19	.543	High
4	[The necessary corrective measures are taken to control cyber security risks and reduce their effects]	4.29	.588	High
5	[The bank's management ensures risk analysis procedures]	4.35	.608	High
6	[The required procedures are formulated and rules are established for process improvement]	4.1	.473	High

(continued)

Table 6. (continued)

No.	Text of the Item	M	SD	Level of Approval
7	[Non-important activities creating risks are eliminated]	4.19	.654	High
8	[It is verified that the root cause of the hazard has been controlled]	4.23	.617	High
9	[The performance reports submitted to the bank’s management contribute to addressing shortcomings and developing work related to cyber security risks]	4.35	.486	High
10	[The continuous evaluation process of the bank’s internal control components is tested and implemented]	4.29	.461	High
11	[The powers of the parties involved in managing cyber security risks are clearly and precisely defined]	4.19	.601	High
12	[The bank promotes cybersecurity awareness for its employees]	4.42	.502	High
13	Cybersecurity Risk Management	4.2876	.32549	High

As shown in Table 6, a high level of approval of the above variable is with a mean of 4.2876. It is also found that item (1) stipulating “The level of cyber security risks is monitored periodically and continuously” is the most approved item. However, item (6) stipulating “The required procedures are formulated and rules are established for process improvement” is the least approved item.

6 Research Instrument Reliability Testing

Cronbach’s alpha formula test is used to measure the reliability of the measurement instrument, as the alpha value for each of the variables in the following in Table 7 is higher than the acceptable ratio of 0.70, which reflects the reliability of the measurement instrument.

Table 7. Cronbach’s Alpha Formula Test

Variable	Alpha’s Value
0.822	Expert Systems
0.741	Knowledge-based Systems and Inference
0.79	Machine Learning
0.903	Internal Audit Quality
0.816	Cybersecurity Risk Management

7 Research Hypothesis Testing

The validity of the six main hypotheses are tested as follows:

Hypothesis No. (1) is read: There is a relationship between expert systems and the internal auditing quality among the ASE-listed banks.

Table 8. Results of the First Hypothesis Test

Dependent Variable	Model Summary		Variance Analysis ANOVA			Coefficients Table					
	R	R ²	Calculated F	Df	F. Sig.	Item	B	Standard Error	Beta	Calculated T	T. Sig.
Internal Auditing Quality	0.786	0.618	46.966	1 29	0.000	Expert Systems	.660	0.096	0.786	6.853	.000

The effect is statistically significant at the level of ($\alpha \leq 0.05$)

A linear regression test has been used to test the above hypothesis. Table 8 shows that the F-value is 46.966 which is a significant value because the sig value is less than 0.05. It is also noted that the value of the correlation coefficient is 0.786, which reflects a strong relationship between the independent variable and the dependent variable. The independent variable explains 61.8% of the change in the dependent variable. Besides, Table 8 indicates that the calculated T-value is significant because the sig value is less than 0.05. Therefore, we reject the null hypothesis and accept the alternative, stipulating “There is a relationship between expert systems and the internal auditing quality among the ASE-listed banks”.

Hypothesis No. (2) is read: There is a relationship between knowledge-based systems and inference and the internal auditing quality among the ASE-listed banks.

Table 9. Results of the Second Hypothesis Test

Dependent Variable	Model Summary		Variance Analysis ANOVA			Coefficients Table					
	R	R ²	Calculated F	Df	F. Sig.	Item	B	Standard Error	Beta	Calculated T	T. Sig.
Internal Auditing Quality	0.843	0.71	71.122	1 29	0.000	Knowledge-based Systems and Inference	.773	0.092	0.843	8.433	.000

The effect is statistically significant at the level of ($\alpha \leq 0.05$)

A linear regression test has been used to test the above hypothesis. Table 9 shows that the F-value is 71.122 which is a significant value because the sig value is less than 0.05. It is also noted that the value of the correlation coefficient is 0.843, which reflects

a strong relationship between the independent variable and the dependent variable. The independent variable explains 71.% of the change in the dependent variable. Besides, Table 9 indicates that the calculated T-value is significant because the sig value is less than 0.05. Therefore, we reject the null hypothesis and accept the alternative, stipulating “There is a relationship between knowledge-based systems and inference and the internal auditing quality among the ASE-listed banks”.

Hypothesis No. (3) is read: There is a relationship between machine learning and the internal auditing quality in banks among the ASE-listed banks.

Table 10. Results of the Third Hypothesis Test

Dependent Variable	Model Summary		Variance Analysis ANOVA			Coefficients Table					
	R	R ²	Calculated F	Df	F. Sig	Item	B	Standard Error	Beta	Calculated T	T. Sig
Internal Auditing Quality	0.764	0.584	40.699	1	0.000	Machine Learning	.589	.092	.764	6.380	.000

The effect is statistically significant at the level of ($\alpha \leq 0.05$)

A linear regression test has been used to test the above hypothesis. Table 10 shows that the F-value is 40.699 which is a significant value because the sig value is less than 0.05. It is also noted that the value of the correlation coefficient is 0.764, which reflects a strong relationship between the independent variable and the dependent variable. The independent variable explains 58.4.% of the change in the dependent variable. Besides, Table 10 indicates that the calculated T-value is significant because the sig value is less than 0.05. Therefore, we reject the null hypothesis and accept the alternative, stipulating “There is a relationship between machine learning and the internal auditing quality in banks among the ASE-listed banks”.

Hypothesis No. (4) is read: There is an impact of cybersecurity risks as a moderating variable on the relationship between expert systems and the internal auditing quality among the ASE-listed banks.

The hierarchical multiple regression test is used to test the above hypothesis. Table 11 illustrates the results.

Table 11, based on three steps, indicates a statistically significant effect of the expert systems variable on the internal auditing quality, with a T-value of ($t = 6.583, p \leq 0.05$), which is statistically significant. With the addition of the cybersecurity variable in the second step, it is found that it has added $\Delta R^2 = 10.6\%$ of the total explanation coefficient, and this percentage is significant, as the results indicate that the T-value, which is ($3.284, p \leq 0.05$), is statistically significant for the cybersecurity variable.

In the third step, the interaction variable between expert systems and cybersecurity is introduced, with a change rate of 2.7% in the explanation coefficient, which is a significant value. The T-value is ($t = 1.703, p \geq 0.05$), which has no significant effect on the dependent variable. This means accepting the hypothesis stipulating “There is

Table 11. Results of the Fourth Hypothesis Test

Variable	Step One		Step Two		Step Three	
	β	T-Value	β	T-Value	β	T-Value
Expert Systems	0.66	6.583*	0.466	4.568*	-2.085	-1.389
Cybersecurity			0.526	3.284*	-2.046	-1.348
Expert Systems* Cybersecurity	.595	1.703				
R ² Value	0.618		0.724		0.751	
ΔR^2 Value	0.618		0.106		0.027	
ΔF Value	46.966		10.787		2.902	

The effect is statistically significant at the level of ($\alpha \leq 0.05$)

no impact of cybersecurity risks as a moderating variable on the relationship between expert systems and the internal auditing quality among the ASE-listed banks.

Hypothesis No. (5) is read: There is an impact of cybersecurity risks as a moderating variable on the relationship between knowledge-based systems and inference and the internal auditing quality among the ASE-listed banks.

The hierarchical multiple regression test is used to test the above hypothesis. Table 12 illustrates the results.

Table 12. Results of the Fifth Hypothesis Test

Variable	Step One		Step Two		Step Three	
	β	T-Value	β	T-Value	β	T-Value
Knowledge-based Systems and Inference	0.773	8.433*	.592	5.512*	-1.151	-0.999
Cybersecurity			.412	2.675*	-1.342	-1.152
Knowledge-based Systems and Inference* Cybersecurity					.412	1.519
R ² Value	0.71		0.769		0.787	
ΔR^2 Value	0.71		0.059		0.018	
ΔF Value	71.122		7.158		2.307	

The effect is statistically significant at the level of ($\alpha \leq 0.05$)

Table 12, based on three steps, indicates a statistically significant effect of the knowledge-based systems and inference variable on the internal auditing quality, with a T-value of ($t = 6.583, p \leq 0.05$), which is statistically significant. With the addition of the cybersecurity variable in the second step, it is found that it has added $\Delta R^2 = 5.9\%$ of the total explanation coefficient, and this percentage is significant, as the results

indicate that the T-value, which is ($t = 2.675, p \leq 0.05$), is statistically significant for the cybersecurity variable.

In the third step, the interaction variable between the knowledge-based systems and inference and cybersecurity is introduced, with a change rate of 1.8% in the explanation coefficient, which is a significant value. The T-value is ($t = 1.519, p \geq 0.05$), which has no significant effect on the dependent variable. This means accepting the hypothesis stipulating “There is no impact of cybersecurity risks as a moderating variable on the relationship between knowledge-based systems and inference and the internal auditing quality among the ASE-listed banks.

Hypothesis No. (6) is read: There is an impact of cybersecurity risks as a moderating variable on the relationship between machine learning and the internal auditing quality among the ASE-listed banks.

The hierarchical multiple regression test is used to test the above hypothesis. Table 13 illustrates the results.

Table 13. Results of the Sixth Hypothesis Test

Variable	Step One		Step Two		Step Three	
	β	T-Value	β	T-Value	β	T-Value
Machine Learning	0.589	6.38*	.418	4.941*	2.638	.043*
Cybersecurity			.601	4.164*	2.550	.028*
Machine* Cybersecurity					-.491	.085
R ² Value	0.584		0.743		0.77	
ΔR^2 Value	0.584		0.159		0.027	
ΔF Value	40.699		17.338		3.195	

The effect is statistically significant at the level of ($\alpha \leq 0.05$)

Table 13, based on three steps, indicates a statistically significant effect of 1the machine learning variable on the internal auditing quality, with a T-value of ($t = 6.38, p \leq 0.05$), which is statistically significant. With the addition of the cybersecurity variable in the second step, it is found that it has added $\Delta R^2 = 15.9\%$ of the total explanation coefficient, and this percentage is significant, as the results indicate that the T-value, which is ($t = 4.164, p \leq 0.05$), is statistically significant for the cybersecurity variable.

In the third step, the interaction variable between machine learning and cybersecurity is introduced, with a change rate of 2.7% in the explanation coefficient, which is a significant value. The T-value is ($t = 0.085, p \geq 0.0$), which has no significant effect on the dependent variable. This means accepting the hypothesis stipulating “There is an impact of cybersecurity risks as a moderating variable on the relationship between machine learning and the internal auditing quality among the ASE-listed banks”.

8 Conclusion

In a word, the direct relationship between artificial intelligence and internal auditing quality, and the impact of cybersecurity risks on this relationship in Jordanian commercial banks are examined in the current research paper. The results show that the elements of artificial intelligence represented by expert systems, knowledge-based systems, inference, and machine learning positively affect internal audit quality. Concerning cybersecurity risks, the results indicate that cybersecurity risks affect the internal auditing quality, but they do not have a significant impact on the relationship between artificial intelligence and the internal auditing quality in commercial banks.

Given these results, artificial intelligence has become an important and major factor in improving and developing internal auditing in commercial banks, as it can be used in internal auditing operations, especially since it is objective and impartial. Therefore, banks must invest and rely on artificial intelligence techniques, especially in the control and follow-up procedures. Regarding the modified variable, which is cybersecurity risks, although it does not affect the relationship between artificial intelligence and internal auditing quality, the results indicate its positive impact on internal auditing quality. Therefore, cybersecurity is one of the most important factors affecting the internal auditing quality in banks, as banks can be exposed to cyber attacks aimed at stealing and hacking sensitive data and information.

Since artificial intelligence can help analyze data and detect security threats, it may play an important role in improving the internal auditing quality in banks. Banks must also adopt strong security measures to reduce cyber security risks and maintain internal audit quality. Among these measures are providing continuous training to employees on information security and safe behavior on the Internet, updating security programs and systems, and conducting penetration tests and security audits regularly.

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The Effect of Theory of Acceptance Model in Learning Process

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Abstract. The development of information and technology made many universities implementing e-learning on online contents. Meanwhile, during the virulent of COVID-19, most of universities transformed the offline learning to the electronic learning process. The electronic learning process can be produced in effective ways required many supporting elements, such as system functionality, design of e-learning contents, perceived usefulness, perceived ease of use, and attitude of the learners toward e-learning. The samples are 979 students in several universities and they answered several questions. This research used quantitative study and applied Partial Least Square - Structural Equation Modeling (PLS-SEM) technique to explain the cause-effect relationship between several concepts or variables. It turned out that perceived system functionality had positively impact on perceived ease of use, design of learning contents had significantly influence on perceived usefulness and perceived ease to use, perceived ease of use significantly affected on perceived usefulness, both perceived ease of use and perceived usefulness had positively affect on attitude toward e-learning. However, perceived system functionality did not impacted on perceived usefulness.

Keywords: Perceived System Functionality · Design of Learning Contents · Perceived Usefulness · Perceived Ease of Use · Attitude Toward electronic learning

1 Introduction

One of the most significant transformation in the educational institutions during the pandemic coronavirus disease 2019 (COVID-19) makes the shifting methods from offline learning to online learning. Before the outbreaking of COVID-19, some of the educational institutions are rarely using its systems. In addition, the Minister of Education and Culture of the Republic of Indonesia 2020, Nadiem Makarim, announced to all educational institutions that they should adopt online education systems (Coconut.co., 2020). However, at this moment, they persuade and adjust the learning process into an online learning method. Therefore, many educational institutions or universities give attention to online learning because of potential education and many benefits in the future (Lee, Yoon, & Lee, Lee et al., 2009). The advantages from the electronic system for the learning process are including cutting-cost of education, consistency, up to date content, more flexibility access, and convenience for the users (Cantoni et al., 2004; Kelly & Bauer, 2004).

The facts on electronic learning process made considers the human and technology factors that will affect learner acceptance with e-learning. Meanwhile, the rapid changing of the technology make the learners and the lecturers accept and adopt the technology as the learning media and it might support the improvement in learning outcomes (Wu et al., 2010; Park, 2009). Learners accepted the electronic learning system because of the intrinsic and the extrinsic factors. The intrinsic factors which is the learners have believed the technology would be make their life easier and more useful to get the deepen insights and learning outcomes in learning contexts. It was not going to be happen if it did not support with extrinsic variables, such as the system functionality and design of contents. The system must be well-functioned and the learning contents must be well-designed to make the learners understand what they learned. The system facilitated the flexible access to learning contents, forum discussion, and the learning material (Pituch & Lee, 2006). Henceforth, the system functions smoothly and the presence of the functionality of system played an important role in influencing the acceptance of technology (Wu et al., 2010). Learners have perception that the system would facilitate a good interaction between them and their lecturers and it would be made them to get the learning materials as fast as they could be. The well-function system has influenced to the perceived ease of use and perceived usefulness. When the system functions well, the learners will be thought that the system made them enjoy the learning process, ease getting learning materials, and more interesting to discuss materials with their peers. Despite the system influence the perceived of usefulness, the system will influence the perceived ease of use. If the system is well-functioned, the learners will be easier to access their online class. Therefore, the system would be given the huge impact factor to their learning process.

Meanwhile, the design of contents also is a crucial factor in the e-learning process. The appropriateness of e-learning contents design is core elements in the online learning (Piccoli et al., 2001). It is crucial, especially for lecturers or instructors when they create, provide, and deliver the content for students. The learning contents are designed properly to facilitate and provide students' learning activities and it affects their understanding what they learned from the lesson during the learning process (Liu et al., 2010). If the learners perceive that the contents are designed attractively, they will be motivated to focus on the lesson. They assessed that the design content influenced them regarding on how the electronic learning made their life easiest and have a great impactful within the learning process. They thought that they got many benefits from the transformation learning process.

In the TAM constructs, two belief variables, perceived ease of use and perceived usefulness, are the critical determinants of learner acceptance and act as antecedents in attitude towards electronic learning process as well (Lee, et., al. (2009); Park (2009)). On the other hand, before the pandemic CORONA 2019, electronic learning process has not been processed effectively. It could be happened because teaching in class would be more effective ways. The lecturers could be discussed directly, appointed the students one by one and made their students was had actively discussion about the learning materials with their peers in the class. Furthermore, the perceived ease of use and perceived usefulness on online learning will influence the attitude of students toward the e-learning process.

According to the background, this research will be focused to how TAM give a great impact to e-learning process in university.

2 Literature Review

e-Learning

Electronic learning or online learning is described as well as the transferring of teaching materials through electronic media platforms and facilitates the web site to communicate, collaborate, and deliver the knowledge from lecturer to learner and the process also provides values added on the transfer knowledge process (Kelly & Bauer, 2004). Online learning is viewed as an active learning method so that students must be actively participated in all learning process activities. From these perspectives, online education provides many benefits in the interactive learning process which is would be supported the quality of online learning for the students (Lee et al., 2009).

Perceived System Functionality (PSF)

Previous research convinced the systems have an important role in acceptance of the technology especially in learning contexts (Davis, 1993; Igarbaria, et.al., 1995; Lucas & Spittler, 1999; Ruth, 2000; Venkatesh & Davis, 1996). Perceived system functionality is defined as the students' perception of the ability of e-learning system to access the course materials and contents, for example, turning in assignments, quizzes online, interactive online discussions, video conference, and online exams (Wu, Tennyson, and Hsia, 2010). For instance, audio, video, and text are an integrated system and its functions for supporting online learning process (Pituch & Lee, 2006). Students believe course materials and contents will be delivered well, such as how learning tasks are delivered to students, how they access flexible to the course, how a lecturer gives feedback as fast as they could and how the learners turn in the assignment without the trouble systems so that the learning process will be more effective and efficiency ways. The online learning system is integrated very well to permit flexible access to course materials and contents (Pituch & Lee, 2006; Wu, et., al., 2010). Hence, the e-learning system must be well-formulated.

Design of Learning Contents (DLC)

Kaynama and Black (2000) assessed one of the measurement used in online service quality is content. Content is described as recognizing an assortment of formats and information (Wu, Tennyson & Hsia, 2010). In the online education environment, content refers to technology-based materials that have value-added for virtual learners (Wu, et., al., 2010). In terms of learning contents, online education aims to share and deliver them through different media, for example, online lectures, online discussions, or online quizzes. Since the variety of delivery formats and types of materials in the e-learning environment, it is important to create a good design and accommodate the online learning content formats suited to delivery to learners (So & Brush, 2008).

Technology Acceptance Model (TAM)

Technology acceptance model (TAM) was proposed by Davis (1989). The theory helps individual to explain and predict their behavior on accepting the information technology (Park, 2009). TAM offers a theory to traces how a user accepts or rejects the information technology and what kind of the external and internal variables involved in its behavior. Based on TAM, the individual's acceptance of the information technology is influenced by their attitude toward the technology, what they perceived on the usefulness of the technology and also what they perceived while they are using the technology, it is easy to operate or it is not (Razmak & Belanger, 2018). These two variables jointly influence attitude. Perceived usefulness refers to how individual accepting and using technology and believing that the technology will enhance his/her productivity or in other words, they will be more productive when they use it (Wu, et., al., 2010). While students believe that an online learning system is very helpful, especially it can help them to improve their learning performance, they have willingness to actively participate and engage in e-learning process (Teo, 2010). Meanwhile, perceived ease of use (PEOU) is described as what a person thought while using technology and it will be more effortless for them (Brandon-Jones & Kaupi, 2018; Autry, et., al., 2010; Davis, et. al., 1989). Moreover, attitude is a predictive variable while using the technology (Teo & Noyes, 2011) because attitude is measured from individual's positive or negative feeling about performance of the technology, what they will be more positive feelings or they will be disagreed regarding on the emergence of the technology (Amirtha & Sivakumar, 2018; Davis, 1989).

2.1 Research Model and Hypotheses

Functionalities are important elements in the e-learning system, especially for distance learning (Pituch & Lee, 2006). The system functionality is very useful and required for online education. The perceived system functionality will be expected to have and impact on an individual's believes (Wu, et., al., 2010). Moreover, the the well-system in the e-learning system have an important role in influencing the perception of usefulness and ease of use of the e-learning system. It means that if the system runs smoothly and any trouble during the learning process, it will have permission to them to access flexibly the course contents anytime. They perceived that that they do not take too much their time for using the system. Thus, perceived system functionality has a potential impact on perceived usefulness and perceived ease of use (Lee et al., 2009). Therefore, the following hypotheses are proposed:

H1: perceived system functionality influences perceived usefulness.

H2: perceived system functionality influences perceived ease of use.

Content considers as an important construct to influence perceived ease of use and perceived usefulness (Brandon-Jones and Kauppi, 2018). Learning materials provided in the e-learning system effect the perceived ease of use and perceived usefulness when those enhance the students' academic performance and make them have a deepen insights because of the variety of learning contents. The learners will be learned from various sources for the learning materials and it will enrich their insights. To improve the students' academic productivity and performance, the content must be well-designed and the contain itself must be a good content to share and deliver to their students (Lee et al.,

2009). The quality of learning contents and materials and learner's information necessity increase perceived usefulness and perceived ease of use. Moreover, the richness and accuracy of information will improve the students' academic performance (Cao, et. al., 2013). Furthermore, within the e-learning environment, well-designed content enables achievement of the learning goals and improvement the academic performance for learners. It means that learners enjoy and easy to use the technology during the learning process (Cho, et. al., 2009). Therefore, the following hypotheses are followed as:

H3: design of learning contents influences perceived ease of use in the e-learning.

H4: design of learning contents influences perceived usefulness in the e-learning.

Technology will be more useful if it makes a person access the technology in an effortless way (Brandon-Jones & Kauppi, 2018; Lu, et al., 2005). When it is easier of using the technology, it will more usefulness (Isaac, et. al., 2018; Elkhani et., al., 2014). In other words, perceived ease of use improves students to accomplish their academic assignment with the same effort and they will be more focus on their lesson. Meanwhile, if the learning system is easy to use, learners also believe that it will help them to achieve better academic performance and lead them to develop a good attitude toward electronic learning process (Brandon-Jones & Kauppi, 2018; Lee, Yoon & Lee, 2009; Park, 2009). Learners realize that online learning is free of effort and do not waste their time, it will positively affect their attitude towards online learning process. Therefore, the following hypotheses are followed as:

H5: perceived ease of use influences attitude toward e-learning.

H6: perceived ease of use influences perceived usefulness in the e-learning.

The usefulness of online learning process could enhance academic performances and it will affect positively the learners' attitude towards online learning (Lu, et al., 2005; Jiang, et al., 2000). A learner recognizes the usefulness of the online learning process, it will be positively impactful to learners' attitude towards online learning process. Learners have a chance in how to improve the learning strategy and enrich the knowledge from various material sources because the lecturers provide not only the one or two material sources but they also attach the online video for supporting the learning materials. On the other hand, if learners perceive the online learning system is to be more attractiveness, they will show a good attitude toward electronic learning process (Brandon-Jones & Kauppi, 2018). According to the explanation, perceived usefulness will influence on learner's attitude toward e-learning. Therefore, the following hypotheses are followed as:

H7: perceived usefulness influences attitude toward e-learning.

Figure 1 displays the research framework with all hypotheses.

2.2 Methods

Survey Instrument

The indicators in questionnaire were developed by previous research. Furthermore, questionnaire construction is developed to measure the learners' attitude while using online learning. The indicators of the construct variables consist of perceived system functionality (five indicators), design of learning contents (five indicators), perceived usefulness (six indicators), perceived ease of use (six indicators) and attitude toward using online

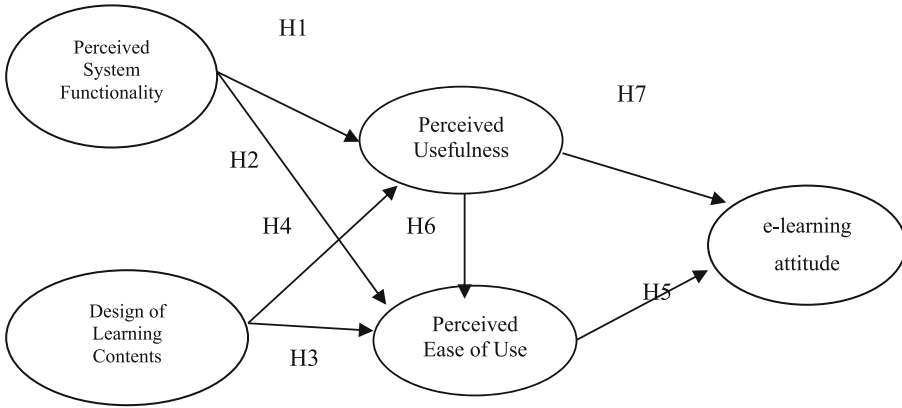


Fig. 1. The Research Framework

learning (six indicators). The indicators of each variable are developed using the five-point Likert Scale with end points of (1) is “Strongly Disagree” and (5) is “Strongly Agree”. Table 1 displays the constructs, the definitions of operational each variable, and indicator statements for each variable.

Table 1. Operational definitions and Instruments of each variable

Construct	Author	Operational definition	Measurement items
Perceived System Functionality (PSF)	Pituch & Lee (2006)	The electronic learning system provides learning materials from various types of media, such as video conference, audio, and text	The electronic learning system... 1. Makes learners having controlling to their learning activity (PF1) 2. Provides flexibility access to learning materials anywhere and anytime (PF2) 3. Provides to flexible access to the online learning materials and use them during the online learning process (PF3) 4. Provides various multimedia types of e-learning content (PF4) 5. Offers a means for taking quizzes online, turning in assignments, engaging in an online discussion, and other learning activities (PF5)

(continued)

Table 1. (continued)

Construct	Author	Operational definition	Measurement items
Design of Learning Contents (DLC)	Lee, Yoon & Lee (2009)	Contents consisted of learning materials is designed very well for the consistency and accuracy delivery of the learning materials	<ol style="list-style-type: none"> 1. The learning content given by lecturer is appropriate (DLC1) 2. The feature of the online learning system makes the learners understand (DLC2) 3. The schedule for the submitting online learning assignments is flexible (DLC3) 4. Online learning provides the alternative learning management strategy (DLC4) 5. Online learning give several sources for learning methods (DLC5)
Perceived Usefulness (PU)	Brandon-Jones & Kauppi (2018); Lee, Yoon & Lee (2009); Park (2009); Pituch & Lee (2006)	An individual believes that learning through online systems will enhance his or her learning goals	<p>Studying through online learning systems...</p> <ol style="list-style-type: none"> 1. Improves my learning performance (PU1) 2. Helps students' to submit their learning assignments as quickly as possible (PU2) 3. is very useful in learners learning process (PU3) 4. Increases learners academic productivity (PU4) 5. Enhances learners effectiveness in the learning process (PU5) 6. Makes it easy to learn lesson materials (PU6)
Perceived Ease of Use (PEOU)	Brandon-Jones & Kauppi (2018); Lee, Yoon & Lee (2009); Park (2009); Pituch & Lee (2006)	An individual's perception when they use the technology, it will be effortless	<p>A student finds out that online learning system....</p> <ol style="list-style-type: none"> 1. Operates easily (PEOU1) 2. is understandable and clear (PEOU2) 3. is less effort than offline learning (PEOU3) 4. Does not take too much time (PEOU4) 5. Makes them have many abilities at learning (PEOU5) 6. is easy to use (PEOU6)

(continued)

Table 1. (continued)

Construct	Author	Operational definition	Measurement items
Attitude toward e-learning (ATE)	Brandon-Jones & Kauppi (2018); Amirtha & Sivakumar (2018); Park (2009)	Individual's positive or negative reaction toward performing the target behavior	A student feels... 1. Happy to study within the online learning process (ATE1) 2. Studying through the e-learning system is a brilliant idea (ATE2) 3. The learning atmosphere is more enjoyable (ATE3) 4. Studying through the online learning system is the best experience (ATE4) 5. That it will be very good to use the technology in the online learning process (ATE5)

Respondents and Procedures

The survey is conducted in four Universities in Surabaya, East Java, Indonesia. The total of 1200 samples are students from four universities. They participated in answering the questionnaire and got the reward after they finished to answer all the indicator statements. However, there are final sample of 979 valid questionnaires measured in the study. The survey is distributed through an online platform to target respondents. The target respondents who are purposively selected for University's students who recently have implemented online learning in their learning process. Structural Equation Modeling based in Partial Least Square (PLS-SEM) approach is chosen to measure and validated the framework. The PLS-SEM chose because it is suitable for exploratory research (Hair, et., al., 2011). Table 2 shows the demographic profiles of the respondents which consists of gender, age, and year in university. According to Table 2, the majority of the sample is female respondents (51.38%), range respondents' age between 20–22 years (45.05), and they are in sophomore level (30.75%).

2.3 Results

Measurement Model

The first phase of measurement model, we assess both convergent and discriminant validity. Table 3 displays the result of analyzed the indicator items and the constructs which the value of each components will be gotten attention, such as the value of factor loading, composite reliability (CR), cronbach alpha, and average variance extracted (AVE) values. All of the factor loadings are greater than 0.60 with the exception of one ease of use item, PEOU3, has factor loading value less than 0.6 and thus PEOU3

Table 2. Demographic profile of respondents

Demographic Item	Frequency	Percentage (%)
<i>Gender</i>		
Male	476	48.62
Female	503	51.38
<i>Age</i>		
17 – 19 years	320	32.69
20 – 22 years	441	45.05
23 – 25 years	213	21.76
26 – 28 years	5	0.05
<i>Year in university</i>		
Freshman	253	25.84
Sophomore	301	30.75
Junior	277	28.29
Senior	148	15.12

is eliminated. All CR values exceed the 0.80 and cronbach alpha of all items is higher than 0.7.

Table 4 presents the discriminant validity. Discriminant validity is measured by comparing the AVE values and the squared correlations between other constructs (Fornell & Larcker, 1981). According to Table 4, all discriminant validity values indicate acceptable discriminant validity because all of the squared correlations (R^2) between pairs of constructs are less than the AVE for each construct.

The Hypotheses Testing

The results of the SEM-PLS measurement are shown in Table 5 and Fig. 2. There are six out of seven hypotheses are statistically significant. Based on the Table 5, H1 is not significant. It means that perceived system functionality does not give impact to the perceived usefulness because p-values on H1 is more than 0.05. Moreover, H2, H3, H4, H5, H6 and H7 are positively significant because p-values on each hypothesis is less than 0.05. It means that six hypotheses are fully supported by data.

Many indices measure the fit of a model and the theory is recommended by Ferdinand (2002) and Hair, et., al. (2010) are used in this research. According to Table 6, the research model is tested and the results indicate a good fit to the data. The values of CMIN/DF = 2.466, goodness-of-fit (GFI) = 0.921, normed-fit-index (NFI) = 0.932, comparative fit index (CFI) = 0.92, root mean square error of appreciation (RMSEA) = 0.05, standardized root mean residual (SRMR) = 0.04, and adjusted GFI (AGFI) = 0.88.

Table 3. The measurement of convergent validity and reliability

Construct	Indicator Items	Factor Loading	Composite Reliability	Cronbach Alpha	Average Variance Extracted (AVE)
Attitude Toward E-learning			0.873	0.819	0.780
	ATE1	0.725			
	ATE2	0.779			
	ATE3	0.818			
	ATE4	0.721			
	ATE5	0.761			
Design of Learning Content			0.846	0.772	0.725
	DLC1	0.658			
	DLC2	0.785			
	DLC3	0.788			
	DLC4	0.723			
	DLC5	0.657			
Perceived Ease of Use			0.867	0.806	0.768
	PEOU1	0.836			
	PEOU2	0.802			
	PEOU4	0.619			
	PEOU5	0.726			
	PEOU6	0.766			
Perceived System Functionality			0.902	0.864	0.748
	PSF1	0.823			
	PSF2	0.764			
	PSF3	0.865			
	PSF4	0.822			
	PSF5	0.745			
Perceived Usefulness			0.863	0.809	0.732
	PU1	0.734			
	PU2	0.702			
	PU3	0.650			
	PU4	0.729			
	PU5	0.709			
	PU6	0.763			

Table 4. The measurement of discriminant validity of the constructs.

	1	2	3	4	5
1 Attitude Toward E-learning	0.762				
2 Design of Learning Content	0.783	0.724			
3 Perceived Ease of Use	0.715	0.690	0.754		
4 Perceived System Functionality	0.658	0.738	0.733	0.805	
5 Perceived Usefulness	0.691	0.755	0.723	0.659	0.715

2.4 Discussion and Implications

Based on Table 5 and Fig. 2, it turns out the different results. Perceived system functionality does not significantly impact to the perceived usefulness. This statement is contrary to research conducted by Pituch and Lee (2006). Pituch and Lee (2006) declared that online learning systems perform the functions if the university has well-integrated systems and has more controlling over the software system. Electronic learning system was designed properly to permit the users to access the system anywhere and anytime and supported with accessible of WI-FI connection so it will make a huge contribution to improve students academic performances (Selim, 2003).

In contrary to WI-FI connection in Indonesia. Since almost 55 percent of respondents have low-speed Internet at home and the online learning system has many problems and it would be happened within the online learning process so several students did not have accessibility to the learning systems, took much time to download the learning materials and submit their assignment to the system. Some of learners complaints regarding having problems with the system, such as the system takes more time to download and the response time of the system is not going consistently, unreasonably and very slowly, so they perceive that e-learning system does not give a good impact on the usefulness of the online learning process. This results is linear to the research conducted by Cho, et al. (2009). Cho, et al. (2009) declared that no matter how higher capability level of a system, it may not be useful if the system is not being processed well because of the lack of WI-FI connection. Moreover, this pandemic insist many sectors to work from home and study from home. Therefore, from outbreaking Covid 19, many universities decide their education have to movement methods, from offline class to online class. Contrast with the H1, perceived system functionality is positively affected to perceived ease of use over to online learning process. The result is going consistent with the Pituch & Lee's (2006) research that when learners perceive that the online learning system has better response time, allow them to access the course materials and it also indicates that the system is easy to use.

Design of learning contents significantly affects to the perceived ease of use and the perceived usefulness. From the results, these are consistent statements with the research which was conducted by Lee, et al. (2009). These results showed that a good-quality learning content motivates students to continue learning through online learning process and they are getting more value on their learning performance (Lee, et al., 2009). From those findings, no matter how the well-design of contents is, it will not be given more

Table 5. Outcomes of the structural model

Hypotheses	Path	Original Sample (O)	T Statistics (O/STDEVI)	P Values	Results
H1	Perceived System Functionality -> Perceived Usefulness	0.043	0.313	0.755	Not Supported
H2	Perceived System Functionality -> Perceived Ease of Use	0.491	4.890	0.000	Supported
H3	Design of Learning Contents - > Perceived Ease of Use	0.327	3.033	0.002	Supported
H4	Design of Learning Contents - > Perceived Usefulness	0.469	4.346	0.000	Supported
H5	Perceived Ease of Use - > Attitude Toward e-learning	0.452	4.966	0.000	Supported
H6	Perceived Ease of Use - > Perceived Usefulness	0.368	4.007	0.000	Supported
H7	Perceived Usefulness - > Attitude Toward e-learning	0.364	3.716	0.000	Supported

benefits if learners felt that its usage is really hard. Learners will have a higher motivation and willingness to use online learning so that online learning system should be designed and developed well and it will give value-added to learners (Lee, et al., 2009). Moreover, the contents have to design for consistency and accuracy delivery the materials from a lecturer to learners. In other word, it will be much more useful if learners think the online learning system gives more advantages than disadvantages, such as develop and improve

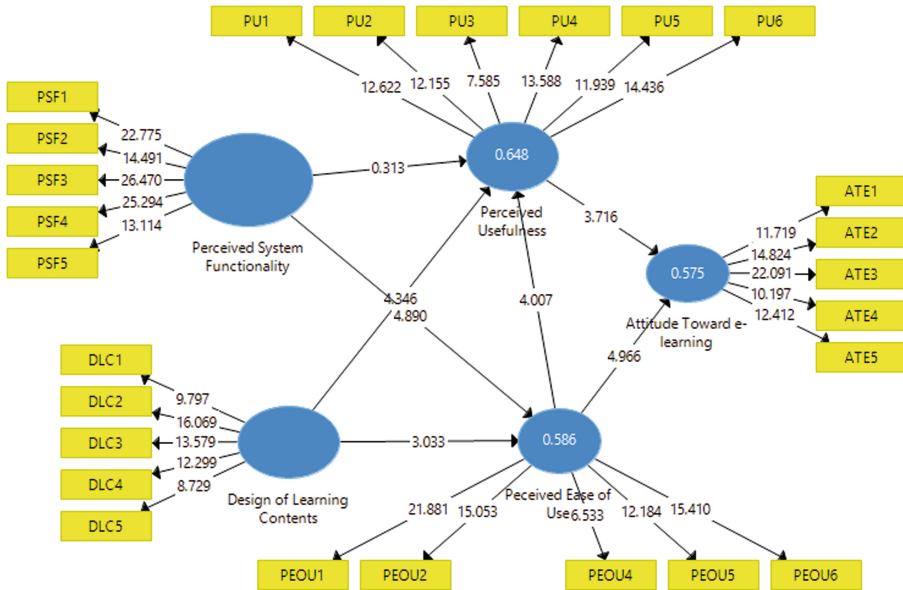


Fig. 2. The result of standardized path coefficients and significance levels

Table 6. The Results of Fit Indices

Model fit statistic	Statistic	Desired levels
χ^2	243.2	smaller
Significance probability		≥ 0.05
CMIN/DF (chi square/degree of freedom ratio)	2.466	≤ 3.00
Goodness-of-fit (GFI)	0.921	> 0.90
Normed fit index (NFI)	0.932	> 0.90
Comparative fit index (CFI)	0.920	> 0.90
Root mean square error of appreciation (RMSEA)	0.05	< 0.08
Standardized root mean residual (SRMR)	0.04	≤ 0.05
Adjusted GFI (AGFI)	0.88	> 0.8

their academic performance and accomplish their task quickly. As the result, the most successful of usefulness and ease to use system during the online learning process are affected by the design of learning contents.

Perceived ease of use has significantly influence on perceived usefulness. In other words, how useful a system is, it depends on how the system ease to use (Teo, 2011). Moreover, perceived ease of use and perceived usefulness are measured to affect the learners' attitude towards online learning system. Based on Table 5, perceived ease of use has the largest value to influence the learners' attitude ($\beta = 0.452$). Those data

indicate that perceived usefulness is only focus on the how the impactful of technology is, it can enhance academic performance. On other hand, perceived ease of use has focus on how users accept of technology and enjoy while they are using it. Furthermore, learners perceive technology to be more useful and easier to use the online learning system would improve and develop their learning performance, their attitude towards online learning system will be significantly positive and they have great willingness to study in online learning system (Teo, 2011). Moreover, when learners using the technology got how they succeed to make improvement regarding to their academic performances, it signaled that those technology is relatively effortless (Davis, et al., 1989; Venkatesh, et al., 2003; Teo, 2011), and it will bring to the learners will have more a good attitude towards online learning (Lee, et al., 2009; Teo, 2011).

3 Conclusions

The advance of technologies has developed consistently, and online learning systems is a crucial factor for helping learners to enrich, develop, and improve their academic performance and ease them to use the technology. The results depict that seven hypothesis have several implications. First, the data tell about the system functionality. The functioned system supposed to carefully maintenance and fulfill the learners' needs and provide value-added to them. The situation will be going to run smoothly if it is supported by the wi-fi connection. Second, the learning contents is being well-designed to enhance and ensure learners to achieve learning goals and make them enjoyable to use the system. A better implementation of functionality and design of learning contents will develop the educational value. Third, the perceived ease of use of the system effects the perceived usefulness. It means that the easier of using the technology, the easier you achieve your learning goals. Learners will more pay attention to the learning materials, submit their assignments, and join the group discussion in each session meeting. An online learning system should be emerged in easier way to use and more useful to enlarge and to achieve their learning goals. Furthermore, what they perceive regarding on the online learning process will offer them to a good attitude and desire to have a positive feelings over an online learning process.

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Guest Perception of Technology vs. Human Interaction in Hotel Check-in Process Implication for Service Quality

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Abstract. In the era of the emerging technology-driven hotel industry, the hotel check-in process is undergoing a profound transformation. The intertwining forces of technology and human interaction have redefined how guests experience services, posing essential questions about the balance between efficiency and personalization in this evolving landscape. This research endeavours to investigate the perception of guests regarding the balance between technology and human interaction during the check-in process at hotels, and how this perception affects the quality of service provided. By utilizing the Technology Acceptance Model (TAM) & the SERVQUAL Model, data have been collected from 346 hotel guests and analysed. The findings of this study demonstrate compelling evidence of the significant role played by perceived usefulness and ease of use in influencing the acceptance, particularly in the context of hotel check-in. Additionally, the perceived quality, which encompasses dimensions such as reliability, responsiveness, assurance, and tangibility, emerges as a noteworthy factor in shaping guests' intentions. It is worth noting that the intention to utilize technology for hotel check-in serves as a pivotal determinant of both the actual usage of technology and guest satisfaction. The results emphasize the rising demand for technology-driven check-in processes, calling for user-friendly, streamlined solutions that prioritize convenience while upholding trust and ethical standards. Furthermore, this study highlights the potential for technology misuse, underscoring the importance of security measures to safeguard the interests of legitimate guests in our increasingly digitalized world.

Keywords: Check-in process · TAM · SERVQUAL · Perceived usefulness · Perceived Quality · Ease of Use

1 Introduction

In the modern hospitality industry, the intertwining forces of technology and human interaction have redefined how guests experience services, particularly in the context of hotel check-in processes. Travelers now have quick and easy ways to book lodging

because technological advancements have forced a crucial change toward tech-driven and automated check-in procedures. But at the same time, the intrinsic value of individualized human interaction continues to be a cornerstone of hospitality, encouraging patron happiness and adherence. This paper embarks on a journey to explore the dynamic interplay between technology and human interaction during the hotel check-in process and assesses its profound implications on service quality.

As technology steadily infiltrates the domain of hospitality, hotels are adopting an array of automated solutions, such as mobile check-in apps, self-service kiosks, and digital key systems. These innovations promise guests unprecedented speed and convenience, reducing the time spent on administrative formalities and empowering them with greater control over their stay. Yet, this technological metamorphosis raises questions about whether the traditional warmth and personal touch of face-to-face interactions at the front desk are being sacrificed in the name of efficiency.

The primary focus of this investigation is to determine whether guests view check-in procedures that are driven by technology as improving or diminishing their overall hotel experience, particularly in terms of service quality. Are travelers of the opinion that technology is a valuable tool that facilitates their journey, or do they long for the interpersonal interaction provided by the human hotel staff? Furthermore, what effect do these viewpoints have on guest satisfaction, loyalty, and the overall success of hotels in a fiercely competitive industry?

The study undertakes a review of the existing literature on the subject in order to seek answers. It explores the ever-changing landscape of technology in the hospitality sector, the significance of human interaction in guest experiences, and the interconnected concepts of service quality and customer satisfaction. Subsequently, a thorough examination of guest perceptions and preferences is carried out through the questionnaires as a means of gathering quantitative data. A random sampling approach was utilized to invite 346 hotel guests to participate in the Questionnaires. By utilizing these data sources in a triangulated manner, our objective is to through light on the intricate relationship between technology & human interaction during the hotel check-in process, thereby providing insights into the implications for service quality.

As we traverse this exploration, it becomes apparent that the hospitality industry finds itself at a pivotal crossroads, where it must strike a delicate balance between the alluring nature of technological innovation and the enduring appeal of personalized service. Through a meticulous examination of the subtleties of guest perceptions, the objective of this study is to furnish hoteliers and stakeholders with invaluable insights, thereby offering them guidance on how to optimize the check-in experience and, consequently, enhance the caliber of service in an era characterized by the coexistence of human warmth and technological expertise.

Flow of the Study (Chapterization)

The paper's flow is structured coherently, beginning with an introduction that highlights the study's importance in the context of technology adoption in hotel check-in processes. Following this, the literature review explores existing research, laying the foundation for the study by delving into concepts like perceived usefulness, ease of use, perceived quality, and intention to use technology. With the theoretical framework established in the methodology part and the research framework as well as the hypotheses

are developed, providing a roadmap for hypothesis testing. The data analysis section outlines the methodology, data collection, and sample demographics, with a focus on Structural Equation Modeling (SEM) for hypothesis testing. Interpretation discusses the implications of the findings. The conclusion offers a concise recap of the study's key outcomes, emphasizing practical implications for the hotel industry, and the implications section extends the discussion to broader applications and potential future research areas. This structured flow ensures a logical progression through the paper, facilitating reader understanding of the research process and its implications.

2 Review of Literature

The literature review for the paper titled “Guest Perception of Technology Vs. Human Interaction in Hotel Check-in Process: Implication for Service Quality” investigates how hotel guests perceive the utilization of technology as opposed to human interaction during the check-in process and its impact on the quality of service. This review covers a range of critical areas:

Furthermore, providing additional human service in situations where robots play a prominent role can improve consumers' perception of the social value of the experience. This enhancement in perception positively influences their attitudes and intentions to repurchase services from the business. (Wu L Fan et al. 2022).

2.1 Service Quality Model (SERVQUAL)

Within the hospitality sector, achieving and maintaining a sustainable competitive edge hinges significantly on service quality, and the fundamental imperative of customer satisfaction and retention cannot be overstated (Park et al., 2022). Numerous investigations have explored the influence of service quality on customer satisfaction within the hotel industry. Research has consistently demonstrated that dimensions like empathy, responsiveness, assurance, and tangibility exhibit a favorable correlation with customer satisfaction (Meeshala et al., 2018).

The hotel industry is greatly influenced by the quality of services on customer satisfaction. The various dimensions of service quality, including empathy, responsiveness, assurance, reliability, and tangibility, all have a connection to the levels of satisfaction experienced by customers in hotels. It is crucial to prioritize the maintenance of high quality of services and the fulfilment of guest expectations within these dimensions as it plays an important role in generating contented customers and fostering the growth of revenue in hotels. (Ali et. al. 2021).

The paper by **Yeong et. al (2022)** suggest that empathy, tangibles, and reliability have substantial impacts on the overall satisfaction of customers in the hotel industry of Malaysia. Nevertheless, responsiveness and assurance were not observed to have a noteworthy effect on customer satisfaction. Out of all the aspects examined, empathy was determined to be the most influential predictor of customer satisfaction. Moreover, the investigation revealed that customer satisfaction exhibits a favourable correlation with customer loyalty within the realm of resort hotels.

In the realm of the hotel industry, Sangpikul's (2023) research focuses on the dimension of assurance within the SERVQUAL framework. Specifically, it examines significant categories such as assurance in food and beverage services, staff assurance, physical assurance, and process assurance in Thailand. Moreover, the study sheds light on the incorporation of perceived hygiene considerations at the time of COVID-19 into the broader aspect.

The fuzzy SERVQUAL and fuzzy AHP methods are proposed as effective tools for evaluating service quality in the hotel industry. (Stefano et. al. 2015). The study emphasizes the significance of understanding customer needs and expectations in order to provide superior services and strengthen competitiveness.

Asirifi et. al.(2014) utilized the SERVQUAL approach to evaluate service quality in the hotel industries, specifically focusing on the Alisa Hotel in Ghana. A modified pretested questionnaire was developed relied on the SERVQUAL approach and used to collect primary data from customers of the hotel. The questionnaire assessed service quality based on tangibility, reliability, responsiveness, assurance, and empathy. With the findings indicating a generally positive perception of service quality at the Alisa Hotel in Ghana.

Musaba et al. (2014) applied the SERVQUAL approach to evaluate employee perceptions of service quality in Namibian hotels. Data was collected from 77 employees in two Windhoek hotels via a questionnaire assessing five service quality dimensions. Gap score analysis indicated that employees perceived service quality to be lower than their expectations, with significant gaps in areas related to fair treatment, employee value, empowerment, and training. Factor analysis identified four factors, with the first one, encompassing aspects like comparable pay and benefits and the use of employee feedback, being the most influential.

Rashidb et. al. (2012). Investigated customer satisfaction as the dependent variable, with five independent variables: tangible, empathy, reliability, assurance, and responsiveness. The study's results offer valuable insights for both the Green Hotels sector and the Malaysian tourism industry, shedding light on service quality and potential gaps. Overall, the paper aims to help Green hotels in Malaysia measure service quality and understand the factors that contribute to customer satisfaction. The study utilizes the SERVQUAL model and provides valuable insights for the Green Hotels sector and the government.

Mouzaek et al. (2021) examined how service quality components influence customer satisfaction within the hotel industry in the United Arab Emirates. They utilized quantitative research methods, employing a self-administered questionnaire to collect data from 5,000 in-house hotel guests in Dubai. Multiple regression analysis revealed that tangibles, reliability, and responsiveness significantly predicted customer satisfaction. The study underscores the role of service quality in meeting customer expectations, enhancing satisfaction, and suggesting that enhanced hotel service quality can lead to increased customer satisfaction and improved organizational performance. However, it's noteworthy that reliability exhibited a negative relationship with customer satisfaction (Soona et al., 2021).

2.2 TAM Model

In the hotel industry, the TAM model assesses how guests and employees embrace and utilize technology, influencing their acceptance and usage of digital tools and services. It helps hoteliers understand and enhance technology adoption to improve guest experiences and operational efficiency.

Lina Zhong et al. (2020) proposes a new model that integrates the theory of planned behaviour and the technology acceptance model. This model is designed to explore how customers perceive and embrace hotel service robots. Their study holds the potential to advance the theoretical understanding within the hospitality industry.

The Technology Acceptance Model (TAM) has found application in various investigations within the hotel sector, examining the determinants of technology acceptance and utilization. In a South Korean study, the focus was on forecasting the acceptance of user-generated content (UGC) websites among Generation Y customers. This was achieved by integrating an extended TAM model with considerations for the trustworthiness of online reviews and cultural consensus analysis. The findings from this study, conducted in the hotel industry, affirmed that perceived usefulness, ease of use, and innovativeness positively influence user attitudes and intentions (Hamid et al., 2020).

In a separate investigation carried out in Malaysia, the focus was on assessing how perceived usefulness, perceived ease of use, and perceived innovativeness influence attitudes and intentions concerning the utilization of smart housekeeping trolleys in hotels. This research incorporated an extended TAM model to forecast the acceptance of user-generated content websites among Generation Y customers in the hotel industry (Bae et al., 2020).

In Bali, a study investigated the impact of personalization, computer self-efficacy, and trust on the utilization of information systems within a five-star hotel, employing the TAM framework. The outcomes of this study revealed that computer self-efficacy and trust exerted a positive and noteworthy effect on the perceived usefulness and ease of use of the information system. However, it was found that personalization did not significantly influence either of these factors (Devi et al., 2014).

The study by Abang et. Al (2017) proposes an integration of the Technology Acceptance Model (TAM) and Information Acceptance Model (IAM) to evaluate consumer acceptance of information technologies for hotel selection. The study delves into the utilization of social media as a marketing and promotional instrument within the hospitality industry, with a specific focus on hotel selection. An increasing trend is observed among consumers who are turning to social media to connect with others and exchange information regarding their experiences within the hospitality and tourism sector.

The study conducted by Mahmoud et. al. (2018) investigates how users' perceptions and beliefs towards a hotel information system (HIS) relate to their day-to-day intention to use it, utilizing the Technology Acceptance Model (TAM). Additionally, it introduces task technology fit and self-efficacy as supplementary factors. The results reveal that task-technology fit and the perceived ease of use have an impact on perceived usefulness, which subsequently influences the intention to use the HIS. Notably, the perceived ease of use doesn't have a direct effect on the attitude towards using the system, and self-efficacy doesn't directly impact the intention to use it.

Based on the literature review, it is evident that most previous papers have predominantly employed either the SERVQUAL or TAM model. However, in our study, we have taken a unique approach by integrating both of these models for our paper.

3 Methodology and Hypotheses Development

The research methodology for this paper would involve a systematic approach to collect, analyses, and interpret data to answer the research questions and address the objectives of the study.

3.1 Integrated TAM and SERVQUAL Model

The Integrated TAM and SERVQUAL Model combines the technology acceptance factors of TAM with the service quality factors of SERVQUAL to provide a holistic understanding of how users accept and adopt technology in a service context (Fig. 1). It emphasizes that the quality of service plays a crucial role in shaping users' perceptions and intentions regarding technology adoption within a service environment technology. (Catherine et. al. 2023).

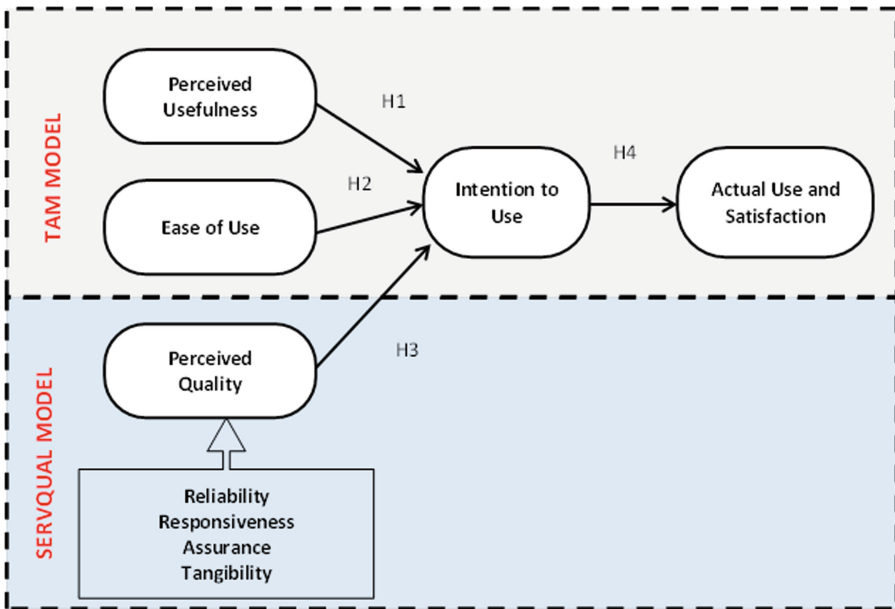


Fig. 1. Integrated Model of TAM & SERVQUAL Model

3.2 Relationship Among Variables in Integrated Model

Numerous previous research endeavours have utilized the Technology Acceptance Model (TAM) to explore the determinants of actual use and satisfaction of customers. These investigations have consistently highlighted the pivotal role of Perceived Usefulness and Ease of Use as essential variables in comprehending user behaviour when adopting novel.

Perceived Usefulness has been established as a contributing factor to satisfaction (Nuryakin et al. 2023). It also exerts a positive influence on intention to use (Hamzah, 2023). Likewise, confirmation has a beneficial impact on both satisfaction and the intention to use. Furthermore, satisfaction serves as a mediator in the connection between perceived usefulness and the intention to use (Andrew & Ardianti, 2022).

The significance of ease of use within the context of the Technology Acceptance Model (TAM) is particularly pronounced in the hotel sector. Extensive research consistently illustrates a positive correlation between perceived ease of use and the intention to use technology (Mahmoud et al., 2018). Furthermore, a specific study indicates that the user-friendliness of e-comment systems positively influences the booking intentions of business travelers seeking hotel accommodations. In the field of education and the adoption of Internet of Things (IoT) technology, perceived ease of use not only impacts perceived usefulness but also plays a role in shaping users' attitudes (Muchran et al., 2018). These collective findings underscore the pivotal role of ease of use in shaping users' attitudes, intentions, and satisfaction with technology, extending its relevance beyond the hotel industry to various domains. (Memarzadeh, et. al 2016).

Guests' perception of the quality of automated check-in solutions has a favourable influence on their intention to utilize these systems. This conclusion is substantiated by research conducted by Choi et al. (2022) and Hossain et al. (2020). In their studies, Choi et al. (2022) observed that the quality of information and the level of innovativeness positively affected the ease of use & perceived usefulness, subsequently enhancing the intention to use self-check-in kiosks. Hossain et al (2020). Specifically investigated the mobile check-in service of airlines and identified that factors like the ease of use and the mandatory nature of self-service technology had demonstrated a clear influence on the inclination to use the service. Based on the findings discussed above, the below hypotheses are framed:

H1: Guest perception of the usefulness of automated check-in solutions positively impacts their intention to use them.

H2: Guest perception of the ease of use of automated check-in solutions positively impacts their intention to use them.

H3: Guest perception of the quality of automated check-in solutions positively impacts their intention to use them.

H4: The intention of guests to use automated check-in solutions positively impacts both the actual usage of these technologies and their overall satisfaction with the hotel's service quality.

3.3 Data Collection Method

The primary data for this research was acquired by means of a meticulously structured questionnaire distributed to 346 respondents who had stayed at diverse hotels.

Data Collection:

Sampling: Define the target population (e.g., hotel guests) and the sampling method (e.g., random sampling, stratified sampling).

Data Collection Instruments:

Surveys: Develop structured questionnaires to collect quantitative data on guest perceptions. Questions should be designed to measure perceptions of technology and human interaction in the check-in process and their impact on service quality.

4 Data Analysis

Data analysis is a fundamental step in our research, offering insights into guest perceptions and service quality implications related to hotel check-in technology. Demographic analysis complements this process by providing a snapshot of respondent profiles, such as age, gender, nationality, income, education, and app usage. These demographic characteristics play a crucial role in understanding the diverse perspectives within our sample and their potential influence on the study’s outcomes.

Table 1. Demographic Profile

Demographic Profile	Frequency	%
Age Group		
18–24	50	14.50%
25–34	100	28.90%
35–44	80	23.10%
45–54	60	17.40%
55 and above	56	16.20%
Gender		
Male	160	46.20%
Female	186	53.80%
Nationality		
Local	240	69.40%
International	96	27.70%
Not specified	10	2.90%
Income Level		
Low (Below \$30,000)	70	20.20%

(continued)

Table 1. (continued)

Demographic Profile	Frequency	%
Moderate (\$30,000 - \$60,000)	120	34.70%
High (Above \$60,000)	100	28.90%
Not Specified	56	16.20%
Education		
High School	60	17.40%
Bachelor's Degree	160	46.20%
Master's Degree	80	23.10%
Doctorate or Higher	30	8.70%
Not Specified	16	4.60%
Apps Used for Booking		
Hotel-specific apps	110	31.80%
Third-party apps (e.g., Booking.com)	150	43.40%
Both types of apps	40	11.60%
No apps used	46	13.30%

The demographic analysis shown in the Table 1 reveals a diverse sample of 346 respondents, with age groups well-distributed, predominantly between 25–44 years old. Gender representation is nearly balanced, with 53.8% female and 46.2% male respondents. A significant majority (69.4%) of respondents are of local nationality, while 27.7% are international, possibly reflecting the study's location. Income levels are fairly evenly distributed, with 34.7% falling in the moderate-income range, and 20.2% in the low-income bracket. In terms of education, 46.2% hold a Bachelor's degree, and 23.1% possess a Master's degree. A noteworthy 43.4% use third-party apps for hotel bookings, while 31.8% use hotel-specific apps. This demographic information is crucial for understanding the sample's characteristics and potential implications on their perceptions and behaviours regarding hotel check-in technology and service quality.

The reliability measures for the measurement model shown in the Table 2 revealed that the internal consistency and validity of the constructs. Perceived Usefulness (PU) demonstrates substantial reliability, with a high factor loading of 0.937 and a satisfactory composite reliability of 0.801, although Average Variance Extracted (AVE) and the R^2 are not provided. Perceived Ease of Use (PEOU) also exhibits strong reliability, with a factor loading of 0.936 and a robust composite reliability of 0.822, yet AVE and R^2 are not specified. The intention to use construct displays good reliability and validity, as indicated by a high factor loading of 0.922, a CR of 0.801, and an AVE of 0.603. Actual Usage & Satisfaction exhibits high reliability and validity, with a factor loading of 0.931, a CR of 0.814, and an AVE of 0.599.

Testing Hypotheses using SEM: This research employed Structural Equation Modelling (SEM) to rigorously test our hypotheses. SEM allows us to examine complex

Table 2. Reliability of the Measurement Model

Variable and Item	Factor Loading	CR	AVE	VIF	R ²
Perceived Usefulness (PU): ($\alpha = 0.790$)		0.937	0.801		N/A
“I believe that utilizing technology for the hotel check-in process enhances your overall check-in experience.”	0.891			3.489	
“In your opinion, does the tech-driven check-in process offer value in terms of saving time and effort compared to traditional check-in methods?”	0.904			2.948	
Perceived Ease of Use (PEOU): ($\alpha = 0.842$)		0.936	0.822		N/A
“The tech-driven check-in process at the hotel is easy for you to understand and use.”	0.891			3.328	
“I find it straightforward to navigate the automated check-in system at the hotel.”	0.892			2.484	
Perceived Quality - Reliability: ($\alpha = 0.819$)		0.954	0.798		N/A
“During the tech-driven hotel check-in process, were your room reservations and preferences accurately met?”	0.789			3.474	
Perceived Quality - Responsiveness: ($\alpha = 0.744$)		0.952	0.804		N/A
“The tech-driven check-in process promptly addressed your needs and requests.”	0.887			2.987	
Perceived Quality - Assurance: ($\alpha = 0.757$)		0.873	0.701		N/A
“I was provided with sufficient information about the hotel’s services, amenities, and policies during the tech-driven check-in process.”	0.871			2.261	
Perceived Quality - Tangibility: ($\alpha = 0.910$)		0.877	0.699		N/A

(continued)

Table 2. (continued)

Variable and Item	Factor Loading	CR	AVE	VIF	R ²
“The physical appearance of the hotel’s automated check-in area and facilities left a positive impression on you.”	0.875			2.837	
Intention to Use: ($\alpha = 0.928$)		0.922	0.801		0.603
“I am likely to choose tech-driven check-in during my future hotel stays.”	0.892			2.714	
“I anticipate relying on tech-driven check-in as your preferred method in the future.”	0.884			2.775	
Actual Usage & Satisfaction: ($\alpha = 0.823$)		0.931	0.814		0.599
“During your most recent hotel stay, I utilized the tech-driven check-in option.”	0.912			3.007	
“Overall, I was very satisfied with the tech-driven check-in experience during my recent hotel stay.”	0.898			3.062	

relationships between observed and latent variables, offering a powerful tool to analyze the impact of guest perceptions and demographic factors on service quality in the context of hotel check-in technology. The results of the hypotheses are shown in the Table 3 and Fig. 2 as well.

Table 3. Test Results of Hotel Check-In Technology and Service Quality

Technology acceptance - Hypotheses	Path Coefficient	t-Value	p - Value
H1. Perceived usefulness → Intention to Use	0.701	23.852	0.001
H2. Perceived Ease of Use → Intention to Use	0.713	8.707	0.000
H3. Perceived Quality → Intention to Use	0.682	9.412	0.015
H4. Intention to Use → Actual Usage and Satisfaction	0.502	9.217	0.011

Hypothesis 1 is resoundingly supported, with a path coefficient of 0.701 and an extremely low p-value of 0.001. This indicates that perceived usefulness significantly and strongly influences the intention to use technology. Guests are highly inclined to use technology when they perceive it as beneficial.

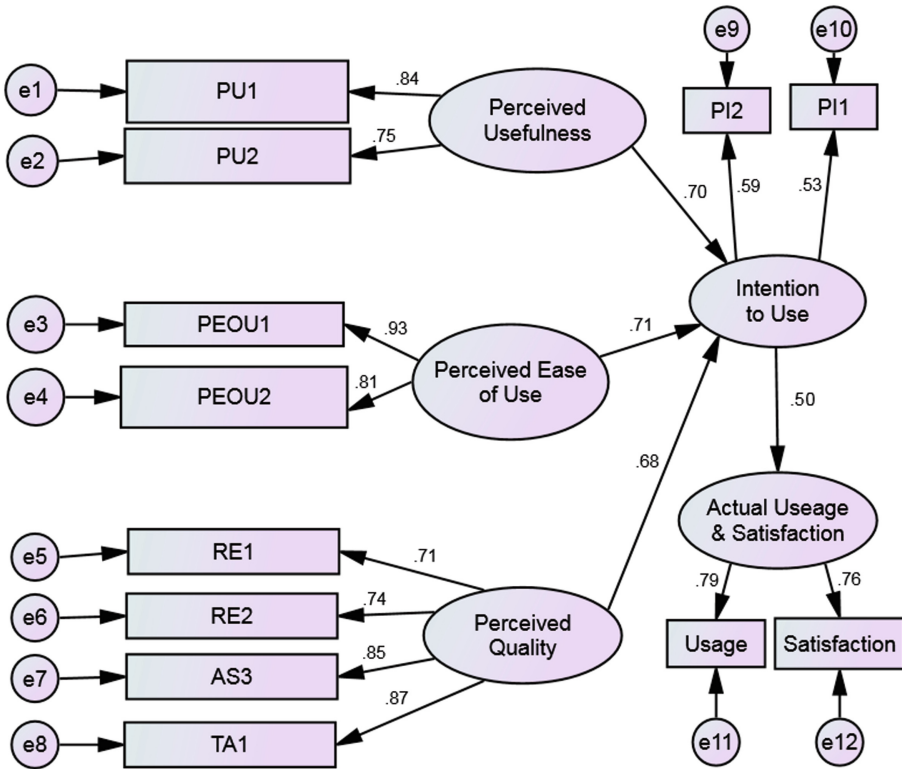


Fig. 2. Guest Perception of Technology acceptance and Service Quality Model.

Hypothesis 2 is robustly confirmed, with a path coefficient of 0.713 and a highly significant p-value of 0.000. This underscores the pivotal role of perceived ease of use, where user-friendly interfaces and streamlined processes significantly and positively impact the intention to use technology.

Hypothesis 3, which focuses on perceived quality, is supported, albeit with a lower level of significance. It has a path coefficient of 0.682 and a p-value of 0.015. This suggests that perceived quality positively affects the intention to use technology, though not as pronounced as perceived usefulness and ease of use.

Hypothesis 4 is upheld with a path coefficient of 0.502 and a significant p-value of 0.011. It emphasizes the essential role of intention to use technology, which significantly influences both actual usage and guest satisfaction. This underscores that a guest’s willingness to use technology has cascading effects on their overall experience, from usage patterns to satisfaction levels.

These results of the study analysis, backed by specific coefficients and p-values, highlights the critical importance of perceived usefulness and ease of use in driving technology acceptance, as well as the significance of perceived quality and the intention to use technology in shaping actual usage and guest satisfaction in the hotel check-in process.

5 Conclusion

The analysis of our research reveals strong support for the influence of perceived usefulness and ease of use in driving technology acceptance in the context of hotel check-in. Perceived quality, encompassing components like reliability, responsiveness, assurance, and tangibility, significantly shapes user intentions. The intention to use technology in hotel check-in is pivotal for both actual usage and guest satisfaction. These findings underscore the importance of user-centric design and quality assurance in developing and implementing technology-based solutions in the hospitality industry. Practical implications call for hotels to prioritize not only the functionality and user-friendliness of their technology but also the consistency and responsiveness of their services. These insights offer valuable guidance to hotel management aiming to enhance guest experiences through technology adoption. Further, the study highlights the rising demand for technology-driven check-in processes in the hotel industry, meeting customers' expectations for efficient, queue-less, and expedited experiences. Hotels must prioritize user-friendly and streamlined technology solutions that enhance convenience and maintain trust and ethical standards. The integration of AI-driven data, including historical customer information, can improve security by identifying potential fraudulent or unauthorized individuals, thus safeguarding the interests of legitimate guests.

5.1 Implications

The implications of this study are two-fold. First, it underscores the need for hotels to invest in and enhance technology-driven check-in processes that meet the demands of contemporary customers. The implications also stress the importance of preserving the integrity and trustworthiness of these processes while providing efficient and convenient services. Additionally, the adoption of AI and historical data analysis can bolster security, enabling hotel staff to identify and address potential fraudulent activities or unauthorized access effectively. Second, it highlights the potential for misuse of such technology for unethical or even illegal purposes, necessitating the implementation of safeguards and security measures. In conclusion, the study's implications emphasize the significance of adopting technology to meet customer demands for streamlined check-in processes while ensuring ethical and security measures to maintain a safe and trustworthy guest experience in an increasingly digitalized environment.

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Factors Influencing Online Purchase Intention of Luxury Watches

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Abstract. The rise of e-commerce and increased trust in online shops has led to the emergence of websites for purchasing luxury watches that were previously only available through certified dealers. In the past, luxury watches were seen as solely luxury and self-symbolic; however, now they are seen through a value-oriented perspective as an investment (Faschan et al., 2020). This research outlines a comprehensive model of factors influencing customers' intention to buy luxury watches online. The theory of reasoned action model (TRA) was extended including trust as another predictor of the customers purchase intention and payment method as a possible moderator between the relationship of these factors. Results indicated that all TRA predictors affect the customers purchase intention of buying luxury watches online, except the factor perceived usefulness (PU). The payment method was discovered to have no direct moderation effect between the predicting factors.

Keywords: Luxury Watches · Online Shopping · Purchase Intention · Consumer Decision-Making · E-commerce

1 Introduction

This study aims to analyse consumer behaviour regarding online purchases of luxury watches, providing insights on both theoretical and practical levels. It seeks to identify the key factors influencing the intention of German customers to buy luxury watches online, serving as a foundation for future research in this market. The study aims to offer valuable information to online watch businesses, enabling them to better understand customer needs and adjust their business models accordingly. The research will address the following two research questions. **RQ1:** What factors influence consumers' intention to purchase luxury watches online? **RQ2:** Does the payment method moderate the relationship between the suggested factors?

In today's digital era, establishing an online presence is essential for businesses (Kim, 2019). The development of e-commerce has provided customers with the opportunity to purchase luxury watches online, both through official brand websites and various marketplaces like Chrono24 and Chronext. Online stores offer convenience by allowing

customers to buy the same products available in physical luxury watch boutiques without the need for a store visit (Morillo et al., 2019).

From a business perspective, selling luxury watches online enhances sales and brand visibility for luxury watchmakers. However, consumers have concerns about online luxury purchases. Firstly, there are security concerns related to payment and delivery, considering the significant monetary value involved (Fazeli et al., 2019). Additionally, online shopping lacks the physical interaction with the product, which is important for luxury purchases as customers cannot touch, smell, or feel the item (Okonkwo, 2009).

Okonkwo (2009) identifies two key characteristics of luxury brands that are seemingly incompatible with the internet: creating desirability and maintaining the perception of limited availability. Online platforms make luxury goods accessible to a wider consumer base, contrary to the targeted exclusivity of luxury brands. However, Kluge and Fassnacht's (2015) research demonstrates that the online presence of luxury brands does not negatively impact consumers' perception of scarcity and desirability of luxury goods.

2 Methodology

2.1 Research Model

The Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975) and the Technology Acceptance Model (TAM) – which is an extension of TRA (Lee et al. 2003) – are modified and applied to this research.

TRA is a well-established model from social psychology that aims to predict human behavior by considering attitude towards a behavior and subjective norms (Fishbein and Ajzen, 1975). While TRA is comprehensive, it does not encompass all the beliefs and motives that influence specific behaviors (Davis et al., 1989). To address this limitation, researchers using TRA should analyse the meaningful beliefs associated with the behaviors under investigation.

The Technology Acceptance Model (TAM), developed in 1989, extends the TRA theory by focusing on the adoption of technology. TAM considers perceived ease of use and perceived usefulness as key factors determining a person's attitude towards using technology (Lee et al., 2003).

TAM has undergone various improvements and additions by researchers to minimise its limitations and has become the most widely used model for studying individuals' attitudes, actual use, and intention to behave regarding the internet (Hassan and Abu-Shanab, 2020). In this paper, the final version of the TAM model is utilised, which removes the factor of attitude and includes perceived usefulness, perceived ease of use, subjective norms, and trust in online luxury watch sellers as predictors for buying luxury watches online (Lai, 2017). The research model also explores the moderation effect of payment methods on the individuals' decision (Hamid et al., 2016).

The final research model consists of four variables: perceived usefulness (PU), perceived ease of use (PEOU), subjective norms (SN), and trust (T) in online sellers of luxury watches. The research model also includes a moderating factor – payment method – which could influence individuals' decisions, as shown in Fig. 1.

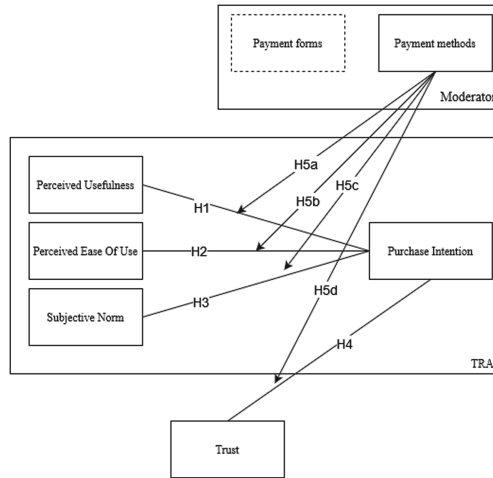


Fig. 1. Research Model (Fishbein and Ajzen, 1975; Davis et al., 1989).

2.2 Research Hypotheses

In order to address the research questions, hypotheses regarding the individual factors must be formulated and tested. These hypotheses are derived from the literature review and the underlying research model. It is anticipated that these factors will have an impact on buying behaviour and online commerce in general.

The following hypotheses are proposed:

- H1. PU positively influences consumers' intention to purchase luxury watches online.
- H2. PEOU positively influences consumers' intention to purchase luxury watches online.
- H3. SN positively influence consumers' intention to purchase luxury watches online.
- H4. T positively influences consumers' intention to purchase luxury watches online.
- H5a-d. Payment method moderates the relationship between the above factors and customers' intention to purchase luxury watches online.

2.3 Research Instrument

This study is based on quantitative research, utilizing an individual survey questionnaire created with Sawtooth Lighthouse Studio software. A pilot test was conducted with 15 users to ensure question clarity. The survey consists of five sections, starting with an introduction that defines luxury watches and mentions processing time and anonymity. The subsequent sections address perceived usefulness (PU), perceived ease of use (PEOU), subjective norm (SN), and trust (T). Each section includes a set of items measured on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The specific questions were adapted from previous studies to ensure relevance to luxury watches (Abu-Shanab, 2014; Abu-Shamaa et al., 2018; Abu-Shanab and Alkailani, 2021; Gefen et al., 2003).

The last section of the survey included questions about participants' preferred payment method, which could serve as a potential mediator. They were also asked whether they preferred to pay the full price or in instalments when purchasing a luxury watch. Demographic data from the participants were collected on the final page of the survey.

2.4 Sample and Data Collection Procedure

The survey was conducted online through platforms like LinkedIn, Instagram, WhatsApp, and luxury watch Facebook groups with the administrators' consent. From November 21, 2022, to December 12, 2022, a total of 311 responses were collected. After removing nine participants who did not meet the residency criteria, the final sample size was 302 participants.

The final sample comprised 177 males and 125 females, with participants distributed across different age groups: 32 participants aged 18–20, 157 aged 21–30, 48 aged 31–40, 31 aged 41–50, and 34 participants aged 51 or above.

Regarding payment preferences, 25 participants chose payment before delivery, 145 selected payments after delivery, and 132 preferred payments through third-party providers. Out of the total, 272 participants preferred full-price payment, while 30 participants preferred instalment payments.

3 Data Analysis

To evaluate the model and hypotheses, multiple regression analysis is employed due to the presence of multiple independent variables and one dependent variable. The focus is on examining the relationship between PU, PEOU, SN and T. Two regression analyses were conducted, one with the payment method as a moderator and one without it, allowing for answers to both research questions.

3.1 Analysis Without the Moderation Effect

According to the findings presented in Table 1, three of the four predictors are statistically significant in predicting the purchase intention, and the overall model is significant ($R^2 = 0.456$, $F = 62.343$, $p < 0.001$). These four predictors collectively account for 45.6% of the variance in the purchase intention of luxury watches in online shopping. The most influential predictor is PEOU with a β value of 0.317 and $p < 0.001$. On the other hand, PU is not a significant predictor ($\beta = 0.099$, $p = 0.075$). Hence, the prediction equation for this model is:

$$PI = -1.120 + 0.167 * PU + 0.480 * PEOU + 0.395 * SN + 0.285 * T \quad (1)$$

These results confirm hypotheses H2, H3, and H4, which align with findings from previous studies (Alkailani and Abu-Shanab, 2021; He et al., 2008; Laohapensang, 2009; Lim et al., 2016). However, hypothesis H1 is not supported, indicating that perceived usefulness is not a significant factor in predicting the purchase intention of luxury watches.

Table 1. Coefficient table of regression.

Construct	B	Std. Error	β	t	Sig.
(constant)	-1.120	0.257		-4.358	<0.001
Perceived usefulness (PU)	0.167	0.094	0.99	1.786	0.075
Perceived Ease of Use (PEOU)	0.480	0.075	0.317	6.403	<0.001
Subjective Norm (SN)	0.395	0.069	0.294	5.725	<0.001
Trust (T)	0.285	0.096	0.170	2.979	0.003

Note. $R^2 = 0.456$, $F = 62.343$ ($N = 302$, $p < 0.001$)

Table 2. Coefficient table of regression with moderation effect.

Construct	B	Std. Error	β	t	Sig.
(constant)	-1.124	0.260		-4.323	<0.001
Perceived usefulness (PU)	0.158	0.345	0.094	0.459	0.646
Perceived Ease of Use (PEOU)	0.450	0.276	0.298	1.628	0.105
Subjective Norm (SN)	0.431	0.293	0.320	1.470	0.143
Trust (T)	0.336	0.385	0.201	0.872	0.384
Perceived usefulness (PU) * Payment Method	0.003	0.142	0.006	0.022	0.983
Perceived Ease of Use (PEOU) * Payment Method	0.013	0.109	0.031	0.121	0.904
Subjective Norm (SN) * Payment Method	-0.014	0.118	-0.030	-0.120	0.905
Trust (T) * Payment Method	-0.022	0.158	-0.040	-0.138	0.891

Note. $R^2 = 0.457$, $F = 30.779$ ($N = 302$, $p < 0.001$).

3.2 Analysis with the Moderation Effect

In the subsequent step, a regression analysis was conducted incorporating new variables that incorporate the interaction between the predictors and the corresponding payment method values. This accounts for the moderating effect of the payment method on the previously examined constructs. The multiple regression analysis involves both the original predictors and the new variables. The findings presented in Table 2 demonstrate that the payment method does not exert a significant moderating influence on the predictors.

Consequently, hypotheses H5a-d are rejected. This outcome aligns with the findings of a similar study conducted by Abu-Shanab and Alkailani (2021).

3.3 Analysis with the Individual Payment Methods

In order to gain a closer insight into the payment method and its influence on the purchasing behaviour, the payment methods (payment before delivery, payment after delivery, and third-party payment) were examined individually in the following step. Hypotheses H1–4 were tested again here.

Two of the four variables were significant. PU and T were not significant as $p > 0.05$. Based on the findings, H2 and H3 are supported, and H1 and H4 are rejected. This indicates that customers probably chose the third-party payment method because they do not trust the system and seek buyer protection.

4 Discussion

The present study investigated the factors influencing online purchase behaviour of luxury watches. One of the key advantages of factors such as perceived ease of use is that they enhance the convenience and accessibility of online shopping for luxury watches. When customers find the online platform easy to navigate and use, it reduces barriers to purchase and increases their overall satisfaction. This convenience factor allows customers to browse a wide range of luxury watches, compare prices, and make informed decisions from the comfort of their homes. An intuitive and user-friendly interface can enhance the overall customer experience and build positive brand perceptions.

Another positive factor is subjective norm, which capitalizes on the influence of social factors. When customers consider the opinions and recommendations of others, it creates a sense of trust and credibility in the online purchase process. Positive social proof plays a crucial role in building customer confidence and encouraging them to make a purchase. By leveraging the power of social influence, luxury watch retailers can benefit from increased customer engagement and loyalty.

Trust is also a significant factor influencing online purchase behaviour. When customers trust the online platform and the retailer, they are more likely to engage in online transactions. Trust can be fostered through secure payment systems, clear return policies, and transparent communication. Building trust is essential for luxury watch retailers as it assures customers of product authenticity, quality, and reliable customer service.

It is important to acknowledge the potential drawbacks and challenges associated with online purchase behaviour. One limitation is the inability to physically examine and try on the luxury watches before making a purchase. The lack of tactile experience can be a barrier for customers who prefer to evaluate the product's quality, materials, and fit in person. Luxury watch retailers need to address this limitation by providing detailed product descriptions, high-quality images, and virtual try-on technologies to bridge the gap between the physical and online shopping experiences.

Another challenge is the risk of counterfeit products and online scams. Luxury watches are highly valued items, and customers may be sceptical about the authenticity and reliability of online sellers. Luxury watch retailers must prioritize establishing

trust by implementing rigorous authentication processes, partnering with authorized distributors, and educating customers about counterfeit risks. Building a reputation for authenticity and reliability is crucial to overcome customer scepticism and encourage online purchases.

This study highlights the importance of factors influencing online purchase behaviour in the luxury watch industry. By understanding and effectively utilizing factors such as perceived ease of use, subjective norm, and trust, luxury watch retailers can successfully navigate the digital landscape and cater to the evolving preferences of customers. By striking a balance between convenience, social influence, and trustworthiness, luxury watch retailers can optimize their online channels and secure a competitive edge in the market.

5 Conclusion

This research paper has shed light on the factors that influence online purchase behaviour of luxury watches. The findings highlighted the importance of perceived ease of use, subjective norm, and trust in shaping consumers' purchase intentions. These factors provide valuable insights for luxury watch retailers to enhance their online platforms and marketing strategies. The study also revealed that perceived usefulness did not significantly impact purchase intentions in the luxury watch context, suggesting the need for further investigation. Overall, this research contributes to the understanding of consumer behaviour in the online luxury watch market and provides practical implications for industry practitioners to effectively engage and satisfy customers in this competitive landscape.

This study has certain limitations, such as its focus on the German-speaking online luxury watch market and may need a more diverse sample. As a cross-sectional study, it is important to continuously update and refine the research due to evolving consumer intentions. Future studies should explore demographic factors and reconsider the inclusion of payment form as a mediator. The close proximity of perceived usefulness to the significance threshold suggests potential for different outcomes in future research. Despite these limitations, this study serves as a foundation for further analysis of luxury goods and offers valuable insights for businesses to enhance their online platforms and adapt their strategies to meet customer expectations.




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Bridging Minds and Markets: Neuroeconomics Unveiling Emotional Influences on Decision-Making

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Abstract. This paper presents neuroeconomics, a newly emerging transdisciplinary discipline. Emotional influences on decision-making have not yet been thoroughly included into economic theory. The field of “neuroeconomics” emerged as a result of interdisciplinary research since data from neuroscience reveals that antecedent emotional processing is necessary for decision-making, as suggested by economic theory. By providing a brief explanation of the concept of neuroeconomics, highlighting commonly utilized methods, and outlining recent investigations in this new study area, this paper seeks to provide an overview of the current status of neuroeconomic research. Finally, some potential outcomes and constraints are presented. The once-dissimilar realms of economics and psychology have become even more entwined thanks to neuroeconomics. Nearly all of this convergence may be attributed to changes in economics. Because the most significant findings in neuroeconomics have presented a greater challenge to the conventional economic paradigm, economics has seen more change as a result of neuroeconomics than psychology. A greater understanding of the country’s economic dynamics can be gained by using neuroeconomics. Neuroeconomics examines how decisions are made by using neuroscientific assessment tools.

Keywords: Neuroeconomics · economics · neuroscience · behavioral science · human behavior

1 Introduction

Neuroeconomics is an interdisciplinary field which studies about human-decision-making, the capacity to consider many options and carry out a strategy. The field of neuroeconomics aims to unite economics, psychology, and neuroscience. Advanced imaging ways and biochemical testing are used in neuroeconomics to examine brain exertion ahead, during, and after making profitable opinions. The goal of neuroeconomics, according to Camerer, Loewenstein, and Prelec’s 2004 article, is to apply neuroscience methods and expertise to economic analysis. (C. Camerer et al., 2004).

The term “economics” should be used in this context to refer to any (human or non-human) decision-making process that involves weighing options. Typically, the definition of economics is optimal allocation of available resources. Note: Economics is not about money- surprisingly, economics has produced very few deep insights about money. Even though measuring someone’s level of concern for something through money is convenient. Fundamentally, economics simulates how people evaluate rewards and make decisions (Zak, 2004).

A logical progression from bio-economics is neuroeconomics. The research programme in bio-economics employs cutting-edge biology to create models that forecast human behaviour. Behavioral economics, a discipline that makes use of discoveries from cognitive psychology to better describe human decision-making, is a second precursor of neuroeconomics. The neuroeconomics study programme tries to identify the immediate causes of choice behaviour, in contrast to bio-economics, which has mostly concentrated on the ultimate causes of behaviour, and behavioral economics, which has focused on how our developed psychologies effect decisions. (Zak, 2004).

Traditional economic issues may benefit from the insights provided by neuroeconomics. Traditional economics may someday incorporate elements of neuroeconomics, even if neuroeconomics itself never addresses any widely accepted standard economic questions. The question of whether neuroeconomics can shed light on the problems that economists have traditionally addressed is still valid and significant, regardless of whether economists eventually widen their areas of interest. While it can be challenging to precisely define the scope of traditional economics. (Douglas Bernheim, 2009).

While research employing neuroeconomic methods to examine decision-making in psychiatric populations has grown substantially over the past ten years, the majority of neuroeconomic studies have concentrated on decision-making in healthy populations. The current special issue’s objective is to highlight the advantages of applying a neuroeconomics approach to the investigation of reward-related decision-making in social and nonsocial contexts with respect to mental illnesses across the lifetime. (Sharp et al., 2012).

Researchers studying the neurological mechanisms behind economic decision-making use a variety of approaches, including electroencephalography (EEG), lesion studies, and functional magnetic resonance imaging (fMRI). These methods assist in locating the brain areas that are active during particular economic tasks and in monitoring changes in brain activity in response to various economic stimuli.

The idea of utility, which refers to the subjective value or satisfaction an individual obtains from consuming things or engaging in specific activities, is a key topic in neuroeconomics. Understanding how the brain calculates utility and how it affects decision-making is the goal of neuroeconomic studies. For instance, scientists may look into the brain activity linked to selecting one item over another or the anticipation of benefits.

A fascinating neuro psycho-economic model was created by Krueger and Meyer-Lindenberg (2019) by fusing techniques from the fields of economics, psychology, and neuroscience. Researchers want to pinpoint the precise brain areas that control psychological and economic behaviour using this method. If this strategy works, it might be

able to excite the brain in order to produce the desired effects. Additionally, discovering variables that affect particular brain regions may aid in behaviour prediction.

Two Styles of Neuroeconomics

A book by Don Ross that is now regarded as a classic in the field of economic philosophy established two “styles” of neuroeconomics. One approach known as “neurocellular economics” is said to use economic models to interpret neuroscientific data, in contrast to “behavioral economics in the scanner,” which is thought to use neuroscientific methods to pinpoint the neurological underpinnings of behaviour that defies normative principles.

The new book *Social Neuroeconomics*, edited by Jens Harbecke and Carsten Herrmann-Pillath, claims that there are (at least) two main styles in the field of social neuroeconomics. The goal of the book is to give a comprehensive alternative to how social neuroeconomics has been used up to this point. This review essay attempts to reproduce both the traditional and more recently created schools of social neuroeconomics, referred to as “internalist” and “externalist” respectively. We won’t, however, limit our discussion to this distinction. We suggest that the book also contains two other (sub)styles of externalist social neuroeconomics, which we refer to as “inflationary” and “deflationary” externalist social neuroeconomics, respectively. These two theories were both put up by Herrmann-Pillath and the same Ross with Wynn Stirling. Figure 1 shows varieties of Social Neuroeconomics.

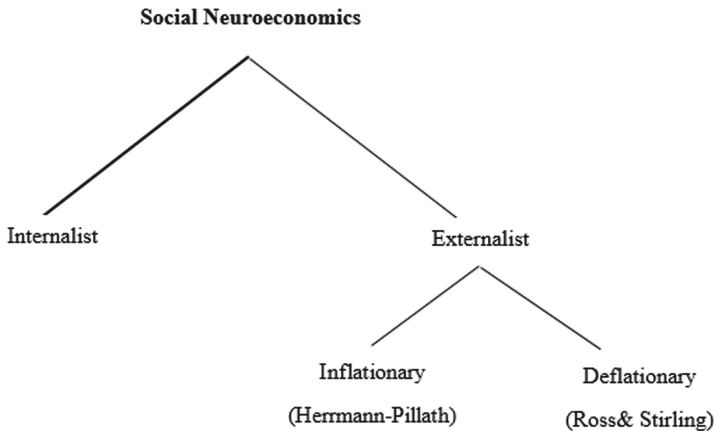


Fig. 1: Varieties of Social Neuroeconomics (Petracca, n.d.)

An Overview of Several Current Neuroimaging Techniques Used in Neuroeconomics

It is theoretically possible to analyse how people make economic judgements using any neuroscientific tool. They can be roughly split into two groups based on the underlying mechanisms: methods for identifying changes in cerebral blood flow or metabolism, and methods for calculating the electromagnetic activity of the brain.

Electromagnetic Recordings

Electroencephalography (EEG)

EEG examines variations in scalp voltage. The underlying ion currents come from modifications in membrane conductivity brought on by synaptic activity and intrinsic membrane processes and occur relatively distance from the electrodes (over skin, the skull, and the meninges) in surface-near cortical regions. In essence, a skin electrode “sees” the accumulated potentials generated by several neurons.

While the temporal resolution of milliseconds and below allows for easy detection of the time history of cerebral activity by EEG, the so-called inverse problem predominantly limits spatial resolution. The proper a priori assumptions about sources and volume conduction are necessary for estimated solutions to the inverse problem, or source localization, to be successful because any number of source configurations can result in the same potentials on the skin.

Magnetoencephalography (MEG).

MEG can measure changes in the magnetic field caused by electrical brain activity. This modality can, for example, clarify the temporal sequence of many brain activities involved in decision-making since its temporal resolution is comparable to the EEG's. But unlike the EEG, the MEG can also detect activity in deeper brain regions. Since the opposite problem generally holds true for MEG as well, source localisation likewise depends on plausible theories. The current source localization models can be improved by incorporating other modalities for examining the brain.

Techniques for gauging the metabolic or hemodynamic effects of brain activity:

Positron Emission Tomography (PET)

The antiparticle of the electron, known as positrons, are released by some radionuclides. Given that they have similar chemical properties, these nuclides can replace their non-radioactive counterparts in biologically relevant molecules. After injection or inhalation with minuscule amounts, a PET scanner can detect the geographic distribution of these altered molecules, such as modified glucose (FDG) or neurotransmitters. When positrons and electrons clash, radiation is created that can be detected by this device. Electrons are found everywhere. From the identified distribution, tomograms can produce and display data on cerebral perfusion or metabolism. The spatial resolution is quite good (approximately 3–6 mm), even though the time resolution is only a few minutes to fractions of an hour. The application is restricted by the use of radioactive tracers.

Functional Magnetic Resonance Tomography (fMRT)

Currently, fMRI is the technique used most frequently for functional brain imaging. Magnetic resonance scanners produce sets of cross sections of the brain, or tomograms, by using the tiny but detectable resonance signals that are generated by tissue water in a very strong magnetic field after being activated with a high frequency electromagnetic pulse. It is possible to pinpoint the spatial origin of the observed resonance signals and create cross-sectional images. The local tissue's water content and particular magnetic properties have an impact on the signal intensity, which is shown as a picture element's

grey value. Structural MR imaging often displays an outstanding contrast and high-resolution picture of brain architecture.

Current topics in neuroeconomic research:

Preferences

Preferences play a crucial part in economic theory since they have a considerable impact on economic decision-making (such as brand preferences). Furthermore, preference judgments—such as picking one brand from a variety at a department store—occur frequently in daily life. Prior until recently, it was necessary to analyse preference as a theoretical idea, for instance, by surveys or behavioural observation. The brain has now been linked to preferences in multiple neuroimaging studies. A deeper comprehension of preferences may be useful for shorter market reaction projections or demand elasticity estimates.

Utility and the Rewarding System

Academics face a hurdle when attempting to measure usefulness because it is always unique to the individual and situation. The investigation of the neurological mechanisms behind (expected and actual) utility (for a definition of utility and preference see) is another area of research in neuroeconomics. In numerous tests where subjects get beneficial rewards (such as money, juice, or other incentives) in exchange for making decisions, the brain's so-called "reward areas" were found to be activated, providing evidence that neuroeconomic approaches may be useful in resolving these problems. The "feeling" of utility may therefore be connected to the functioning of the brain's rewarding mechanisms.

The Social Brain: Fairness, Altruism and Trust

Even though study on individual decision-making produced preferences and utility, neuroeconomics also analyses social behaviors (such as teamwork). The assumption of self-interest is necessary to represent economic decision-making in traditional theoretical frameworks, as was already mentioned. However, a number of problems emerge when this assumption is contrasted with the data from studies in experimental economics.

Insights on Dynamic Concepts: Learning, Memory and Knowledge

In western economies, innovations are seen as being essential for economic growth. Therefore, economic policy strives to develop a society that produces knowledge and is imaginative. The concept of learning is essential to knowledge management. The neurological foundations of learning are currently poorly understood by economists. Thus, the study of neuroeconomics may be closely tied to a theory of learning. (Kenning & Plassmann, 2005).

Marginal Rate of Substitution

Unforeseeably, specific psychiatric conditions exhibit context-specific manifestations. Initially, individuals grappling with eating disorders might exhibit a complete aversion to food consumption. However, when their pathological low body weight is a result of this food avoidance, they may transition into binge eating behaviors. Subsequently, they might resort to vomiting or using laxatives to prevent weight gain. Over time, they may

develop intricate routines to manage their fear of food, including secretly hoarding substantial quantities of food throughout their living spaces. Despite the complexity and variability of their clinical symptoms, their sole focus revolves around food, eating, and body weight.

In a broader context, mood and anxiety symptoms specific to particular domains demonstrate resistance to monoaminergic medications compared to more general, domain-unspecific symptoms. This indicates significant variations in their etiology and pathophysiology. Additionally, domain-specific symptoms tend to be associated with specific genetic risk factors. Various economic theories have been proposed to explain low marginal rates of substitution in such cases.

One theory suggests that individuals are unwilling to exchange a problematic item for unproblematic ones when they perceive the subjective value of the problematic item to be significantly higher than that of all unproblematic items. In situations with low alternative pay-off probability, individuals may consistently favor substance abuse without experiencing related adverse pharmacological effects.

Another theory posits that the consumption of problematic “goods” (e.g., alcohol, illegal drugs, commercial sex) is typically more certain and readily available compared to non-problematic “goods” (e.g., meaningful interactions with loved ones, professional achievement). Consequently, individuals may be hesitant to exchange problematic items to reduce consumption uncertainty.

A third theory suggests that some patients are reluctant to exchange their bothersome symptoms, viewing them as integral to their identity. This phenomenon is particularly prevalent in paraphilias and personality disorders and resembles an extreme case of the endowment effect. The endowment effect, a concept from behavioral economics, denotes the tendency for individuals to increase their estimation of a good’s value once they possess it, resulting in an aversion to parting with it. This is related to a discontinuity in the marginal rate of substitution, where individuals exhibit a high minimal willingness to tolerate giving up a good they already own and a low maximum willingness to pay for it.

Lastly, psychiatric symptoms can be perceived as sacred or taboo values that individuals are unwilling to compromise in favor of other values. When confronted with the prospect of making a “taboo tradeoff,” trading their sacred values for secular ones, individuals may experience intense negative emotions, such as anger, contempt, and moral outrage. Consequently, they become less responsive to logical cost-benefit analyses. For example, individuals with anorexia may make seemingly irrational decisions when asked to compromise their ideal body image, which they regard as a non-negotiable taboo value, to reduce the risk of serious health issues like osteoporosis and cardiac arrhythmia.

Our hypotheses regarding the marginal rate of substitution in psychiatric diseases are as follows:

- Addiction risk factors involve a low marginal rate of substitution for addictive commodities.
- A low marginal rate of substitution for addictive items is attributed to impaired rescaling of mesolimbic synapses, the neurological substrate of addiction (Hasler, 2012).

The Historical Divide Between Economists and Psychologists

A long-standing difference between economists and psychologists lies in the reluctance of economists to incorporate latent variables into their modeling. This divide often stems from the assumption that economists' resistance may be rooted in a lingering behaviorist perspective. When discussing modeling approaches for human decision-making among psychologists, economists, and philosophers, it's vital to note that the use of behaviorism is viewed skeptically. However, even for economists who reject behaviorism, the introduction of latent variables raises questions about the definition of "constructs" that their standard methods allow them to bypass.

Economists typically avoid this challenge for two main reasons. First, they frequently employ behavioral conditions as axiomatizations for their unobservable explanatory factors. Second, the use of standard econometric techniques forces economists to operate under the assumption that all independent variables in their models are formative constructs because, for the purpose of statistical testing, these variables cannot be perfectly correlated. This creates difficulties in identifying models that can accommodate diverse datasets and remain tractable from an econometric perspective. Despite occasional criticism, this approach has proven beneficial to economics, fostering an ongoing enhancement of the breadth and sophistication of econometric theory and methods. Neuroeconomists can draw a compelling argument for continuing their work in this field.

Data vs. Estimates

Neuroeconomics primarily analyzes brain regions emitting signals over time, resulting in numerous observations from a few brains at each time point in a time-series, a common feature of fMRI datasets. Consequently, statistical challenges arise when drawing conclusions about an individual brain or a group of brains. A glance at the standard estimation techniques commonly employed by neuroeconomists underscores the relevance of this issue.

Reference Inference

A related and well-known issue is the problem of reverse inference. This situation arises when specific brain activations are assumed to correspond to the onset of a labeled cognitive activity. The neuroeconomics literature has a tendency to avoid complex statistical matters, such as those presented by the reverse inference problem.

Preemptive Blood Flow

Another significant concern in the current discourse surrounding fMRI imaging is the phenomenon of "preemptive blood flow," initially identified by Sirotnin and Das (2009) and summarized by Leopold (2009). This phenomenon was observed when blood flow and brain activity were directly and independently monitored in monkeys. It poses an inferential challenge since blood flow activity anticipates an event, even if the event does not materialize. This divergence between blood flow and brain activity is notable.

One theory posits that this activity primes the brain, making blood available and ready in anticipation of its use. This discovery is particularly troubling as the temporal relationship between stimulus and response forms the core of most neuroeconomic approaches. Given that humans can acquire extensive networks of anticipation from

their cultures, this challenge is even more pertinent in neuroscientific studies involving human subjects.

But Is It Good Economics?

So much for the marketing; what are we to make of some of the most important assertions made in the literature on neuroeconomics? Is the economics sound and compelling? We start by looking at a few general problems involving samples, statistics, and practices. These are problematic, and they must be made clear because the existing literature omits them, but ultimately, they are not the criteria we should use to assess the potential contribution of neuroeconomics. The common theme is that numerous recognized confounds in the literature on experimental economics are glossed over, and the contribution is to merely add some neurological evidence to support the desired narrative. This brief review serves as a foundation for Sect. 3's question of whether or whether this is essential or simply a reflection of a developing field, in which case we should exercise greater patience.

Questions About Procedures

If we use a brain as the unit of analysis, sample sizes for many neuroeconomics studies relying on imaging are modest. 8 Studies with sample sizes of less than 10 are frequently found, and studies with sample sizes of more than 12 are uncommon. 9 In a recent study by Bhatt and Camerer (2005), which is somewhat of an outlier, they used 16 people. "To experimental social scientists, 16 seems like a small sample," they said. However, since adding additional participants does not significantly change the results, this sample size is often sufficient for most fMRI research to draw a conclusion. It begs the question of how one can draw the ultimate conclusion from this experiment and set of statistical conclusions without actually executing it. Given that so many neuroeconomists now have access to imaging equipment or have access to it on a short notice, there must be a compelling financial justification for just using a small number of patients. (G. W. Harrison, 2008).

General Themes

This section describes one method for classifying neuroeconomic information and insights into well-known economic categories. I want to start off by saying that there are many different techniques employed in neuroscience. The most attractive technique is functional magnetic resonance imaging (fMRI), which can capture and display activity throughout the entire brain. However, fMRI has the largest marginal cost per data point and has a short temporal resolution (a few seconds).

Types of Valuation and Choice

Decisions in the realm of economics are typically seen as reflections of individual preferences, which are encoded as subjective values in the conventional economic paradigm. Neuroeconomics research, conducted using various methods and across different species, has uncovered at least four distinct neural systems for subjective evaluation and decision-making. While some of these systems appear capable of computing stable utility-based valuations for the purpose of limited maximization, others function as clear guides for decision-making without necessitating such stable valuations.

Neuroeconomic data tentatively support several assumptions from behavioral economics. For example, findings from functional magnetic resonance imaging (fMRI) studies back nonlinear probability weighting, akin to the concepts within prospect theory. Moreover, they suggest that intrinsic motivations can be displaced by external monetary rewards, leading to a negative performance response when incentives become exceedingly high. Comparing brain activity during hypothetical and actual choices through fMRI studies reveals overlaps in regions associated with value computation. This research indicates that hypothetical reporting biases are rooted in biology and offers insights for enhancing the predictability of real-world decisions by refining hypothetical methodologies.

Evidence for Mental State-Dependent Choice

One of the most valuable contributions of neuroeconomics lies in its ability to empirically demonstrate how mental states influence decision-making, alongside the identification of underlying neural mechanisms. Various mental states, such as conscious attention, visceral conditions like fatigue, pain, and hunger, cognitive overload, and emotions spanning fear, sadness, contempt, joy, and anger, exert their influence on economic choices.

To investigate this, a novel approach is proposed, one that involves concurrent measurement of both mental states and decision-making, and even experimentally modifying states. Mental states can be directly observed through methods encompassing self-report, autonomic nervous system responses, facial expressions, observer coding, and fMRI signals. By scrutinizing data from these states in tandem with actual choices, hypotheses regarding how changes in mental states impact preferences, information processing, and constraints can be rigorously tested.

Why Caring About the Brain's Role in Choice Matters

The question arises: Why should we concern ourselves with the specific brain regions where decision-making occurs? The answer lies in the potential for improved and more precise predictions based on the location of brain circuitry. Economic theorists are skilled at constructing formal models to explain observed anomalies, but applying these theories to real-world data and rigorous experiments to test various competing hypotheses has often proven to be challenging. If the unobserved variables in economic theories can be linked to specific brain regions and jointly tested using brain data and real choices, progress can be significantly accelerated.

Additionally, the location of brain activity matters for several other reasons. Understanding human brain activity patterns can lead to predictions of similar behavior in non-human subjects, accounting for structural and functional differences between species. Identifying which brain regions are involved in decision-making enables researchers to conduct causal experiments, using techniques such as transcranial magnetic stimulation (TMS), deep brain stimulation, or the study of severe lesions to manipulate brain activity.

Moreover, knowledge about how specific brain regions change over the course of a person's lifetime is essential for predicting the impacts of aging, particularly in diverse age groups, including the young, adolescents, and the elderly. It also opens avenues

for individual differences in brain structure and function, such as exploring the correlation between the size of a person's social network and the anatomical volume of their amygdala region.

Please ensure that any specific references or citations related to this text are provided as needed in an academic or research context.

2 Conclusion

Understanding what influences choices is one of microeconomics' main objectives. Neuroeconomics also connects mathematical ideas and behaviour to neurological circuitry. In addition, other techniques are employed (other than fMRI), and the most are marginally affordable. Usually, the shortcomings of one strategy are made up for by another. Last but not least, data has shown that various valuation and choice systems (such as habits and model-directed) will deviate in predictable ways from rational choice.

From the standpoint of economists, the literature on neuroeconomics appears to have adopted a production function with an unfavorable distribution of physical and human capital out of sheer curiosity with the neuroscience toys. Brilliant visuals of light bulbs turning on in various brain regions as a result, but poor economics. The broad substantive topics covered in the review, which should be the low-hanging fruit for neuroeconomics, don't teach me very much as an economist. The lack of understanding is not primarily due to a lack of acquaintance with the specifics of the methodology; although some of those specifics worry me and require explanation by the economists on these teams, it does not ultimately matter. My fundamental question is whether neuroeconomists have clarified previously unclear experimental designs or if they have merely hidden them and favored one plausible explanation over another. Unfortunately, I come to the latter conclusion. It is obvious that pre-confused designs do not require the addition of neurological correlates.

No matter how frequently they cross the border, neuroeconomists are advised to keep that in mind as well as the reasons why there is one between economics and psychology.

There is substantial evidence that decision theory and neuroscience can examine and characterize key elements of mental diseases, especially in people with normal intelligence and intact reality testing.

In terms of the motivating forces that drive people, economic decision theory has the ability to explore a wide range of interrelated aspects in a single model. Given that there is evidence that the interaction of social, psychological, and biological variables underlies psychopathology, this seems to match the needs of psychiatry quite well.








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Blockchain-Based Electronic Health Records (EHRs): Enhancing Patient Data Accessibility in Emergency Situations

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Abstract. The healthcare landscape is undergoing a rapid transformation propelled by the explosive growth of electronic data storage and the burgeoning interest in health research. Each day births a wealth of new data, presenting unprecedented opportunities for scientific discovery and innovation. Researchers are harnessing digital technologies to expedite scientific advancement, with the ultimate objective of customizing future patient care and maximizing health advantages. Nevertheless, substantial impediments to public acceptance persist, particularly pertaining to concerns of data privacy and security. Now, envisage a solution where this vital medical information can be accessed securely and expeditiously, all via the patient's fingerprint. This solution takes the form of Electronic Health Records (EHRs) constructed upon blockchain technology, serving as a digital fortress for the safeguarding of crucial health data. This paper embarks on a profound exploration of EHRs in the context of emergency healthcare scenarios, probing into whether EHRs can offer the key to swift medical data access and, more fundamentally, whether individuals are open to the idea of converting their medical information into an electronic format. The study is not only centered on the potential of blockchain in healthcare but also scrutinizes the profound implications of public perceptions and attitudes towards the digital transformation of the healthcare sector.

Keywords: Electronic Health Records (EHRs) · Block chain Technology · Health Data Privacy · Emergency Healthcare · Medical Information Sharing

1 Introduction

In an era where personal data privacy is paramount, individuals are understandably cautious about sharing their medical histories (Fernandez et al., 2003). However, there are critical moments when the need for rapid access to one's medical data becomes not

just desirable but life-saving. Imagine a scenario where someone has met with a sudden accident, is unconscious, or has encountered a medical emergency at their workplace. In these harrowing instances, when every second counts, the attendants, helpers, or friends who rush the patient to the hospital face a daunting challenge - how to contact the patient's family and provide crucial medical information.

In some unfortunate cases, the identity of the patient remains a mystery, leaving both medical professionals and loved ones in a state of uncertainty (Evans et al., 2011). When the patient's medical history, allergies, recent surgeries, or underlying conditions are essential for immediate treatment, delays can be catastrophic.

The healthcare landscape is rapidly evolving with the exponential growth of electronic data storage and the surging interest in health research (John and Shenoy, 2014). With each passing day, more data is generated, offering unprecedented opportunities for scientific discovery and innovation. Researchers are harnessing the power of digital technologies to accelerate the pace of scientific advancement, with the ultimate goal of personalizing future patient care and maximizing health benefits. Yet, amid this transformative journey toward digital healthcare, significant barriers to public acceptance persist. Individuals understandably raise concerns about data privacy and security, especially when it comes to sensitive medical information. They question whether their personal health data will remain confidential and protected from unauthorized access.

Now, envision a solution where this critical medical information can be accessed securely and swiftly, using nothing more than the patient's fingerprint. Enter the concept of Electronic Health Records (EHRs) built on blockchain technology—a digital fortress where vital health data is stored (Krittanawong et al., 2022). This innovative approach promises to address the data privacy and security concerns that have restrained the widespread adoption of digital health records.

In this paper, we embark on a profound exploration of Electronic Health Records (EHRs) in emergency healthcare scenarios. We investigate whether EHRs can provide the answer to the urgent need for swift medical data access, and, more importantly, whether people are willing to embrace the idea of converting their medical information into an electronic format. Our study encompasses not only the potential of blockchain in healthcare but also the profound implications of public perceptions and attitudes toward the digital transformation of healthcare.

1.1 Background

The Age of Digital Health Records: Our world has witnessed a transformative shift in healthcare with the advent of Electronic Health Records (EHRs). These digital repositories have redefined the way medical data is recorded (Bauer and Brown, 2001), accessed, and shared. They offer the promise of improved healthcare delivery, reduced errors, and enhanced decision-making (McAfee et al., 2012).

The Urgency of Emergency Access: Yet, a pressing challenge persists—ensuring rapid access to EHRs during life-or-death emergencies (Mapp et al., 2013). In these critical moments, the inability to swiftly retrieve essential medical information can have dire consequences.

Definition and Purpose of EHRs:

Electronic Health Records (EHRs) are digitalized versions of patients' comprehensive medical histories, including diagnoses, treatments, medications, and more (Pai et al., 2021; Wu et al., 2013).

EHRs serve the primary purpose of centralizing and digitizing patient data for healthcare providers, enabling efficient access and sharing of critical medical information (Rodrigues et al., 2013).

Advantages of EHRs:

Improved Accessibility: EHRs provide healthcare professionals with quick access to patient information, reducing the risk of errors and delays in diagnosis and treatment (Vimalananda et al., 2015).

Enhanced Care Coordination: EHRs facilitate seamless communication among healthcare providers, leading to better-coordinated patient care (Burton et al., 2004).

Data Security: EHR systems are designed to ensure the security and privacy of patient data, with strict access controls and encryption measures (Kruse et al., 2017).

Efficiency and Cost Savings: EHRs streamline administrative tasks, reduce paperwork, and lower operational costs for healthcare organizations (Bar-Dayyan et al., 2013; French et al., 2018).

Challenges and Concerns:

Interoperability: Ensuring that different EHR systems can communicate and share data effectively remains a challenge in the healthcare industry (Iroju et al., 2013).

Data Privacy: Protecting patient data from breaches and unauthorized access is a critical concern (Ronquillo et al., 2018; Esmaeilzadeh, 2018).

Implementation Costs: The initial setup and ongoing maintenance of EHR systems can be expensive for healthcare providers, especially smaller practices (Gans et al., 2005; Mason et al., 2017).

Blockchain Technology in Healthcare

Blockchain is a decentralized and distributed ledger technology that records transactions across multiple computers (nodes) in a secure and tamper-resistant manner (Wang et al., 2019). It uses cryptographic techniques to ensure the integrity and immutability of data (Zhang et al., 2018).

Application of Blockchain in Healthcare:

- **Secure EHRs:** Blockchain can be used to create secure, tamper-proof EHRs. Patient data is stored in blocks, and each block is linked to the previous one, creating a chronological chain of information.
- **Data Interoperability:** Blockchain can facilitate data sharing and interoperability among different healthcare providers and systems, overcoming one of the major challenges in healthcare.
- **Patient Consent and Control:** Patients can have more control over who accesses their medical data and can grant or revoke access through smart contracts on the blockchain.
- **Drug Traceability:** Blockchain can be used to track the production and distribution of pharmaceuticals, ensuring the authenticity and safety of medications.

- Clinical Trials: Blockchain can streamline and enhance the transparency of clinical trials, making it easier to track and verify results.

Benefits of Blockchain in Healthcare:

- Data Security: The decentralized and encrypted nature of blockchain ensures that patient data is highly secure and resistant to unauthorized changes.
- Interoperability: Blockchain can solve the interoperability problem by providing a standardized platform for data sharing.
- Transparency and Trust: Blockchain's transparency and immutability build trust among patients, healthcare providers, and regulatory authorities.
- Reduced Frauds: Blockchain can reduce fraud in healthcare by preventing duplicate billing and ensuring the authenticity of medical records.

Challenges and Considerations:

- Scalability: Blockchain networks need to be scalable to handle the vast amount of healthcare data generated daily.
- Regulatory Compliance: Ensuring that blockchain solutions comply with healthcare regulations, such as HIPAA, is crucial.
- Integration: Integrating blockchain with existing healthcare systems can be complex and require significant effort.

Electronic Health Records (EHRs) are a fundamental aspect of modern healthcare, offering improved data accessibility and coordination (Tanwar et al., 2020). Blockchain technology has emerged as a promising solution to address EHR challenges, offering enhanced security, interoperability, and patient control over data. While both EHRs and blockchain have their advantages and challenges, their integration holds great potential to revolutionize healthcare data management and improve patient outcomes (Zaabar et al., 2021).

1.2 Problem Statement

In the modern era of healthcare, the adoption of Electronic Health Records (EHRs) has transformed the way patient information is managed, offering numerous benefits. However, the willingness of individuals to share their health-related data in EHRs, especially during critical emergency situations, remains a subject of concern and inquiry. This study seeks to address the multifaceted issue of health data sharing by assessing the general willingness of individuals to share health information in EHRs during normal times and evaluating their intentions during emergency scenarios. Furthermore, it aims to investigate the specific types of health-related information individuals are willing to share in their EHRs and the factors that influence their decisions.

Objectives of the Study

- To Assess Willingness to Share Health Information in EHRs during Emergency Scenarios
- To investigate the types of health-related information individuals are willing to share in their Electronic Health Records (EHRs) during normal times and emergency situations and understand the factors influencing their decision.

Based on the objectives the following hypotheses were developed.

- H1: Individuals will express a higher willingness to share their health information in EHRs during emergency situations compared to non-emergency times.
- H2: Specific reasons or factors intend to share health information in EHR during emergency situations compared to normal times.

Methodology: Population, Sample, and Questionnaire.

Population: This study encompassed a diverse population from various age groups across India. The objective was to capture a broad cross-section of individuals, reflecting the rich demographic and cultural diversity of the country.

Sample Selection: To ensure a representative sample, a stratified random sampling method was employed. The population was divided into different strata based on age, gender, education, and geographical location. From each stratum, a proportionate sample was drawn to account for the varying characteristics within the population.

Questionnaire Development: The research team designed a comprehensive questionnaire to measure the study's objectives and test the formulated hypotheses. The questionnaire was carefully crafted to gather insights into individuals' willingness to share health information in Electronic Health Records (EHRs) during both normal and emergency situations. It included a mix of Likert-scale questions, multiple-choice questions, and open-ended questions to provide a holistic view of participants' perceptions and intentions.

Data Collection Methods

Electronic Distribution: To maximize reach and convenience, the questionnaire was distributed electronically through various digital platforms. Participants could access and complete the survey online, ensuring a geographically diverse respondent pool.

Printed Questionnaires: Recognizing the importance of catering to diverse audiences, printed copies of the questionnaire were administered in specific regions where electronic access was limited or preferred. This approach ensured inclusivity and equal participation.

Interview Method: For participants who required additional support, particularly among older individuals, interviews were conducted. Trained interviewers followed a structured approach to gather responses and insights.

Sample Size and Data Collection

A total of 325 responses were collected from the diverse sample pool. However, after meticulous review, 235 responses were selected for inclusion in the current research.

The decision to exclude certain responses was based on incompleteness or participants' unwillingness to answer all questions, ensuring data quality and reliability.

Data Coding and Analysis

The collected data underwent a systematic coding process, with each response assigned a unique code. Subsequently, the data was input into statistical software, specifically SPSS (Statistical Package for the Social Sciences), to conduct a rigorous analysis. This analysis aimed to measure the study's objectives and test the formulated hypotheses.

Ethical Considerations

The study adhered to strict ethical guidelines, ensuring participants' informed consent, data privacy protection, and respect for their rights throughout the research process.

Analysis

The demographic information presented in this study offers a snapshot of the diverse participant profile, encompassing a wide range of ages, genders, educational backgrounds, geographic locations, and self-reported health statuses. This information provides a foundation for understanding the varied perspectives and experiences within the research sample.

The sample of 235 respondents for this study reflects a broad spectrum of demographics, mirroring the rich diversity found across India. In terms of age, 19% falling within the 18–25 age group, 25% in the 26–35 category, 17% in the 36–45 range, 15% between 46 and 55, 13% within the 56–65 bracket, and 11% aged 66 and above. Regarding gender distribution, 47% identifying as male, 51% as female, and a small percentage (2%) opting not to disclose their gender or selecting "Other.". Further, 19% have a high school education or less, 30% possess some college experience or an associate degree, 28% hold bachelor's degrees, 17% have attained master's degrees, and 6% possess doctoral or professional degrees. In terms of self-reported health status, respondents provide insights into their well-being. 23% describe their health as excellent, 43% rate it as good, 26% indicate fair health, and 8% characterize it as poor. Additionally, a small fraction of respondents (2%) prefer not to disclose their health status.

Regression analysis was conducted to find out the willingness to share their health information in Electronic Health Records (EHRs) during emergency situations, utilizing a multiple regression model to assess the significance of various predictors in this context was exhibited and the results were shown in the Table 1.

The multiple regression analysis through Table 1 shows that the model is statistically significant (F -statistic = 25.67, $p = 0.001$) and explains approximately 32.1% of the variance in individuals' willingness to share health information in Electronic Health Records (EHRs) ($R^2 = 0.321$). Among the predictors, "Emergency Contacts" ($p = 0.031$), "Blood Type and Vital Medical Stats" ($p = 0.012$), "Current Medications and Dosages" ($p = 0.012$), and "Critical Medical Conditions" ($p = 0.031$) have statistically significant positive coefficients, suggesting that individuals are more willing to share their health information in EHRs when it includes these specific details. However, other predictors such as "Preferred Hospital or Medical Facility," "Primary Care Physician's Contact Information," "Advanced Directives or Medical Preferences," and "Recent Surgical Procedures" do not appear to have a statistically significant impact on willingness

Table 1. Willingness to share health information in EHRs during emergency situations

Model	R	R Square	Adjusted R Square	F-Statistics	Sig.
1	.358 ^a	0.321	0.294	25.67	0.001

a. Dependent Variable: Willingness to Share Health Information in EHRs

b. Predictors: (Constant), Personal Identification, Critical Medical Conditions, Current Medications and Dosages, Emergency Contacts, Recent Surgical Procedures, Blood Type and Vital Medical Stats, Preferred Hospital or Medical Facility, Primary Care Physician’s Contact Information, Advanced Directives or Medical Preference

Model		Co-efficient	Sig.
1	(Constant)	2.41	0.001
	Personal Identification (Name, Contact)	0.20	0.042
	Critical Medical Conditions (e.g., Allergies, Chronic Diseases)	0.28	0.031
	Current Medications and Dosages	0.31	0.012
	Emergency Contacts	0.42	0.031
	Recent Surgical Procedures	0.01	0.521
	Blood Type and Vital Medical Stats	0.38	0.012
	Preferred Hospital or Medical Facility	0.02	0.081
	Primary Care Physician’s Contact Information	0.03	0.092
	Advanced Directives or Medical Preferences	0.01	0.072

a. Dependent Variable: Willingness to Share Health Information in EHRs

to share health information in EHRs. This analysis provides insights into factors influencing individuals’ willingness to share health data electronically during emergency situations.

Further, to analyze the various factors that motivate people to share their information in Electronic Health Records (EHRs) during emergency situations, a regression analysis was conducted, and the following Table 2 presents the statistical results of the analysis.

The regression analysis, aimed at understanding the factors influencing individuals’ intent to share health information in Electronic Health Records (EHRs) during emergency situations, yielded significant results (F-statistic = 28.552, p = 0.000). The model explains approximately 42.3% of the variance in this intent ($R^2 = 0.423$), with an adjusted R^2 of 0.415. Among the predictors, “Awareness of potential life-saving benefits” (p = 0.001), “Trust in the security and confidentiality of EHR systems” (p = 0.012), and “Recommendations from healthcare providers” (p = 0.021) have statistically significant positive coefficients, indicating that these factors positively influence the intent to share health information during emergencies. Additionally, “Concerns about personal safety and well-being” (p = 0.022) and “Knowledge that access is restricted to authorized healthcare professionals” (p = 0.032) also show positive and significant effects. This

Table 2. Factors intend to share health information in EHR during emergency situations

Model	R	R Square	Adjusted R Square	F-Statistics	Sig.
1	.474 ^a	0.423	0.415	28.552	0.000

- a. Dependent Variable: Factors intend to share health information in EHR during emergency situations
- b. Predictors: (Constant), Increased likelihood of faster and more accurate treatment, Concerns about personal safety and well-being, Trust in the security and confidentiality of EHR systems, Awareness of potential life-saving benefits, Recommendations from healthcare providers, Knowledge that access is restricted to authorized healthcare professionals

Model		Co-efficient	Sig.
1	(Constant)	2.083	0.000
	Increased likelihood of faster and more accurate treatment	0.07	0.032
	Concerns about personal safety and well-being	0.14	0.022
	Trust in the security and confidentiality of EHR systems	0.31	0.012
	Awareness of potential life-saving benefits	0.42	0.001
	Recommendations from healthcare providers	0.21	0.021
	Knowledge that access is restricted to authorized healthcare professional	0.28	0.032

- a. Dependent Variable: Factors intend to share health information in EHR during emergency situations

analysis highlights the importance of factors related to perceived benefits, trust, recommendations, and personal safety concerns in shaping individuals’ willingness to share health information in EHRs during emergency situations (Table 2).

2 Conclusion

“In modern healthcare, Electronic Health Records (EHRs) play a pivotal role, significantly improving patient care coordination, reducing medical errors, and enhancing overall healthcare efficiency. The global adoption of EHRs is on the rise, driven by the pressing need for accurate, accessible, and streamlined health data management, ultimately resulting in improved patient outcomes and more effective healthcare systems. This current research underscores the critical importance of rapid access to medical information during emergency situations while also acknowledging the valid concerns about data privacy in the digital healthcare era. The concept of Electronic Health Records (EHRs) built on blockchain technology is introduced as a potential solution to these challenges, offering a secure platform for storing vital health data. The analysis highlights the compelling need for swift medical data access during emergencies, emphasizing its potential to save lives. Additionally, it highlights the genuine privacy and security concerns individuals have when it comes to electronically storing their sensitive medical

information. In this context, blockchain technology emerges as a promising solution that could alleviate these concerns and encourage greater public acceptance of EHRs. Through an exploration of public perceptions and attitudes toward the digital transformation of healthcare, this study provides valuable insights into the evolving landscape of health data management and the potential for blockchain-based EHRs to revolutionize emergency healthcare scenarios."

Implications of the Study:

The implications of this study are far-reaching. The urgent need for swift access to medical information during emergencies becomes evident, highlighting the potential life-saving benefits of adopting Electronic Health Records (EHRs) built on blockchain technology. This technology not only addresses data privacy and security concerns but also offers individuals a higher level of confidence in the confidentiality and integrity of their sensitive medical data. Furthermore, the study suggests that the wider acceptance of blockchain-based EHRs could herald a transformative era in healthcare, with the potential to revolutionize emergency healthcare scenarios, ultimately improving patient outcomes and enhancing the overall efficiency of the healthcare system.

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Hardiness, Emotional Intelligence and Occupational Stress Among Technocrats

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Abstract. The study was conducted on technocrats (R&D and production) both male and female (working in a defense electronics (manufacturing) industry. Schutte Self Report Emotional Intelligence Test (SSEIT) to measure emotional intelligence, the Occupational Stress Index to measure occupational stress, and the Personal Views Survey III-R to measure hardiness were used for the study. Non experimental correlation research design and purposive sampling method was adopted to select the sample. A sample of 150 technocrats were chosen based on qualifying criterion of which 87 responses were recorded due to production schedules, only 84 responses were found to be valid after scoring. Hardiness had a positive correlation with emotional intelligence and negative correlation to stress levels of the individuals, confirming the mediating role plays in reducing the ill-effects of stress.

Keywords: Emotional intelligence · hardiness · occupational stress · technocrats · executives and senior executives

1 Background

1.1 Hardiness

This article discusses the concept of hardiness in the context of the technology industry. Hardiness refers to the ability of individuals with technical expertise to withstand and adapt to the challenges and demands of their roles in a constantly changing environment. It is also described as resilience and mental toughness necessary for success in technology-related fields.

Technocrats in the tech industry need to continuously adapt and adjust to growing technologies and industries [1]. They must learn new skills, update their knowledge, and remain effective and affective in their roles. These professionals face setbacks, failures, and high levels of stress, so developing hardiness is crucial and the need of the hour. It involves the ability to bounce back from challenges and approach problems with a

positive attitude and a willingness to find creative solutions to the landing global problems [4]. Technocrats also need to be resourceful and persistent when faced with complex technical challenges. They should have self confidence in their skills and abilities to improve, make mark in their respective domains.

Effective stress management strategies are essential to prevent burnout and maintain wellbeing in the high-pressure tech industry. Lifelong learning is also vital for technocrats to stay relevant in technological scenario. Hardiness entails having the determination and enthusiasm to acquire new knowledge and skills throughout their careers for achieving their heights [7]. Collaboration is important in technology projects, so hardiness also involves the ability to work effectively in teams, communicate clearly, and adapt to different team dynamics. Moreover, technocrats should have the ethical hardiness to make responsible necessary decisions and consider the broader consequences of their work, given the profound societal impacts of technology.

Building and maintaining a professional network can be valuable for technocrats so that they are aware of burning global issues around the world and take up the posing challenging problems. It provides support, mentorship, and opportunities for growth. Overall, hardiness among technocrats is about adapting to changes, staying resilient, and continuously developing skills and knowledge to succeed in their roles in the fast-paced and demanding world of technology [6].

1.2 Emotional Intelligence

Emotional Intelligence (EI) is essential for technocrats is their need for effective collaboration in teams. EI helps them understand and manage their emotions and their colleagues' emotions, leading to better teamwork and communication. Additionally, many technocrats eventually find themselves in leadership positions, and high emotional intelligence enables them to inspire and motivate teams, resolve conflicts, and make better decisions by considering the emotional impact on team members.

The rapidly changing tech world emphasizes the need for technocrats to adapt to new technologies and environments. EI facilitates stress management, adaptability, and resilience in the face of challenges. Moreover, technocrats often work with clients or customers, and understanding their needs and emotions is crucial for building and maintaining strong professional relationships [5]. EI enables them to empathize with clients and create solutions that resonate with them.

Conflicts may arise in any professional setting, and high emotional intelligence allows technocrats to effectively navigate conflicts while preserving positive working relationships. EI also plays a role in fostering creativity and innovation, as it helps technocrats understand human emotions and needs, leading to more innovative solutions and products [8].

To develop EI among technocrats, the article suggests several strategies. These include raising awareness of emotions and their impact, teaching effective emotion management techniques, developing empathy and understanding of others' perspectives, and fostering communication, conflict resolution, and teamwork skills. Workshops, training programs, and mentorship opportunities can also contribute to the development of EI, and regular assessment and feedback are important for continuous improvement.

EI has a direct impact on job performance and career success for technocrats. Organizations can promote EI to create a positive work environment and enhance the overall effectiveness of technocratic teams [9].

1.3 Occupational Stress

Occupational stress among technocrats, professionals working in technology-related fields. These individuals face unique challenges and stressors due to the complex and rapidly evolving nature of their work. The tech industry is characterized by heavy workloads, long working hours, and the constant pressure to meet high expectations. Technocrats also need to continually adapt and learn new skills to keep up with technological advancements, which can be mentally and emotionally draining “personal stance that facilitates coping effectively with stressful circumstances” [2].

Stress is a distressing emotional state that causes a variety of physical, cognitive, and behavioural changes. These can be aimed at either changing the stressful occurrence or adapting to its consequences. Technocrats often encounter high levels of stress as a result of factors such as a lack of influence over projects, interpersonal disputes within teams, and the organization’s competitive nature [10].

Lack of control over projects, interpersonal issues within teams, and the competitive nature of the industry further add to the stress experienced by technocrats. Extended periods of sitting, screen time, and high stress levels can lead to health issues. It is also defined as ‘a condition arising from the interaction of people and their jobs and characterized by changes within people that force them to deviate from their normal functioning’ [3]. Moreover, economic uncertainties and job market fluctuations contribute to job insecurity and increasing stress levels among the technocrats.

To address occupational stress, employers and individuals can take several steps. Employers can encourage a healthy work-life balance by setting clear boundaries and providing flexible work arrangements. Organizations can hire psychological professionals; counselors, psychologists and other experts to provide a manful service for the stake holders. They can also support continuous learning and provide opportunities for skill development to help technocrats keep up with technological advancements. Offering mental health resources at a timely point and promoting open communication within teams are also important in resolving conflicts and addressing interpersonal issues.

Redistributing workloads, setting realistic deadlines, and ensuring employees are not overwhelmed with excessive tasks are key to reducing stress levels. Providing job security through clear career paths and growth opportunities is vital in alleviating job-related stress. Promoting physical health and well-being through ergonomic workspaces and initiatives to combat sedentary behavior can also contribute to a less stressful work environment [12].

Addressing occupational stress among technocrats is crucial for maintaining a healthy and productive workforce in the technology sector. Both employers and employees need to collaborate and create a supportive work environment that focuses on employee well-being [11].

2 Method

The aim of the study was to study the hardiness, emotional intelligence and occupational stress among male and female executive and senior executive engineers working in a public sector manufacturing industry in Bangalore.

2.1 Research Objectives

1. To study the significant relationship between emotional intelligence and hardiness occupational stress among technocrats.
2. To identify whether there is a difference in emotional intelligence, hardiness and occupational stress among the technocrats based on their gender.

2.2 Hypotheses

H⁰¹: There is no significant relationship between emotional intelligence and hardiness occupational stress among technocrats.

H⁰²: There is no significant difference in emotional intelligence, hardiness and occupational stress among the technocrats based on their gender.

2.3 Variables

Hardiness

Occupational Stress

Emotional Intelligence

2.4 Research Design

Non experimental correlation research design was used to study the variables namely emotional intelligence, hardiness and occupational stress among engineers of a public sector manufacturing industry in Bangalore.

2.5 Inclusion Criteria

- i. Technocrat's grade 1 to 4 was included in the executive category.
- ii. Technocrat' grade 5 and above were included in the senior executive category.
- iii. Only Technocrats in departments were included in the study.
- iv. Male and female participants were selected on the basis of availability at a ratio of 1:2 approximately.

2.6 Exclusion Criteria

- i. All Technocrat's apart from other departments were excluded.
- ii. All senior executives beyond grade V were excluded.

2.7 Sample

In the present study, the researcher aimed to administer the questionnaires to 130 engineers working in a public sector manufacturing industry. The sample consists of engineers, from beginners to senior executive managers, working in two departments of the organization. Since it was distributed during peak production time (November–March), the researcher was only able to obtain 87 data, out of which only 84 were found to be relevant. This includes 59 males and 25 females.

2.8 Sampling Technique

The engineers for this study were selected on the basis of their gender and grade using purposive sampling technique, from two different departments in the organization.

2.9 Ethical Considerations

The researchers ensured that participants were well-informed about the purpose and content of the study, as well as the process of completing the test. They also addressed ethical considerations such as the rights of participants, confidentiality, and data unification. Participants agreed to take part in the study voluntarily by signing a consent form that was written.

2.10 Tools Used

Emotional Intelligence

The Schutte Self Report Emotional Intelligence Test (SSEIT) by Schutte et al. (1998) The reliability of the tool was reported to be 0.90, as measured by Cronbach's Alpha, validity was found to be 0.892.

Hardiness

The Personal Views Survey PVS III-R (Maddi & Kosaba, 2001) was used to assess the general construct of hardiness and resilience among participants. The Cronbach's Alpha coefficients for the sub scales ranging from 0.70–0.75 for commitment, 0.61–0.84 for control and 0.60–0.71.

Occupational Stress

The Occupational Stress Index (Srivastava, A.K., & Singh, A.P., 1981) was designed for measuring perceived stress among employees of various occupational levels. The reliability of the tool was reported to be 0.863 in the present study.

2.11 Procedure

Procedure

The researcher administered the three questionnaires to 130 engineers. The following instructions were given to the participants after introducing the researcher's details and the purpose of the visit: "Here are three questionnaires for measuring emotional

intelligence, hardiness and occupational stress. The instructions are given on the front page. Kindly go through it and fill in the questionnaire giving responses that suits you best. Also, all your responses will be kept confidential and will not be disclosed to anyone apart from me. So I do not need your personal details, apart from your gender and grade. If you have any doubts you can ask me now, I will help you.” After this, the researcher collected the questionnaires back from the participants.

2.12 Data Analysis

The statistical methods used in this research were Process macros using 3, 4 version using Statistical Package for Social Sciences (SPSS).

2.13 Ethical Consideration

The research was conducted on engineers from a public sector manufacturing industry which is under the Ministry of Defense, Government of India. The results therefore have been kept confidential along with the details obtained from the participants, which is under no circumstance disclosed to anyone apart from the researcher.

3 Results

Table 1. Descriptive statistics of emotional intelligence, hardiness and occupational stress among the technocrats

Variables	N	Range	Mean		Std. Deviation
			Statistic	Std. Error	Statistic
Emotional Intelligence	84	88	126.68	1.460	13.377
Hardiness	84	30	25.37	.598	5.477
Occupational Stress	84	76	127.05	1.815	16.635

The Table 1 shows the descriptive statistics of the technocrats for each of the three constructs-, hardiness emotional intelligence and occupational stress. The mean hardiness score of the sample was found to be 25.37 which fall under the average category. The mean emotional intelligence of the sample was found to be 126.68, which falls under the above average category. The mean occupational stress of the sample was found to 127.05 which falls under the average category.

Objective 1: To study the significant relationship between hardiness, emotional intelligence and occupational stress among technocrats,

From the Table 2, it can be seen that emotional intelligence is positively correlated with hardiness ($r = .200^*$), that is, as emotional intelligence increases, hardiness also increases, which is significant at 0.05 level of significance. Also, emotional intelligence

Table 2. Correlation between emotional intelligence, hardiness and occupational stress

Variables		Emotional Intelligence	Hardiness	Occupational Stress
Emotional Intelligence	Pearson Correlation	1	.200*	-.262**
	Sig. (1-tailed)		.034	.008
Hardiness	Pearson Correlation	.200*	1	.021
	Sig. (1-tailed)	.034		.426
Occupational Stress	Pearson Correlation	-.262**	.021	1
	Sig. (1-tailed)	.008	.426	

*. Correlation is significant at $p < 0.05$ (1-tailed) **. Correlation is significant at $p < 0.01$ (1-tailed)

is negatively correlated with occupational stress ($r = -.262^{**}$), that is, as emotional intelligence increases, occupational stress decreases, which is significant at 0.01 level of significance. This proves the first hypothesis which states that emotional intelligence is positively correlated with hardiness and negatively correlated with occupational stress level of the technocrats. Also, hardiness and occupational stress is found to have no significant difference with correlation coefficient value ($r = .021$) which indicated that as hardiness increased, there was a slight increase in occupational stress which was not significant at 0.05 level of significance. Thus, the second hypothesis was accepted which states that there is no significant difference between hardiness and occupational stress level among the technocrats.

Table 3. Correlation of the 4 subscales of EI with hardiness among the Technocrats

Variable		POE	MOE	MOTE	UOE
Hardiness	Pearson Correlation	.103	.268**	.260**	.028
	Sig.(1-tailed)	.176	.007	.008	.400
	N	84	84	84	84

** . Correlation is significant at $p < 0.01$ (1-tailed)

Predictor Variables: POE-Perception of Emotions; MOE-Managing Own Emotions; MOTE-Managing Others' Emotions; UOE-Utilization of Emotions.

Table 3 indicated that the relationship between the four sub-variables of emotional intelligence, namely, perception of emotions, managing own emotions, managing others' emotions and utilization of emotions with hardiness variable. It is observed that hardiness has a significant positive correlation with managing own emotions ($r = .268^{**}$) and managing others' emotions ($r = .260^{**}$) at 0.01 level of significance. The other two

sub-variables are shown to have a positive correlation which is not significant at 0.05 level of significance.

Objective 2: To identify whether there is a difference in emotional intelligence, hardiness and occupational stress among the technocrats based on their gender their gender.

Table 4. Gender differences in emotional intelligence, hardiness and occupational stress

Variables	Gender	N	Mean	Std. Deviation	Std. Error mean	t	df	p
Emotional Intelligence	Male	59	126.05	5.751	1.83	-.658	82	.256
	Female	25	128.16	4.873	2.32	-.712	54.55	.239
Hardiness	Male	59	25.44	14.104	.749	.183	82	.427
	Female	25	25.20	11.614	.975	.196	53.04	.423
Occupational Stress	Male	59	127.41	17.143	2.23	.302	82	.381
	Female	25	126.20	15.676	3.135	.314	49.25	.377

Table 4 shows that the mean difference for EI, hardiness and occupational stress among male and female technocrats. There is no significant difference found between the mean values of EI; for males, it was 126.05 and 128.16 for females. The t values were -.658 and -.712 respectively which was not significant at 0.05 level of significance. For hardiness, the mean value for males was 25.44 ($t = .183$) and for females it was 25.20 ($t = .196$) which did not have any significant difference at 0.05 level of significance. For occupational stress, the means were found to be 127.41 ($t = .302$) and 126.20 ($t = .314$) among male and female technocrats, which again indicated no significant difference at 0.05 level of significance.

4 Discussion

Emotional intelligence is inversely correlated with occupational stress, i.e., as emotional intelligence increases, the effect of stress reduces. Also, emotional intelligence was positively correlated with hardiness which means that as emotional intelligence increases, hardiness also increases. Thus, the first hypothesis which states that emotional intelligence is positively correlated with hardiness and negatively correlated with occupational stress level of the engineers is proved [14]. Therefore, emotional intelligence plays a major role in buffering the ill effects of stress and helps an individual to turn any stressful situation into a positive one, with an opportunity for growth. It was also seen that no significant difference existed between hardiness and occupational stress, thus accepting the second hypothesis.

Researchers had tried to correlate the four dimensions of emotional intelligence with hardiness and occupational stress, respectively. The four sub-variables under emotional

intelligence were perception of emotions, managing own emotions, managing others' emotions and utilization of emotions. It was noted that the two dimensions of managing own emotions and managing others' emotions had a marked or substantial significance with hardiness which was significant at 0.01 level of significance. The researcher also established a marked significance between certain dimensions of occupational stress with that of the sub-variables of emotional intelligence. When an individual perceives and manages his/her own emotions it is shown to drastically reduce the occupational stress levels, with significance at 0.05 level of significance [13].

It was observed that there was no significant difference between gender and grade in determining emotional intelligence, hardiness and occupational stress among the engineers. This can be attributed to the organizational factors; an organization's culture plays an important role in binding the workforce together. In this particular organization, the employees have been seen to work for many years due to the work environment, job flexibility and autonomy that are given to them among several other factors. Therefore, irrespective of their gender, job position and experience with the organization, the engineers have displayed no major differences pertaining to the three variables of the study.

5 Summary and Conclusion

Emotional intelligence had a marked positive correlation with hardiness construct and a significant negative correlation with occupational stress. It was also found that hardiness and occupational stress had a slight positive correlation which was not significant. The study also revealed that hardiness had a considerable role in mitigating the effects of stress. For example, the control and commitment components of hardiness were found to improve the responsibility of persons; more challenges increased role ambiguity and role conflict but also enhance intrinsic impoverishment dimension of occupational stress which gave the individuals opportunities to utilize abilities and experience independently and develop aptitude and proficiency. Hardiness, was found to have a marked positive correlation Emotional intelligence with which shows that as emotional intelligence increases, hardiness of a person also increases. Emotional intelligence was found to have a negative correlation with stress which indicates that as emotional intelligence of an individual increases, his/her stress levels decreases substantially.

6 Implications of the Study

The emotional intelligence is mainly required for people in positions such as leaders, top managers, teachers, doctors, coaches, psychologists, psychiatrists, and since everyone undergoes stress on a daily basis, it is only right to say that emotional intelligence needs to be developed to enhance advanced behavior.









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AI-Assisted Personal Finance for Minimalists: Streamlining Budgeting and Saving

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Abstract. In an era characterized by complexity and information overload, minimalism has emerged as a lifestyle choice embraced by individuals seeking simplicity and intentionality in various aspects of their lives. This study explores the intersection of minimalism and artificial intelligence (AI) in the realm of personal finance, introducing the concept of “AI-Assisted Personal Finance for Minimalists.” Minimalists prioritize what truly matters, focusing on essential expenditures, mindful saving, and the reduction of financial intricacies. AI-powered tools and platforms excel at automating tasks, providing real-time insights, and simplifying decision-making. The synergy between minimalism and AI in personal finance offers a promising paradigm shift. The research investigates the readiness and intention of individuals to adopt AI-powered financial tools to streamline budgeting processes and enhance savings within a minimalist framework. Drawing upon the Technology Readiness Index (TRI) framework, the study assesses four key dimensions: optimism, innovation, discomfort, and insecurity, to gauge respondents’ willingness to adopt AI-powered tools for minimalist financial management. The findings challenge conventional expectations, indicating that discomfort and insecurity do not act as significant deterrents to the adoption of AI-powered financial tools. Optimism and innovation significantly influence individuals’ positive intentions to use these tools. Respondents are open to leveraging technology to simplify financial management and align with minimalist principles. Automated expense tracking and automated bill payments are among the AI-powered tools most preferred by respondents.

Keywords: Minimalism · Artificial Intelligence (AI) · Personal Finance · Financial Minimalism · Technology Readiness

1 Introduction

In an age of increasing complexity and information overload, minimalism has emerged as a lifestyle choice embraced by many seeking simplicity (Kang, 2021) and intentionality in various aspects of their lives. Minimalists prioritize what truly matters and aim to eliminate the excess (Millburn, 2015; Fu, 2023) be it physical possessions, digital clutter,

or even financial intricacies. In this pursuit of a streamlined and purposeful existence, minimalists are turning to innovative solutions (Strickland, 2022), including artificial intelligence (AI), to transform the way they manage their personal finances. The marriage of minimalism and AI in the realm of personal finance offers a promising synergy. Minimalists seek to declutter their financial lives, focusing on essential expenditures and mindful saving, while AI-driven tools and platforms excel at automating tasks, providing real-time insights, and simplifying decision-making (Iaia, 2022). This intersection gives rise to a compelling concept: “AI-Assisted Personal Finance for Minimalists.”

This concept acknowledges the unique financial goals and preferences of minimalists, who often prioritize experiences over possessions, debt reduction, and saving for meaningful pursuits. AI technologies stand ready to assist minimalists in achieving these objectives by intelligently analyzing financial data, suggesting optimized budgets, automating savings strategies, and offering personalized financial advice—all while minimizing the mental and emotional burden of managing money (Sabel, 2011). In this exploration of AI-Assisted Personal Finance for Minimalists, we delve into the potential benefits, challenges, and emerging trends at the intersection of minimalism and financial technology. We examine how AI-powered tools can aid minimalists in streamlining budgeting processes, enhancing saving practices, and ultimately empowering them to lead financially minimalist yet purposeful lives. This paradigm shift in personal finance not only aligns with the core principles of minimalism but also presents a novel approach (Padgett, 2016) to financial well-being in the digital age.

1.1 Background of the Study

In recent years, minimalism has gained substantial traction as a lifestyle philosophy that champions simplicity, intentionality, and the reduction of excess in various aspects of life. Minimalists are often characterized by their desire to declutter (Palafox, 2020), both physically and mentally, and to focus on what truly matters. This ethos extends to personal finance, where minimalists seek to simplify their financial lives, prioritize mindful spending, reduce debt, and save for meaningful life experiences rather than accumulating possessions (Vitale, 2018).

Simultaneously, the proliferation of artificial intelligence (AI) and machine learning technologies has revolutionized the way individuals manage their finances. AI-driven tools have the capability to automate routine financial tasks, provide data-driven insights, and optimize financial decisions (Bharadiya, 2023). These tools can create customized budgets, track expenditures, analyze investment opportunities, and even predict future financial trends—all with a high degree of precision and efficiency.

The convergence of minimalism and AI in the domain of personal finance presents an intriguing opportunity. Minimalists, who strive for a less cluttered and more focused existence, can benefit significantly from the capabilities of AI in achieving their financial goals (Dopierala, 2017). AI-Assisted Personal Finance for Minimalists proposes an innovative approach to simplify budgeting, enhance saving practices, and promote financial mindfulness (Newport, 2019).

At its core, this study explores how AI can cater to the distinctive financial preferences and objectives of minimalists. Minimalists often aim to reduce financial stress, eliminate unnecessary expenses, and allocate resources to experiences that align with their values.

AI technologies have the potential to assist minimalists in automating budget creation, identifying areas for expense reduction, optimizing savings plans (Kunnathuvalappil Hariharan, 2018), and providing personalized financial guidance (Wamba-Taguimdje, 2020).

By exploring the intersection of minimalism and AI-assisted personal finance, this research seeks to provide insights into how technology can be harnessed to support individuals in their pursuit of a simplified, mindful, and financially responsible lifestyle. It also highlights the potential benefits, challenges, and ethical considerations surrounding the use of AI in personal finance for minimalists,

1.2 Structure of the Article

The article commences with a fundamental introduction to the concept of AI-assisted personal finance, followed by an in-depth segment delving into the background of the study. Subsequently, the article presents recent and pertinent literature related to the topic. Following this, the article provides a comprehensive description of the key principles and strategies for minimalist personal finance, followed by the formulation of hypotheses, presentation of results, and a detailed discussion. Finally, the article concludes with a summary, discusses the implications of the study, and outlines future research directions.

2 Literature Review

Minimalism as a lifestyle and design philosophy has a rich history that spans several decades (Harris, 2006). Its roots can be traced back to various movements and cultural shifts. Here is an overview of the history of minimalism as a lifestyle:

Early Influences (Late 19th to Early 20th Century): The roots of minimalism can be found in various art movements, including the Russian Constructivism and the Bauhaus school of design in the early 20th century (Dixon, 2015). These movements emphasized simplicity, functionality, and the reduction of unnecessary ornamentation in art, architecture, and design (VanEenoo, 2011).

Minimalism as a Lifestyle (Late 20th Century): In the late 20th century, minimalism began to extend beyond the realms of art and design into lifestyle choices. People started to embrace the idea of living with less, reducing clutter, and simplifying their lives. The book “The Life-Changing Magic of Tidying Up” by Marie Kondo, published in 2011, became a significant influence in the popularization of minimalist living (Kondo, 2014; A. Sandlin, 2022).

Digital Minimalism (21st Century): With the rise of digital technology and social media in the 21st century, digital minimalism (Lieber, 2020) gained prominence. People started to seek ways to reduce screen time, declutter their digital lives, and regain focus on the real world.

Sustainable Minimalism (21st Century): Minimalism and sustainability became interconnected trends in the 21st century (Wilson, 2022). Many individuals adopted minimalist lifestyles to reduce their environmental footprint. Sustainable practices, such as reducing waste and choosing eco-friendly products, became integral to minimalist living (Seferian, 2021).

Tiny Houses and Minimalist Living Spaces (21st Century): The concept of living in smaller, more efficient spaces gained popularity in the 21st century. Tiny houses and micro-apartments became symbols of minimalist living, emphasizing the importance of space optimization (Vasseur, 2022).

The history of minimalism as a lifestyle reflects a gradual shift toward simplicity, functionality, and mindfulness in various aspects of life, from art and design to personal choices. It has evolved over time to address the changing values and needs of society, including a growing emphasis on sustainability and digital well-being. Minimalism continues to be a relevant and influential philosophy in the modern world.

2.1 Personal Finance for Minimalists

Personal finance for minimalists involves applying minimalist principles to your financial life, emphasizing simplicity, intentionality, and efficiency in budgeting, saving, and spending. The goal is to prioritize what truly matters to you while minimizing unnecessary expenses and financial clutter.

Key principles and Strategies for Personal Finance for Minimalists

- Prioritize values and financial goals.
- Simplify your budget by cutting non-essential expenses.
- Automate savings and investments for consistency.
- Squeeze frugality and mindful spending.
- Reduce or eliminate high-interest debt.
- Build an emergency fund for financial security.
- Invest thoughtfully in line with your goals.
- Avoid lifestyle inflation as your income grows.
- Practice contentment with what you have.
- Regularly review and adjust your financial plan.
- Seek financial independence for freedom.
- Stay focused on what truly matters in your life.

2.2 AI-Powered Tools Benefit Minimalists in Achieving Financial Minimalism

AI-powered tools have the potential to significantly aid minimalists in streamlining budgeting processes, enhancing saving practices, and ultimately empowering them to lead financially minimalist yet purposeful lives. Following points outline how AI can achieve this:

Automated Expense Tracking: AI-driven apps can automatically track and categorize expenses, eliminating the need for manual entry. This simplifies budgeting by providing real-time insights into spending patterns.

Personalized Budgeting: AI can analyze your financial data and create personalized budgets based on your income, expenses, and financial goals. These budgets can adapt over time as your circumstances change.

Expense Optimization: AI can identify areas where you can cut expenses by analyzing your spending habits and suggesting cost-effective alternatives, aligning with minimalist principles of frugality.

Smart Savings Recommendations: AI can analyze your financial situation and recommend the most suitable savings strategies, such as setting up automatic transfers to high-yield savings accounts or investment platforms.

Bill Negotiation: Some AI-powered services can negotiate bills and subscriptions on your behalf to reduce monthly expenses, aligning with minimalist goals of reducing unnecessary financial clutter.

Behavioral Insights: AI can provide insights into your financial behavior and help you make more mindful spending decisions by pointing out patterns of excessive or impulsive spending.

Investment Advice: AI-powered robo-advisors can offer personalized investment advice and create diversified portfolios that align with your financial goals, supporting minimalist investment strategies.

Emergency Fund Monitoring: AI can monitor your financial health and notify you when your emergency fund falls below a certain threshold, helping you maintain financial security.

Goal Tracking: AI can track your progress toward financial goals and offer recommendations to stay on course, motivating minimalists to stick to their values and aspirations.

Predictive Analysis: AI can use predictive analytics to anticipate upcoming financial challenges or opportunities, allowing minimalists to plan ahead and make informed decisions.

Automated Bill Payments: AI-powered tools can automatically schedule and make bill payments, ensuring you never miss due dates and incur unnecessary fees.

Financial Education: AI can provide educational content and resources tailored to your financial situation, helping minimalists make informed decisions about their finances.

Data Security: AI tools can enhance security by detecting unusual financial activity or potential fraud, providing peace of mind to minimalists who value financial simplicity and security.

Customizable Alerts: AI can send customizable alerts and notifications, reminding minimalists to stay on track with their financial goals and minimalist principles.

2.3 Technology Readiness of AI-Powered Tools for Financial Minimalism

The study on “Technology Readiness (Parasuraman, 2000) of AI-Powered Tools for Financial Minimalism” aims to assess the readiness and acceptance of AI-powered financial tools among individuals seeking a financially minimalist lifestyle. It explores the willingness to adopt and utilize these tools to streamline budgeting processes, enhance

savings practices, and ultimately empower individuals to lead a financially minimalist yet purposeful life. Technology Readiness of AI-Powered Tools for Financial Minimalism” and assessing respondents’ intention to use this technology, can be aligned with four key concepts: optimism, innovation, discomfort, and insecurity. Optimism reflects respondents’ positive attitudes toward AI-powered financial tools, considering them effective for budgeting and savings aligned with minimalism. Innovation gauges respondents’ willingness to explore new technologies even before purchase decisions. Discomfort assesses concerns about tool complexity or misalignment with minimalist values, while insecurity pertains to worries about data security and reduced personal interaction. Measuring these concepts helps evaluate respondents’ readiness and willingness to adopt AI-powered tools for minimalist financial management.

Hypotheses of this Study

H1: Optimism - Positive beliefs about AI-powered financial tools align with minimalism, positively affecting the intention to use these tools.

H2: Innovation - Willingness to explore new financial technologies positively influences the intention to use AI-powered tools for minimalist financial management.

H3: Discomfort - Concerns about tool complexity or misalignment with minimalist values negatively impact the intention to use this technology.

H4: Insecurity - Worries about data security and reduced personal interaction negatively influence the intention to use AI-powered financial tools for minimalism.

2.4 Method: Data Collection and Measurement Scales

Data for this study on the “Technology Readiness of AI-Powered Tools for Financial Minimalism” was collected in September 2023 from individuals interested in financial minimalism. An online questionnaire was developed in English and underwent a qualitative pretest by 50 respondents to ensure clarity and relevance of questions. After adjustments and the addition of definitions, the final questionnaire was used for the study.

Survey respondents were recruited using convenience sampling, targeting individuals interested in financial minimalism through online platforms and social media. A total of 252 responses were collected, after excluding incomplete and unanswered questionnaires.

The study employed measurement items aligned with the Technology Readiness Index (TRI) framework (Parasuraman, 2000). The TRI dimensions of optimism, innovation, discomfort, and insecurity were assessed using four measurement items each. Additionally, respondents’ intention to use AI-powered financial tools for minimalist financial management was measured using manifest variables, and demographic data were collected to analyze the influence of various factors on technology readiness. The following Table 1 shows the questionnaire and its reliability.

3 Data Analysis

Demographic analysis provides a snapshot of the survey respondents’ characteristics, revealing insights into their age, gender, location, education, income, and employment status. Understanding these demographics offers valuable context for interpreting the

Table 1. AI-Powered Tools for Financial Minimalism scale

TRI - Constructs	Questions Regarding AI-Powered Tools for Financial Minimalism	Cronbach's Alpha
Optimism	AI-Powered tools would enhance my financial management experience	0.821
	I appreciate tech for customized financial processes	
	Open to AI-Powered tools for savings and investments	
	Tech would improve financial skills and minimalism	
Innovation	Inclined to be early AI-Powered tool adopter	0.807
	Actively seek info on AI financial tech	
	Learning about tech as rewarding as using it	
	People inquire about my thoughts on AI financial tools	
Discomfort	AI-Powered tools make me uneasy, seen as complex	0.678
	Concerns about AI tool value and cost	
	Prefer knowledgeable guidance for AI tools	
	May not explore all AI tool features	
Insecurity	Concerned about tech dependence for finance	0.711
	Uneasy about tech's impact on relationships	
	Worried about online data misuse	
	Feel unsafe sharing personal info online	
Behavioral Intention	Intend to use AI tools for financial management	0.886
	Intend to learn to use AI financial tools	
	Likely to recommend AI financial tools to others	

Source: Primary Data

survey results and tailoring financial insights to specific audience segments which is shown in the Table 2.

The provided demographic data represents the distribution of respondents across various age groups, genders, locations, education levels, income brackets, and employment statuses in a survey. Notably, the largest age group among respondents is 65 or older, comprising 25% of the sample, while the 25–34 age group follows closely behind with 20%. In terms of gender, a fairly balanced distribution exists between male and female respondents, with a small percentage (9%) preferring not to disclose their gender. Urban residents constitute the majority of the sample at 48%, followed by suburban and rural residents at 32% and 21%, respectively. Education-wise, the survey includes a diverse

Table 2. Demographic Breakdown of Survey Participants

Demographic Group		No. of Respondents	%
Age	18–24	20	8
	25–34	50	20
	35–44	44	17
	45–54	46	18
	55–64	30	12
	65 or older	62	25
Gender	Male	120	48
	Female	110	44
	Prefer not to say	22	9
Location	Urban	120	48
	Suburban	80	32
	Rural	52	21
Education Level	High School or less	70	28
	Bachelor's Degree	90	36
	Master's Degree	60	24
	Doctorate or Professional Degree	32	13
Income Level	Below \$5,000	38	15
	\$5,000–\$14,999	61	24
	\$15,000–\$29,999	71	28
	\$30,000–\$44,999	45	18
	\$45,000 or more	37	15
Employment Status	Employed full-time	110	44
	Employed part-time	30	12
	Self-employed	35	14
	Unemployed	20	8
	Student	35	14
	Retired	22	9

Source: Primary Data

range of respondents, with 36% holding a Bachelor's degree and 24% with a Master's degree. In terms of income, the largest bracket is the \$15,000–\$29,999 range, representing 28% of respondents. Among employment statuses, those employed full-time make up 44% of respondents, while students and self-employed individuals each account for 14%. These demographic insights provide valuable context for understanding the survey results within different population segments.

A survey question was asked to gauge respondents' preferences for AI-powered financial tools, allowing them to select the tools they find appealing for optimizing budgeting and enhancing savings. The following Table 3 presents the respondents' preferences for AI-Powered Financial Tools, indicating the percentage of respondents who expressed interest in each tool.

Table 3. Preference for AI-Powered Financial Tools among Respondents

	No. of respondents	%
Automated Expense Tracking	68	27%
Personalized Budgeting	55	22%
Expense Optimization	44	18%
Smart Savings Recommendations	63	25%
Bill Negotiation	32	13%
Behavioral Insights	41	16%
Investment Advice	48	19%
Emergency Fund Monitoring	38	15%
Goal Tracking	51	20%
Predictive Analysis	39	15%
Automated Bill Payments	72	29%
Financial Education	58	23%
Data Security	67	27%
Customizable Alerts	59	23%

Source: Primary Data

The Table 3 shows that Automated Bill Payments garnered the highest interest at 29%, followed closely by Automated Expense Tracking at 27%. These preferences reflect a strong inclination toward tools that streamline financial tasks and enhance security, such as Data Security and Personalized Budgeting, which were also well-received at 27% and 22%, respectively.

Structural Equation Modelling

This study employed Structural Equation Modelling (SEM) to examine the readiness and intention of individuals to adopt AI-powered financial tools as part of their minimalist financial management strategies. We investigate the interplay between factors such as optimism, innovation, discomfort, and insecurity in shaping individuals' willingness to utilize these tools for streamlining budgeting and enhancing savings, ultimately contributing to a financially minimalist lifestyle. SEM allows us to uncover the complex relationships among these variables and gain insights into the technology readiness of minimalists in the realm of personal finance. The model fit for this study is as follows:

- Chi-square (χ^2): Approximately 419.110

- Degrees of Freedom (df): Approximately 259
- p-value: Less than 0.000
- Comparative Fit Index (CFI): Approximately 0.925
- Root Mean Square Error of Approximation (RMSEA): Approximately 0.055

These values suggest that the overall measurement model provides an adequate fit to the data. The CFI value of approximately 0.925 indicates a good fit, and the RMSEA value of approximately 0.055 suggests a reasonable fit to the data. Additionally, all standardized regression loadings for the measures exceed 0.60, indicating that the measures are reliable indicators of the constructs in the model. The test results of SEM is shown in the Table 4 and the model is shown in the Fig. 1.

Table 4. Hypotheses testing of Intention to Use

Hypotheses	Dependent	Independent	Estimate	Std. Error	Sig	Decision
H1	Intention to Use AI-powered tools for minimalist financial management	Optimism	0.313	0.088	0.005	Supported
H2		Innovation	0.398	0.127	0.002	Supported
H3		Discomfort	-0.003	0.069	0.975	Not Supported
H4		Insecurity	-0.315	0.171	0.373	Not Supported

Source: Primary Data

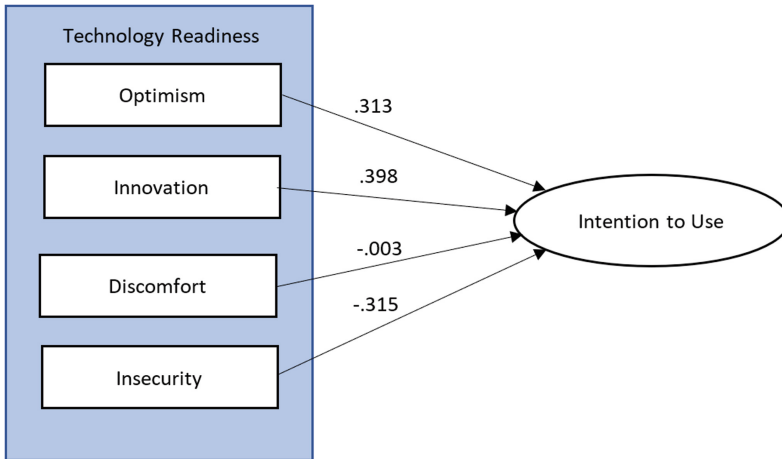


Fig. 1. Intention to Use AI-powered tools for minimalist financial management

H1: Optimism - Positive beliefs.

The hypothesis is supported as there is a statistically significant positive correlation between respondents' optimism and their intention to use AI-Powered financial tools.

Optimism in this context represents a positive attitude towards technology, including one's perceived level of control, technology's flexibility, convenience, and efficiency (Parasuraman, 2000). For individuals to be optimistic about adopting AI-Powered financial tools, it's crucial that they have confidence in their ability to control and benefit from the technology. The results show that those who held optimistic views about technology were more likely to express a positive intention to use these tools, indicating that their belief in the benefits and controllability of the technology influenced their intention.

H2: Innovation - Willingness to explore

The hypothesis is supported as there is a statistically significant positive correlation between respondents' innovation and their intention to use AI-Powered financial tools. Innovation in this context reflects a proactive attitude towards adopting new financial technologies. Respondents who actively sought information about AI financial tools and believed that learning about new financial technologies would be rewarding were more inclined to intend to use these tools. Their openness to innovation and new technology adoption positively influenced their intention to use AI-powered tools.

H3: Discomfort - Concerns about complexity

The hypothesis is not supported as there is no statistically significant negative correlation between respondents' discomfort and their intention to use AI-Powered financial tools. Discomfort in this context relates to concerns about the complexity and alignment of AI-powered tools with minimalist values. Respondents may not have found AI-powered financial tools too complex or misaligned with their minimalist financial goals. Their willingness to explore new technologies and the perceived benefits of these tools may have outweighed any discomfort they initially felt, suggesting that discomfort did not deter their intention.

H4: Insecurity - Worries about data security

The hypothesis is not supported as there is no statistically significant negative correlation between respondents' insecurity and their intention to use AI-Powered financial tools. Insecurity in this context relates to concerns about tech dependence and data security. Respondents may have felt secure in using these tools, and the potential for reduced personal interaction might not have deterred their intention. Their perceived benefits of using AI-powered financial tools might have outweighed concerns about security, suggesting that insecurity did not significantly affect their intention.

4 Conclusion

This study provides a profound understanding of individuals' readiness and intentions when it comes to adopting AI-powered financial tools as a means to achieve financial minimalism. In a rapidly evolving digital landscape, where technology increasingly intertwines with our daily lives, it is crucial to discern how individuals perceive and engage with these tools for managing their finances. Our research unearthed fascinating insights into this intersection of technology and financial minimalism. Firstly, optimism emerged as a significant driving force behind individuals' positive intentions to embrace AI-powered financial tools. This optimism reflects their belief in the potential of these tools to enhance their financial management experience. They see AI-powered tools as effective instruments for streamlining budgeting processes and elevating their savings

strategies. In essence, they view technology as an enabler of their minimalist financial goals.

Innovation, another pivotal factor, was found to significantly influence individuals' intentions to adopt these tools. This suggests that individuals inclined to explore new technological advancements are more likely to be early adopters of AI-powered financial tools. Even before making purchase decisions, they actively seek information about the latest developments in financial technology. This eagerness to learn about new financial technologies aligns with their belief that understanding these innovations can be as rewarding as the technology itself. It signifies their commitment to staying at the forefront of technological advancements.

4.1 Implications of the Study

Interestingly, our findings challenged the conventional notion that discomfort and insecurity would act as significant deterrents to the adoption of AI-powered financial tools. Contrary to expectations, these factors did not emerge as substantial barriers. Respondents did not perceive new technology as overwhelmingly complicated or find it too unsettling to be useful. Instead, they were open to the idea of relying on AI-powered tools to simplify their financial management. The study's results suggest that individuals are embracing technology as a means to streamline their financial processes and align more closely with minimalist principles. AI-powered financial tools offer flexibility and customization, allowing individuals to tailor their financial strategies according to their specific goals and values.

4.2 Future Research Direction

As we look to the future, it is evident that AI-powered financial tools will continue to evolve and play a pivotal role in empowering individuals to lead more purposeful and financially minimalist lives. This study underscores the significance of this evolving landscape, with technology becoming an integral part of personal finance. For both practitioners and researchers in this field, these insights offer a valuable foundation for further exploration and development, enabling them to better cater to the changing needs and aspirations of individuals seeking to integrate technology with financial minimalism. This study opens the door to a deeper understanding of how we can harness the potential of AI-powered tools to lead more meaningful and financially fulfilling lives.






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The Effect of Shop Design, Digital Signage and Digital Spirit on the Online Shopping Experience of Retail Businesses

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Abstract. Human-computer interface and device architecture are increasingly important in today's fast-paced retail sector. The infrastructure of a virtual world is put in place to provide an engaging environment that encourages customers to spend more time browsing and shopping. A shop's success depends on how quickly it can adapt and implement new technologies that enhance the customer shopping experience. Online shops are crucial to the success of any retail sector. The use of digital signage to advertise shop products is widespread. The selection of a digital signage design is the focus of this study. Digital signage can be used in public spaces such as airports, train stations and shopping centers to improve the efficiency of customer service operations. Once the product's short response code was successfully verified, the system directed the delivery of the item to the end customer. Digital signage can also refer to a flower arrangement, a pipe or a guide arrangement. Statistical data suggests that shop design, digital signage, and digital spirit significantly influence the online shopping experience.

Keywords: Store automation · online shopping · customer experience · digital signage · human-machine interaction

1 Introduction

In an online marketplace you can find a list of sellers and an order form. Now, you can shop in virtual shops that can be accessed via the Internet. Buying things in a virtual shop is more convenient than going to a traditional shop. Virtual shops use 3D modelling and animation to give customers a better view of their potential purchases [1]. The most significant advance in human-computer interaction to date is digital reality. Virtual shops are referred to as sales partners because of the instant and continuous access to customers

and the extensive access to product data they provide. The structure of online shopping is complex, with many factors determining a customer's ability to make a purchase at different times. A well-designed storefront can have a significant influence on business [2].

The design composites of a virtual online retailer have a much greater impact on customer perceptions and opinions than the components and design of an actual shop. Many company websites have failed to deliver results, including those created by 'website specialists' [1]. A customer's reluctance to make a purchase on a fraudulent website is understandable. The poorly described interface may be contributing to the decline in website traffic. Thirty per cent of customers who do not buy or order from the website do so because they cannot access it. A faulty automated storefront can ruin a shopper's day when buying online. Therefore, special attention should be paid to configuration problems that arise during ordering, browsing and performing a search. The design of the online shop is crucial, as it provides useful information and recommendations to customers. In addition, many customers were frustrated with online shops due to technical difficulties with their devices when shopping [3].

In this analysis, we focus on the "online shop environment" as an important factor in the online shopping experience of retail companies. The differences between offline and online advertising are analyzed, focusing on customer retention and promotional materials [4]. Using theoretical insights from the aforementioned fields, this thesis identifies and measures the influence of key elements of the online shop environment on customer purchases in e-commerce. Research has been conducted on the factors that influence customers' in-store and online purchases for both physical shop retailers and online retailers. The following are some of the most basic questions to ask:

What is the effect of shop design, digital signage, and digital spirit on the online shopping experience for retailers?

The main objective of the research is therefore to examine how shop design, digital signage and digital spirit affect the online shopping experience of retail companies. Therefore, the purpose of this study is to provide a theoretical framework on how the interior design of an online shop influences the online shopping experience.

2 Review of the Literature

The retailer's go-to option for shop design is the free layout. The use of different sizes, styles and types of displays and aisles in this layout ensures a clutter-free environment. Its main users are department stores, which use it to illustrate the centralized management function of various departments. The layout is intuitive, making it easy for customers to find what they need and move around the shop in any direction. This unstructured format encourages customers to take their time and make more informed purchases. Customers are willing to shop around the shop if they have many options. According to [5] Among the advantages of a free-standing structure are its durability, visibility and convenience. This type of design is crucial for directing customers to the different parts of the shop. The walkway allows the shopper to explore the entire business district or agency of their choice. This demonstrates the shopper's confidence and the retailer's competence [6]. Customers spend more time in a shop tailored to the pathway, which is

a positive outcome. Shoppers are more likely to encourage additional purchases in the shop. Department stores often use this type of design [7].

2.1 E-commerce Development

E-commerce has been thriving for some time now, and for good reason. Online sales have been growing by double digits every year, and this trend is expected to continue until at least 2008. Despite the fact that more than half of US internet users make at least one online purchase a year and collectively spent \$784 million (or \$29 billion) in 2010, the importance of this market cannot be overstated. On the other hand, we cannot ignore this staggering statistic: 66% of people who go online would never buy from a poorly designed website, regardless of the brand [8]. Thirty per cent of respondents say that the design of the site is more important than the size of the product itself, while only four per cent say they would make a purchase from a poorly designed website despite a discount. In addition, approximately 30% of customers would stop visiting their favorite physical shops if they had a negative experience shopping online.

When a potential online shopper has a positive experience, more doors open for them. So, start thinking of other ways to attract customers. Any novel idea that can increase the attractiveness of online retailing and its benefits is welcome. One strategy to attract customers is to create an electronic storefront in the virtual world, where customers can shop digitally in a fully immersive third dimension. By harnessing the potential of virtual reality technology, a unique, cutting-edge and seductive user experience can be offered, putting it ahead of more traditional e-commerce platforms.

2.2 Advances in Virtual Reality

There are many things involved in creating a virtual reality (VR) e-commerce platform, such as creating a simulated world with three-dimensional representations of things, providing product and/or environment habits and user experiences, and making shopping activities available in a variety of ways [9]. It is a complex task that requires professionals with extensive knowledge of VR technology, programming skills or knowledge of scripting language, just like the broader task of designing a virtual environment. It is also incredibly expensive and time-consuming. This situation has already inspired the creation of tools such as Sketchup. Sketchup is a 3D modelling programmed that facilitates rapid prototyping and exploration of virtual worlds.

2.3 Internet Retailing and E-marketplace Dynamics

The Internet is fast becoming a true marketplace that can support all steps of a commercial exchange in a purely digital environment [10]. According to research by [11] traditional business encounters are being replaced by “market room” transactions, which differ in substance, meaning and transaction support infrastructure. As the use of the Internet becomes more widespread, [12] predict an explosive development of e-commerce, in particular e-commerce shops. Based on the information superhighway, e-commerce is also known as the digital television industry, the Internet and even shopping malls. To

paraphrase [13] the Internet is a gateway to wide and varied knowledge and the way organizations search for and use information can be revolutionized.

They show that the external context of an organization is composed of two parts: (a) its immediate mission environment and (b) an overview of the industry as a whole. Customers and business partners (suppliers) must be part of the local working community, and the list must be comprehensive and sector-specific to be useful. According to [9], advertisements should highlight accurate and up-to-date information about customers, as well as the specific characteristics and service levels they are looking for. The main concern of this study is what information users need to better interact with technology. How to collect, process and apply this knowledge via the Internet in the retail sector are also important research topics.

2.4 Shop Layout for E-commerce

In conventional shops, this layout is called a “grid”. Customers in a tree- or hub-based online shop can find what they are looking for more easily thanks to a more logically organized hierarchy of categories and subcategories. Customers can navigate between product types at the click of a button [14]. In the online retail sector, the tree structure is being explored as an alternative to the grid [8]. In standard retail, this type of layout would be considered free-form. This layout primarily serves to free up mobility for our customers. Customers will be able to see all their preferred tags at once on any of the shop’s results pages using multiple maps or search engines. The search bar and home page of this design make it easy to find what they are looking for and save it for later [15]. When it comes to traditional commerce, which includes online shopping, the pipeline design may be used instead of a free-form design.

However, the shopping experience is different now that new technologies are used to choose and evaluate products [16]. It is not the typical shopping mall experience. The digital signage market is expanding rapidly, with an expected value of more than USD 17 billion worldwide by 2025. With the use of digital signage, businesses can give their consumers up-to-date and credible information about items in a way that ultimately leads to a sale [17]. Information is not available throughout the entire shopping process. Large shopping centers, shopping malls and shopping arcades are common locations for digital signage, as described by [18]. Digital signage in retail environments has been shown to increase foot traffic, customer retention, average order value and customer spending. Customers are more engaged, served and entertained by digital signage. A shop’s user interface, or “front end”, must be intuitive to reduce friction throughout the shopping process. The virtual storefront is a crucial part of any virtual retail system. Since shop design has a direct effect on consumer actions, retailers should pay attention to it [16].

2.5 The Effectiveness of Digital Signage

Eight out of ten customers who saw a sign ended up buying something, according to research. 80% of businesses have experienced a substantial increase in revenue of up to 33% thanks to digital signage. Customers can browse the shop’s offerings with confidence thanks to optical signage [19]. Digital signage with pictures or audio-visual material can be helpful. The moment of purchase comes after customers have made

their selection. Here, shops can use point-of-sale displays to encourage customers to buy accessories. We all know that interactive signage can drastically alter consumption habits, such as purchase frequency, shop loyalty and repeat purchase [20]. Users can easily see digital signage in ad-free environments such as subways, airports and bus terminals. Shoppers can choose to purchase a product via desktop, mobile app or smartphone depending on how easily they can view product images. Customers have more options to choose from thanks to our online shop, which currently sells a digital signage device. However, the consumer appreciates the time and effort saved, as it saves a trip. Instead of waiting for customers to find their way to us, we choose to actively seek them out. Visual signs can serve a dual function as a medium for advertising and e-commerce.

The costs associated with production, installation and transportation are reduced compared to more traditional methods thanks to the interactivity of the content [21]. As long as there was engaging material, there would be buyers. The information displayed on digital billboards can be massively updated in real time via a central server. The decision place and purchase point of the digital online shop is a digital sign, which increases consumer engagement and loyalty. Thanks to the interactive touch screen of the signage, users enjoy chatting with each other [22]. Large retailers can use interactive signage to gain insight into the mindset and shopping habits of their customers. The main advantage of digital signage is its low power consumption. Unlike a traditional PC, which can consume between 80 and 200 W, digital signage typically runs on much less. A touch screen on an interactive sign helps customers find their way around a shop.

3 Methodology

The methodology employed in this study can be classified as quantitative, as statistical procedures were used to meet the research objectives stated by [23].

This section describes the set-up and how the layout of retail shops has changed. The preliminary phase includes the preparations for the selection of virtual shops. In this study, we apply these concepts shop design, digital signage and digital spirit to measure their effect on the online shopping experience of retail companies.

The variables were analyzed in online shops such as: Saga Falabella, Ripley, Linio and Marcadolibre are those offering products from the following main subcategories; Hardware, Clothing, Make-up, Function, IT and Nutrition. Customers who have interacted with the shop and then filled in the questionnaire were 183 in total.

4 Results

4.1 Reliability and Validity Testing

Thirteen questions of the questionnaire became the core of the factor analysis with varimax rotation used to assess construct validity. A proper understanding of the factor loadings has been explained by careful examination of the loading values using realistic importance rules, which revealed, for example, that a loading value of 0.3 indicates a factor of minor importance, 0.4 indicates a factor of major importance, and 0.5 indicates a major factor. Loading variables with values below 0.3 are presumed to have

a negligible impact on the factor and can be safely ignored. The results showed high discriminative validity, with no factor loadings < 0.3 for any of the variables. For all constructs with factor loadings above 0.6. These results also demonstrate the uniqueness and standardization of each system. These results demonstrated that all three factors accurately represent the impact of shop format on consumers.

4.2 ANOVA Test

Analysis of variance (ANOVA) was used to assess between-group mean differences in the study data. When more than two categories are compared, analysis of variance (ANOVA) should be used instead of the t-test. It measures the magnitude of the difference between groups compared to the standard difference. Normality of the data and homogeneity of variance are the two pillars on which ANOVA is based. Levene's and Shapiro-Wilk tests were used to ensure homogeneity and normality, respectively. Levene's test showed that homogeneity of variance was achieved at >0.05 , while the Shapiro-Wilk test generally shows a uniform distribution of results at $p > 0.05$.

Once normality was demonstrated, the data were considered parametric and classes were compared by ANOVA. P-values of less than 0.05 are defined. To ensure a statistically significant difference between tests, Turkish experiments were used in this review. The Turkish test is another name for the truly significant difference (HSD) test. A single value is used for all possible equivalences. The results of the ANOVA test are summarized in Table 1.

Table 1. Regression analyses: Summary of the model.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.624 ^a	.432	.421	.793

^aPredictors: (Constant), Shop design, Digital signage, Digital spirit

A margin of error of less than 5% in the above regression analysis indicates that the hypothesized association holds. The null hypothesis is rejected and the alternative hypothesis is accepted due to significance levels of 0.012 for Store Layout, 0.016 for Digital Signage and 0.017 for Digital Spirit, as shown in Table 2.

$$Y = A + BX1 + BX2 + BX3$$

Shopping Experience = 0.549 Store Layout + 0.544 Digital Signage + 0.518 Digital Spirit.

This means that:

For every unit increase in shop design, the shopping experience is affected by 0.649 units.

For every unit increase in digital signage, the shopping experience will be affected by 0.644 units.

For every unit increase in digital spiral, the shopping experience will be affected by 0.618 units.

Table 2. Regression analyses: Coefficients^a.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.191	.244		8.986	.000
	Shop design	.429	.055	.649	7.779	.0012
	Digital signage	.038	.064	.644	2.590	.0016
	Digital spirit	.015	.057	.618	2.270	.0017

^aDependent Variable: shopping experience

5 Discussion

The aim of the research is to improve the user experience of online shopping by solving the problems posed by the current design. The problems of searching, ordering and shopping are solved using these templates. This shows that the pipeline style was more popular, as it was less complicated to implement. The interface offers options such as “search” and “start”. By clicking on these buttons, users quickly get what they need. Food products are particularly well suited to this layout because of the abundance of low-priced options. For a larger number of items, this format is therefore not practicable due to the lack of a search button. As a last factor, leisure time was evaluated. The carry-over value of the pipeline layout was higher than that of the other designs [24, 25]. The pipe layout is more time consuming than alternative approaches, such as tree structures and guided routing.

Digital layout is superior because of the greater importance placed on fun. The pipeline layout is significant because it offers several customer services options. The above results show that there is no universal layout. In terms of perceived usefulness and entertainment, the pipeline layout is superior to the other layouts, but the tree layout is adequate in the case of basic use [26, 27]. However, it has spent a lot of time along the steering path. This poses a challenge for marketers, as each form has its own advantages.

To learn more about how people interact with digital signage and how the different formats affect their online shopping, we integrated qualitative insights with respondents’ observations in an open-ended questionnaire. Most people are intrigued by the option of wireless touchscreen signage. To drive entertainment sales, a digital signage shop can use QR codes and photos of the actual product. Not having a manual or preview film has been criticized in several responses. Because of its simplicity and variety of options, the shopping channel interface is the most popular among respondents. The majority of shoppers had a positive experience in the fully immersive digital signage shop [28, 29]. Respondents commented negatively on the standards, noting that they found them difficult to implement. The touch screens in the interactive signage shop make it easy to navigate the shop inventory, search by category and find out more information about specific products.

By using clearly laid out menus, the immersive touch screen eliminates user error. Customers can have a good look around the shop thanks to the immersive touch screen in

the sign shop [30]. According to our findings, a consumer using a digital panel will select the tree and pipe configuration. Consequently, the solution is to link all designs together to make digital signage effective. The complex structure and limited menu selections of the recommended routing style prevent their combination. Ultimately, combining these forms makes them easier to use, more exciting and more practical.

6 Conclusions

The research seeks to understand shop design and the impact on the retail consumer. The analysis is mainly a literature review and finds a superior layout of interactive digital signage. Some 183 people participated in this study. Sustainable online shop design includes performance and energy efficiency. When the shop design is user-friendly, clear and efficient, productivity increases. Fewer visual elements, dark colours and high contrasts improve energy quality. More pictures and low contrast would use fewer resources. Internet retailers based on digital signage use “green ingredients” in their visual design to promote environmental sustainability. We use the colour green to show how great retail design would encourage sustainable growth in different shop layouts. Digital signage can automatically dim or turn off when no one is using it, to save energy. Other effects include making shopping easier, using renewable items, clarifying product features and emphasizing recycled components. This study has several implications for management.

This study demonstrates that shop layout design is a key digital signage web distributor. The structure of a shop provides customers with information for decision making. Shop closing is decided. Designers and developers must ensure customer productivity while developing the shop layout. Shop managers can collaborate with designers and developers to improve interactive signage. The ease, perceived usefulness and enjoyment of the digital signage shop affect consumer shopping intensity. Shop styles could contain “search”, “home” and “back” to enhance choice. These shop selections could make the shop design more user-friendly. The use of the smartphone is another result of this research. The user can use the shop’s payment program to capture the QR code of a product from the digital display. Orders are shipped to the customer’s home after payment.

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Grasping Society 5.0: Keys for Ameliorate Human Life

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Abstract. Society 5.0 represents the latest stage in the evolution of human civilization, characterized by the seamless integration of technology, digitalization, and human existence. This paper delves into the essential components and strategies required to grasp the full potential of Society 5.0 and its profound impact on improving human life. By exploring the convergence of cutting-edge technologies, such as artificial intelligence, blockchain, and the Internet of Things, we uncover the transformative power of these innovations in addressing critical societal challenges. Through an interdisciplinary approach, we examine how Society 5.0 fosters sustainable development, enhances the quality of life, and promotes economic growth while considering the ethical implications and potential risks associated with these advancements. Moreover, this paper identifies the pivotal role of education, policy frameworks, and inclusive governance in navigating the complexities of this new societal paradigm. By creating insights from various fields, this research offers a comprehensive overview of the keys to ameliorating human life within the context of Society 5.0. It underscores the importance of fostering collaboration between governments, industries, and individuals to harness the full potential of emerging technologies and create a more equitable and prosperous future for all.

Keywords: Society 5.0 · Industrial transformation · Information of Technology · Sustainable Development Goals (SDGs) · Artificial Intelligence

1 Introduction

The Japanese cabinet has proposed an idea called “Society 5.0” that encapsulates the initiatives being taken to build a new society. Just after the previous four “societies” the hunting and gathering Society 1.0, the farming and agricultural Society 2.0, the manufacturing and business society 3.0, and the technological society 4.0 comes society 5.0. By utilizing evolving technology (including artificial intelligence, robotics, and Information of Technology,) and several sorts of societal facts, Society 5.0 objectives are to raise the business and discourse societal concerns. Big Data gathered by Information Technology would be transformed by Artificial Intelligence into a new kind of knowledge and spread to every nook and cranny of society. As we transition into Society 5.0, everybody’s life will get better, and become more pleasant and healthy since they are only going to be provided with the goods and services they require when they need them.

By utilizing below distinctive characteristics, Society will go in resolving societal issues such as an aging population, a decline in the population of the workforce, and energy and sustainability concerns. By increasing production and establishing new markets, we shall achieve a prosperous economic civilization. Society will play a vital part in introducing the new Societies 5.0 paradigm to the rest of the world in this way. These goals will help create a society that is sustainable and in which everyone can live happily and safely. With the help of Society 5.0, the Sustainable Development Goals (SDGs) set forth by the UN will be achieved. The attempts to address social glitches all across the globe will be spearheaded by Society 5.0, a concept of a modern society A human-centered strategy where everyone can live joyfully and vitally is what Society 5.0 aims to achieve. It aims to accomplish this by incorporating cutting-edge technologies into a variety of sectors and facets of society and by fostering innovation to create new value (Fig. 1).

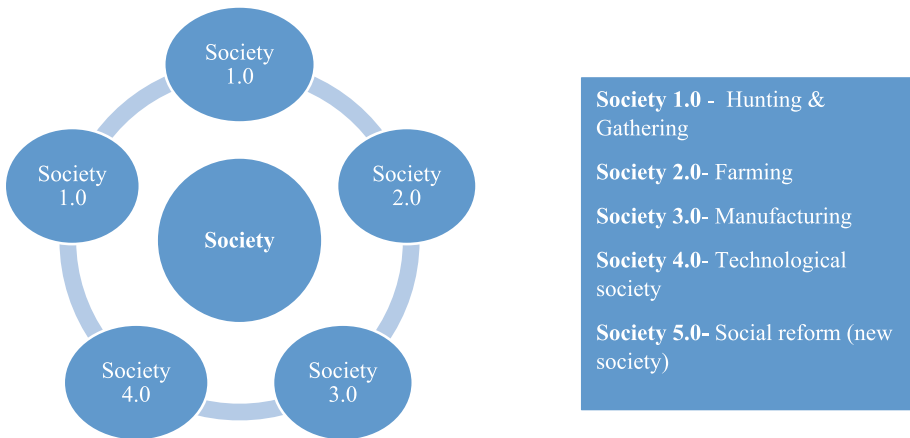


Fig. 1. Society 5.0 Reform. **Source:** Prepared based on materials from the Japan Business Federation (Keidanren)

2 Review of Literature

A hypothetical future civilization called Society 5.0 integrates various technologies, including Artificial Intelligence (AI), Big data, the Internet of Things (IoT), and robotics, amongst others. Here is a literature review of Society 5.0: A Human-Centered Society for the 4th Industrial Revolution by the Japanese Government (2016) This report by the Japanese Government provides a comprehensive overview of Society 5.0 and its potential impacts. It highlights the importance of a human-centered approach and the need to address ethical and social considerations. A Literature Review” by Muhammad Amir Hussain and colleagues (2021) this literature review provides an overview of the key concepts and themes related to Society 5.0. It highlights the potential impacts of Society 5.0 in various fields, including healthcare, education, and manufacturing. “Towards Society

5.0: A New Social Contract for a Fourth Industrial Revolution” by Klaus Schwab and Thierry Malleret (2020) This book by the founder of the World Economic Forum and a business strategist provides a vision for Society 5.0 and the 4th Industrial Revolution. It discusses the need for a new social contract and a more inclusive and sustainable approach. “Artificial Intelligence and Society 5.0” by Hiroaki Kitano and colleagues (2017) This paper discusses the role of AI in Society 5.0 and its potential impacts. It highlights the importance of ethical considerations and the need for a human-centered approach. “Society 5.0: An Emerging Super Smart Society and Its Application to Healthcare” by Hiroyuki Sakai and colleagues (2018) this article discusses the potential applications of Society 5.0 in healthcare, including personalized medicine, telemedicine, and health monitoring. It highlights the potential benefits and challenges of these developments. The article looks at how corporate social obligation is understood and used in contemporary corporations. The public’s perception of companies’ behavior and their benefits to current societal sustainable growth are continuously deteriorating as a result of media stories on “environmental issues,” “risky technology progress,” and “intentional torts of community relationships” (Wang et al., 2016; Kish-Gephart et al., 2019). Since the 1960s, when the concept of a group’s social responsibility started to gain more traction, research about a group’s obligation to address environmental, societal, and economic problems has increased (Carroll, 1999; Dahlsrud, 2008; Wang et al., 2016). Ethical considerations surrounding the integration of technology into society are thoroughly examined. Works by ethicists and scholars in the field of responsible technology, like Sherry Turkle’s “Reclaiming Conversation” and Nick Bostrom’s “Superintelligence,” are referenced to shed light on the ethical dilemmas and social challenges posed by Society 5.0. (Kaku, Michio., 2018). Futurists and technology visionaries, including Ray Kurzweil and Michio Kaku, provide speculative insights into the trajectory of technological advancements and their potential impact on human life. Their works serve as a backdrop for discussing the possibilities and challenges of a Society 5.0 future (Kaku, Michio., 2018).

Joseph, A. (2023) the research intends to investigate the utilization of the Metaverse concept in contributing to the attainment of Sustainable Development Goals. Mathew et al., (2023) revealed that the “Metaverse” is a new tech concept seen as the next step in the internet’s evolution. It’s an immersive 3D virtual world where people can live beyond the physical realm. This technology can be used to address global issues and work on Sustainable Development Goals (SDGs).

Patra and Roy (2023) study provides insights into the application of Industry 4.0 for enhancing the sustainability of cutting-edge technology firms. The study’s findings support the assertion that technologies such as computer vision, the Internet of Things, robotics, and artificial intelligence contribute to improved operational and managerial performance in firms. These findings also offer guidance to firms that have yet to adopt these technologies.

Overall, the literature on Society 5.0 highlights its potential to bring about significant improvements in various fields but also emphasizes the importance of ethical considerations and a human-centered approach.

3 Present Study Theoretical Framework: Society 5.0

In Society 5.0, gaps in location, age, gender, and culture will be filled by the invention of new riches, enabling the provision of goods and services that are exactly adapted to the requirements of various people as well as to social demands. It will be feasible to create a community in this manner that both can encourage growth in the economy and find solutions for social issues. However creating such a community won't be easy, and Japan plans to meet these challenges head-on to be the first nation in the world to offer a template for future society while also tackling serious problems.

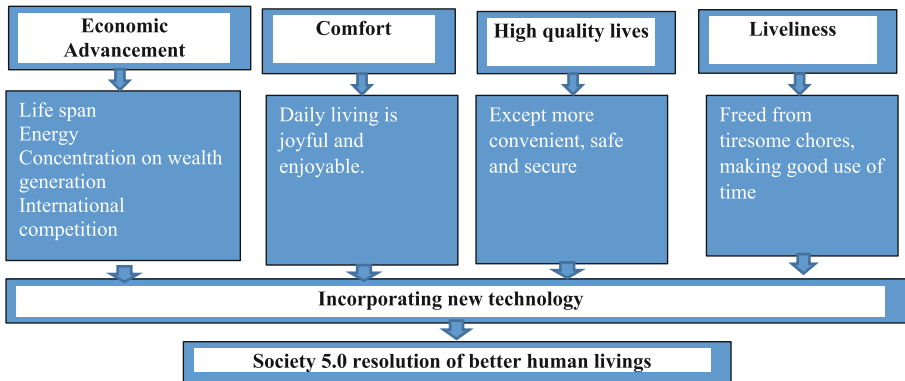


Fig. 2. Grasping Society 5.0: Keys for Ameliorate Human Life. **Source:** Prepared based on extensive review of literature

Figure 2, essentially serves as a visual representation of how the Society 5.0 concept can be harnessed to address societal challenges and enhance the well-being of individuals and communities.

4 Functions of Society 5.0

In society 5.0, computer-generated space (cyberspace) and real space merge to a great extent (physical space). People in the information age (Society 4.0) used the Internet in the past to find, collect, and analyze information and data from cloud services (cyberspace databases). A massive amount of data collected by sensors in the physical environment is saved online in Society 5.0. This vast amount of data is analyzed by artificial intelligence (AI) in cyberspace, and the results of the analysis are communicated to people in the real world in several ways. In the past, collecting data through a network and having it examined by people was standard procedure in the information age. Nevertheless, in Society 5.0, everything is interconnected in cyber, and the best outcomes produced by AI that are more advanced than humans are recycled directly into the actual world. Industry and society both benefit from this process in ways that were not before feasible. Figure 3 presents functions of society 5.0.

Present Technological Society 4.0  **Society 5.0**

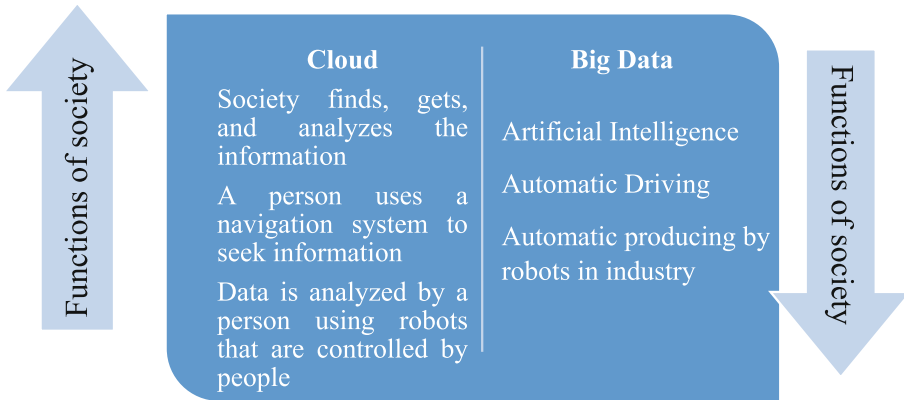


Fig. 3. Functions of Society 5.0. **Source:** <https://doi.org/10.1007/s11356-023-25543-2>

5 Attaining Society 5.0

Cross-sectional learning and information exchange were insufficient in the information revolution (Society 4.0), and interaction was challenging. The difficulty of extracting important information from the abundance of information and analyzing it was stressful, and the range of work and activity was constrained by age and varied levels of skill due to a limitation to the individuals can do. Additionally, Several restrictions on issues including a declining birthrate, an aging population, and regional depopulation made it difficult to respond adequately. Society 5.0 will become a progressive society that breaks free from the existing sense of stagnation through social change (innovation). One in which all of its citizens respect one another across ages, and one in which every person is valued equally.

6 Statement of the Problem

The study seeks to address various societal challenges such as an aging population, healthcare, education, and the environment. Society 5.0 aims to do this by leveraging advanced technologies and creating solutions that are people-centered and sustainable. The need for Society 5.0 arises from the desire to create a better future for all, address societal challenges, harness the power of technology, and create sustainable and inclusive societies.

7 Objectives

- To understand Society 5.0 and its responsibility for ameliorating human life through the advancement of technological changes in society.

- To identify the various ways to attain Society 5.0 and study its functions of society 5.0
- To develop the model for Society 5.0 and its responsibility for ameliorating human life
- To find out and suggest the future scope of Society 5.0

8 Hypothesis

H₀: Economic Advancement, Comfort, High-Quality Lives, Liveliness, and Incorporating new technology have no significant influence on Society 5.0 resolution of better human living.

H₁: Economic Advancement, Comfort, High-quality Lives, Liveliness, and Incorporating new technology have significant influence on Society 5.0 resolution of better human living.

9 Methodology

This study uses a quantitative survey design to investigate the connection between Society 5.0 resolution and better social living. The study collects the data from a sample of advanced technology user (lead user) using a self-administered questionnaire, and analyze the data using multiple regression and mediation analysis. The study ensures validity and reliability by using established measures and standardized procedures. The longitudinal form of the study and the findings' limited generalizability are among its drawbacks.

10 Result and Discussion

Table 1. Reliability result

Items	Results
Economic Advancement	7.21
Comfort	8.10
High-quality Lives	8.25
Liveliness	8.41
Incorporating new technology	8.35
Society 5.0 resolution of better human living	8.21

Source: Primary Data

Table 1 shows that, Reliability analysis permits the investigator to learn the possessions of weighing scales and the variables that comprise the scales. If the reliability value is more than 0.7. This shows that the enhanced model is generally accurate and suitable for analysis.

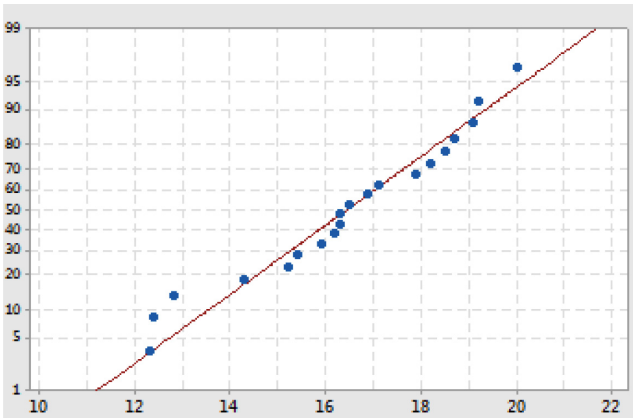
Table 2. Basic statistics of given variables

Items	Mean	SD	Min	Max
Economic Advancement	0.39	1.01	0	5
Comfort	0.41	2.09	0	4
High-quality Lives	1.61	1.39	0	5
Liveliness	2.32	0.10	0	4
Incorporating new technology	1.61	1.42	0	3
Society 5.0 resolution of better human living	1.72	1.4	0	3

Source: Primary Data

Table 2 reveals that, on average, respondents rated Liveliness the highest, followed by Society 5.0 resolution of better human living, High-quality Lives, Incorporating new technology, Economic Advancement, and Comfort. However, it’s important to note that there is significant variability in the responses for most of these items, indicating diverse opinions among the respondents.

Normality of Data



Mean	3.75
St Dev	17.87
AD	0.257
P-Value	0.678

Graph 1. Normality. **Source:** Primary Data

Graph 1 shows that, the default hypothesis for these findings is that the data have a normal distribution. The decision to fail to reject the H_0 null hypothesis is made since the p-value is higher than the implication level of 0.05 at 0.678, which is greater than 0.05. The data in this probability plot create a roughly straight line that follows the line. The data seem to suit the normal distribution well.

Table 3 display the correlation and rank correlation of study variables, a high degree of positive correlation exists between the choice of comfort factors and the incorporation of

Table 3. Correlation and Rank Correlation of study variables

Correlation Analysis	Economic Advancement	Comfort	High-Quality Lives	Liveliness	Incorporating new technology	Society 5.0 resolution of better human living
Economic Advancement	1					
Comfort	0.1812	1				
High-Quality Lives	0.1923	0.3227	1			
Liveliness	0.0921	0.2250	0.3303	1		
Incorporating new technology	0.7330	0.8844	0.3150	0.0848	1	
Society 5.0 resolution of better human living	0.7888	0.3757	0.0859	0.3286	0.2442	1

Source: Primary Data

new technology (0.8844). The second high degree of positive correlation exists between Society 5.0 resolution of better human living and economic development (0.7888). People are ready to opt for comfort so they choose more technology involvement in daily living. Economic advancement is happening and that leading society 5.0 and the resolution of better human living.

Table 4. Ranking and Score

Items	Ranks	Overall Score
Economic Advancement	3	480
Comfort	1	523
High-quality Lives	2	515
Liveliness	5	311
Incorporating new technology	4	410
Society 5.0 resolution of better human living	6	290

Source: Primary Data

Table 4 revealed that, the interpretation of these rankings and scores indicates that comfort and high-quality lives are the most valued aspects, followed by economic

advancement and the integration of new technology. Liveliness and the concept of “Society 5.0 resolution of better human living” are less prioritized in this context.

SEM Model Index Value Summary

The SEM index values, CMIN/df, CFI, GFI, and AGFI, are commonly used in structural equation modeling (SEM) to assess the goodness-of-fit of a statistical model, such as a path model or a latent variable model. Let's elaborate on what these values mean in the context of Grasping Society 5.0. CMIN/df (Chi-Square/degrees of freedom):

This index assesses the goodness-of-fit of the model by comparing the chi-square value (CMIN) with the degrees of freedom (df). A better fit is indicated by a CMIN/df value that is lower (nearer to 1) between the model and the experiential data. In the case of Grasping Society 5.0, a CMIN/df value of 1.14 suggests that the model may have an acceptable fit, as it is slightly higher than the ideal value of 1. However, further evaluation of other fit indices is needed to obtain a more accurate assessment of model fit.

Comparative Fit Index (CFI): This indexing method is the upgrading in the fit of the model relative to a baseline model, with standards extending from 0 to 1. A CFI value close to 1 (e.g., 0.9) indicates a good fit, with values above 0.90 generally measured as acceptable. Therefore, a CFI value of 0.9 suggests that the model has a relatively good fit in the context of Grasping Society 5.0.

GFI (Goodness-of-Fit Index): This index assesses the proportion of variance in the observed data that is explained by the model, with values ranging from 0 to 1. A GFI value close to 1 (e.g., 0.9) indicates a good fit, with values above 0.90 generally considered acceptable. Therefore, a GFI value of 0.9 suggests that the model has a relatively good fit in the context of Grasping Society 5.0.

The adjusted goodness-of-fit index (AGFI), which ranges from 0 to 1, changes the GFI to consider the number of anticipated parameters. An AGFI score close to 1 (for instance, 0.9) indicates a good match, with outcomes above 0.90 often being accepted. Therefore, an AGFI value of 0.9 suggests that the model has a relatively good fit in the context of Grasping Society 5.0.

Overall, based on the provided SEM index values, the model assessing Grasping Society 5.0 has an acceptable to good fit. However, it is important to consider these indices in conjunction with other factors, such as the sample size, model complexity, and theoretical context, to make a comprehensive evaluation of the model's goodness of fit and validity.

11 Conclusion

The notion called “Society 5.0” imagines integrating cutting-edge technology into society to build a more equitable and environmentally friendly future. It aims to overcome the challenges of previous industrial revolutions by placing the well-being of individuals at the center of technological progress. The Society 5.0 model promotes the habit of cutting-edge pieces of knowledge such as artificial intelligence, robotics, and the Internet of Things to address societal challenges and improve the quality of life. It also emphasizes the importance of ethical considerations in technology development, including transparency, fairness, and accountability. One of the key features of Society 5.0 is its

focus on collaboration between government, industry, and academia to drive innovation and address social issues. By working together, these sectors can create a more inclusive and sustainable society that benefits everyone. While Society 5.0 holds great promise for the future, it also presents challenges and risks. These include concerns about privacy, data security, and the potential for technology to exacerbate existing social inequalities. Addressing these challenges will require careful consideration and proactive measures to ensure that technology is used responsibly and ethically. Overall, Society 5.0 represents an ambitious vision for the future of society and one that holds the potential to discuss some of the world's most persistent challenges. However, realizing this vision will require a concerted effort from all stakeholders to ensure that technology is used to promote the greater good of society. The future scope of Society 5.0 is vast, and it has the possibility to carry about momentous improvements in various fields, leading to a more efficient, sustainable, and inclusive society. However, it is important to ensure that these developments are guided by ethical considerations and prioritize the well-being of all members of society.

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Exploring Green Human Resource Management to Achieve Sustainability in the Banking Industry of Bangladesh

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Abstract. The bank's success relies heavily on its dynamic, skilled, capable workforce. Implementing effective human resource management practices ensures a motivated, skilled workforce to achieve the bank's goals. Green human resource management (GHRM) involves integrating environmentally sustainable practices into all aspects of HR management. This encompasses policies, practices, and systems that encourage employees to use eco-friendly and sustainable resources to benefit individuals, society, the environment, and the business. This research aims to assess the importance of GHRM policies and the impact of sustainable HR initiatives on corporate performance. Social identity theory guided this study, which employed quantitative research using a closed-ended questionnaire to collect data from 210 employees in various banks in Bangladesh. This cross-sectional study experimentally examined hypotheses formulated based on constructive epistemology. The five-point Likert scale questionnaire covered various HRM aspects, such as recruitment, compensation, job security, career development, training, management approach, job design, rewards, motivation, and work environment. The study employed regression analysis, and results showed a positive and significant correlation between HRM practices, including training, fair compensation, career advancement opportunities, job stability, performance evaluation, and the development of trust. This study offers valuable insights for all stakeholders interested in understanding current HRM practices in Bangladesh.

Keywords: GHRM · Sustainable Development · Corporate Performance · Human Resources · Employment Stability

1 Introduction

Green HRM is an eco-friendly HR program that increases employee engagement, improves competencies, and reduces costs. It assists businesses in identifying cost-cutting alternatives that do not require losing elite personnel. It calls for implementing environmentally friendly HR initiatives that result in increased employee engagement and retention, which in turn helps organizations reduce employee carbon footprints by adopting practices such as carpooling, teleconferencing, virtual interviews, recycling, telecommuting, online training, and energy-efficient office spaces, among others (Ouyang et al., 2019).

Bangladesh has 61 scheduled banks that operate under the complete direction and supervision of Bangladesh Bank, which is authorized under the Bangladesh Bank Order, 1972 and the Bank Company Act, 1991. There are 6 State Owned Commercial Banks (SOCBs) that the Government of Bangladesh entirely or partially owns, as well as three specialist banks founded for particular purposes such as agricultural or industrial development. The government of Bangladesh also owns all or most of these banks. There are 43 private commercial banks, mostly owned by individuals or private groups. There are now 33 conventional PCBs operating in the industry. They perform the banking functions in a conventional fashion, i.e., interest-based operations. There are 10 Shariah-based Private Commercial Banks in Bangladesh, and they execute banking activities according to Islami Shariah-based principles, i.e., Profit-Loss Sharing (PLS) mode (Bangladesh Bank, n.d.).

Green Human Resource Management can improve both employee wellness and corporate performance. Green human resources management contributes to improving both the financial and environmental performance of the company. Similarly, by enhancing the working environment and satisfying the needs of a workforce that is becoming more ecologically aware, these activities improve the well-being of people in the workplace (Adubor et al., 2022a).

Promoting “green” organizations is a strategy for sustainable human resource management (HRM), effectively addressing environmental performance issues. Adopting new ecological techniques can be accomplished by utilizing an organization’s human capital and innovative strategies (Chams et al., 2019).

Since the 1990s, more companies, organizations, corporations, and enterprises have become conscious of environmental management. Companies take voluntary steps to minimize waste, pollution, and environmentally dangerous activities because they think doing so will add value to their company. Their efforts to create products that use less polluting materials, packaging, and energy are examples of how they began establishing environmental management systems and strategies. Several studies concentrate on managing human resources and human capital concerning sustainability and environmental challenges. Human resource management and development are crucial to creating an environmental culture in any organization (Zaidi & Jamshed, 2021).

According to Beard and Rees, 2000 organizations must train their staff members to accept the management structure and process to generate new ideas, develop innovations, and foster creativity. Many studies are concentrating their studies on green human resources. The scholar offers several definitions of GHRM. According to Prasad,

2013 GHRM is a component of green management, comprising a company's environmental management philosophy, policies, and practices. The term "green resource and human resource management" (GRHM) refers to a collection of activities that are connected to assisting in the achievement of environmental management that will reduce an organization's carbon footprint and earn carbon credits by making changes to HR practices, including hiring and onboarding, performance management, training, pay and benefits as well as managing incentives.

To boost employee morale and contentment with the environment, GHRM uses human resource management strategies to urge companies, corporations, and enterprises to promote environmentalism. As a result, GHRM can develop more effective processes, lower costs, and higher levels of employee engagement and retention, resulting in initiatives that lessen employees' carbon footprint. These initiatives include electronic filing, carpooling, teleconferencing, virtual interviews, recycling, online training, and energy-efficient office space. The guiding concepts include employee empowerment, employee training, employee collaboration, incentives and pay, hiring, training and development, and management environment training. The GRHM practice is crucial for boosting employee morale, which may assist the business in achieving enormous benefits for both the person and the organization (Usman & Mat, 2021).

An organization's human resources department is expected to play an essential role in designing the organization's sustainability. Many writers, notably in human resource management, have stated that the usefulness and success of any management innovation and strategic tools depend on the quality and ease of use of their human resources. Green HRM refers to using every employee to promote sustainability, boost employee responsiveness, and commit to sustainability concerns. It entails implementing eco-friendly measures that result in increased efficiency. Green HR practices include reducing paperwork and concentrating on sustainable green practices (Ali et al., 2021).

There are still gaps in Bangladeshi organizations' human resource management abilities, such as low worker productivity, low management ratios, and outmoded management ideologies. It is necessary to do further study on the relationship between employee commitment and human resource procedures (Luna., 2019).

In Bangladesh, HRM applications are considered beneficial to all businesses. Nowadays, most organizations in Bangladesh have a human resources department. Previously, the HR function in Bangladeshi organizations mainly focused on employees (Anjum Nishat and Mahfuja Zahan, 2021).

Considering the present situation, businesses must also find ways to address the need to reduce their environmental imprint and financial constraints. In order to succeed in the corporate world and advance shareholder profit, organizations must increasingly concentrate on social and environmental factors in addition to economic and financial ones. The effective execution of these long-term business goals inside an organization demands strong leadership and a systematic approach. The sustainability problem is quickly raising the priorities for corporate executives as knowledge of integrating "green" into corporate strategy spreads (Das & Dash, 2022).

2 Objective of Study

This research focuses on decisive HR functional areas such as recruitment and selection, training and development, performance management, compensation and benefits, green HR practices, and organizational sustainability in organizations and their employees. This research's primary objective is to determine the significance of green HRM policies and the impact of sustainable human resources initiatives on corporate performance. This study aimed to fulfill the following objectives:

RO₁. This article examines the impact of green human resource management (HRM) practices on industry sustainability in Bangladesh.

RO₂. Impact of sustainable human resource initiatives on corporate performance.

3 Theoretical Background

Working with employees who support the company's green initiatives may assist other employees in minimizing social uncertainty in their professional interactions. We do this by drawing on social identity theory. According to the Social Identity Theory (SIT), individuals create a positive sense of who they are by first categorizing themselves into groups and then accepting their membership in that specific group (Tajfel & Turner, 1979). Additionally, affiliation with positive pictures strengthens this sense of self (Khan et al., 2022).

When members identify with the group, they know shared views and behaviors. SIT is often used in organizational studies to explain employee identification in the social context of a company (Kim et al., 2019). Employees support corporate principles, enjoy organizational activities, and are devoted to the organization as members (Ashforth & Mael, 1989). In this way, organizational identity helps employees become more committed to a company, particularly if that company positively impacts their behavior (O'Reilly & Chatman, 1986).

4 Green HRM and Organizational Sustainability

Green HRM is related to the organizational capabilities and capacity to pull in, prepare, and keep up representatives utilizing eco-friendly tools. These hone empower organizations to improve their social awareness of the environment and lead them to achieve maintainability. The process has several dimensions centered on the capacity of enterprises to implement environmentally friendly human resource practices that have a notable impact on the well-being of workers, the overall performance of organizations, and the ecological sustainability of the country. Human capital that is equipped with environmentally friendly practices demonstrates a higher level of proficiency in several areas, such as work sharing, teleconferencing, online interviews, electronic filing, recycling, carbon emissions reduction, waste management, green buying, and virtual training (Arulrajah et al., 2016).

Employees are one of the most critical aspects of the growth and maintenance of a business or organization. With proper direction and motivation, the individual may quickly realize the organization's or business' goal. Green human resource management is gaining popularity among corporations (Fathussalam et al., 2021).

Increasing employee responsiveness and commitment, often known as GHRM, is utilized to aid sustainability through using employees. Authors, particularly in HRM, concurred that GHRM helps firms save costs, raise employee awareness and engagement, and is ecologically friendly, e.g., car sharing, job sharing, flexible working hours, teleconferencing, online training, etc. Human resource procedures, recruitment, selection, performance assessment, training, and awards are all components of GHRM, but they are also tied to environmental objectives, business culture, collaboration, and employee empowerment (Das & Dash, 2022).

5 Green Training and Development

Employees are encouraged to pay attention to environmental concerns by participating in green training programs. For environmental objectives to be met, green training is essential. Improving staff awareness, competence, and understanding may make environmental activities safer and more ecologically friendly. Employees who have received green training are more aware of the need to safeguard the environment and, thus, are more knowledgeable about how to govern the environment. High-quality training, the availability of training opportunities, assessing training, and its applicability will be revealed as aspects of green recruitment. Employee training substantially impacts organizational performance (Adubor et al., 2022).

In recent years, training and development of human resources in private sector firms has gone from being disregarded to being well-organized. The private sector of Bangladesh is now in a stronger position than the state sector in terms of training and development. Private businesses interested in making a profit are concerned about increasing worker productivity; thus, they provide substantial training and development opportunities in response to employee demands. Most training courses concentrate on developing IT knowledge, capability, and leadership skills, among other things (Nishat & Zahan, 2021).

6 Green Recruitment and Selection

Recruiting employees is one of the most essential HRM responsibilities because it can change corporate culture (Guerci et al., 2015). A well-planned recruitment strategy can help a company foster a culture conducive to achieving its goals. The main difference between recruitment and selection expressions must be clarified as they are often used in the same context. On the other hand, selection is deciding whether to hire each candidate for a job (Gomez-Mejia et al., 2012). Conversely, recruitment creates a pool of qualified candidates (in the right place and at the right time) for a given position. Employers hire people with the necessary abilities through employee recruitment and selection. This process involves identifying the qualities needed to succeed based on a job analysis and comparing those qualities to the candidate's talents (Adjei-Bamfo et al., 2020).

The organization's Green HR initiatives for hiring and selection procedures should continue aligning with other HR duties, including orientation, training, and development activities. Organizational procedures with the GHRM have a significant relationship to staff members' understanding of eco-friendly efforts and improving their skill sets regarding eco-literacy and data collecting of their relevant waste materials (Azad et al., 2022).

7 Relationships and Employee Engagement

Employee relations is about the structure and psychological contract of the employment relationship. Employee relations encompasses a broader range of topics than labor relations, such as collective bargaining, collective bargaining agreements, and dispute resolution, which primarily involve interactions between management, trade union representatives, and staff (Armstrong & Taylor, 2014).

Employee relations are significant in developing organizational safety, group advocacy, and the symmetry of knowledge and power. The two most important and readily discernible forms are the scope of a collective agreement and the size of a trade union's organization. Additionally, our present strategy considers the possibility of communal legitimacy. Trade unions participate in various activities in addition to these; thus, the rate and direction of change in their power to influence are crucial. In addition to trade unions, work/jobholder counsels might provide insight into how enterprises run inside (Poór et al., 2020).

Creating a sense of connection between the employee and the company is known as employee engagement. Employee retention, customer satisfaction, income, and profitability are all impacted by employee engagement. Building positive employee connections and engagement is crucial for a company. The Bangladeshi banking industry is passionate about sustaining positive worker engagement and relationships. If a problem emerges, banks take it seriously and work to resolve it as quickly as possible. Positive employee relations and engagement contribute to accomplishing an organization's strategic goals (RA Shumi 2021).

8 Conceptual Framework

Figure 1 shows the conceptual framework of this study, which includes all hypotheses.

Incorporating environmentally friendly human resources practices into an organization's recruiting and selection procedure must remain consistent with other HR practices—becoming oriented, being trained, and working on personal growth objectives. The GHRM's organizational practices have a significant connection to employers' knowledge of environmentally friendly efforts, the enhancement of employees' skill sets regarding Eco literacy, and the gathering of data on their concerned waste material.

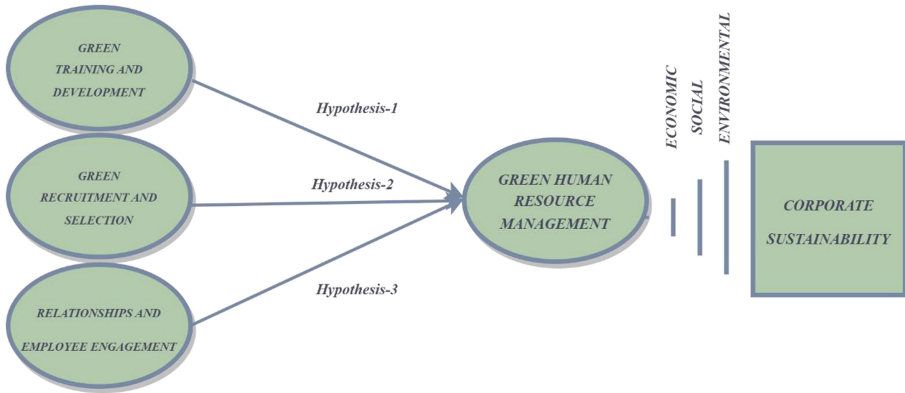


Fig. 1. Conceptual Framework

9 Hypothesis Development

A research hypothesis is developed when researchers estimate how a study or experiment will turn out. The statement, which serves as the ultimate objective of any research, must form the cornerstone of every worthwhile experimental strategy. The hypothesis may be created in several ways, but it is often the outcome of an inductive reasoning process wherein data from observations is used to create a theory. Next, scientists develop a tested, falsifiable, realistic hypothesis using various logical techniques. Creating a hypothesis is the first step in the scientific process, in which observations and experiments may then be evaluated. Instead of proving the original idea, the scientist seeks to disprove it (Mourougan & Sethuraman, 2017).

Based on the literature, the hypothesis would be as follows:

H1: Green training and development have a significant influence on corporate sustainability.

H2: Green recruitment and selection have a significant influence on corporate sustainability.

H3: Relationship and corporate engagement have a significant influence on corporate sustainability.

A multivariate statistical approach, namely the Structural Equation Model (SEM), was used to examine the proposed hypotheses.

10 Data Source and Methodology

The method used was quantitative research, which used a questionnaire, and data were collected from 210 employees in the different banking industries in the capital city of Dhaka, Bangladesh. Data collection for this study primarily involved using a questionnaire, which utilized a five-point Likert scale and consisted of 20 questions aimed at assessing both dependent and independent variables. Structural questionnaires were distributed via mail to gather information from the financial industry in the capital city of Bangladesh. In cases where respondents did not respond within the expected timeframe

after receiving the questionnaires, follow-up was conducted through telephonic interviews. 350 possible respondents were chosen at random from the banking industry of Bangladesh. There were 210 responses, which is 60% of the total.

11 Result and Analysis

11.1 Demographic Descriptive Analysis

The researcher carried out the research, and the findings are provided in Table 1 below; female respondents make up 42.9% of all respondents, while male respondents make up 57.1%, implying that female respondents are fewer than male respondents. In the Occupation section, Table 2 shows that 74.8% of respondents are private bank employees, and 25.2% are government bank employees.

Table 1. Gender

Gender of Respondents					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MALE	120	57.1	57.1	57.1
	FEMALE	90	42.9	42.9	100.0
	Total	210	100.0	100.0	

Table 2. Job Sector

Job Sector					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Government Bank	53	25.2	25.2	25.2
	Private Bank	157	74.8	74.8	100.0
	Total	210	100.0	100.0	

11.2 Reliability Analysis

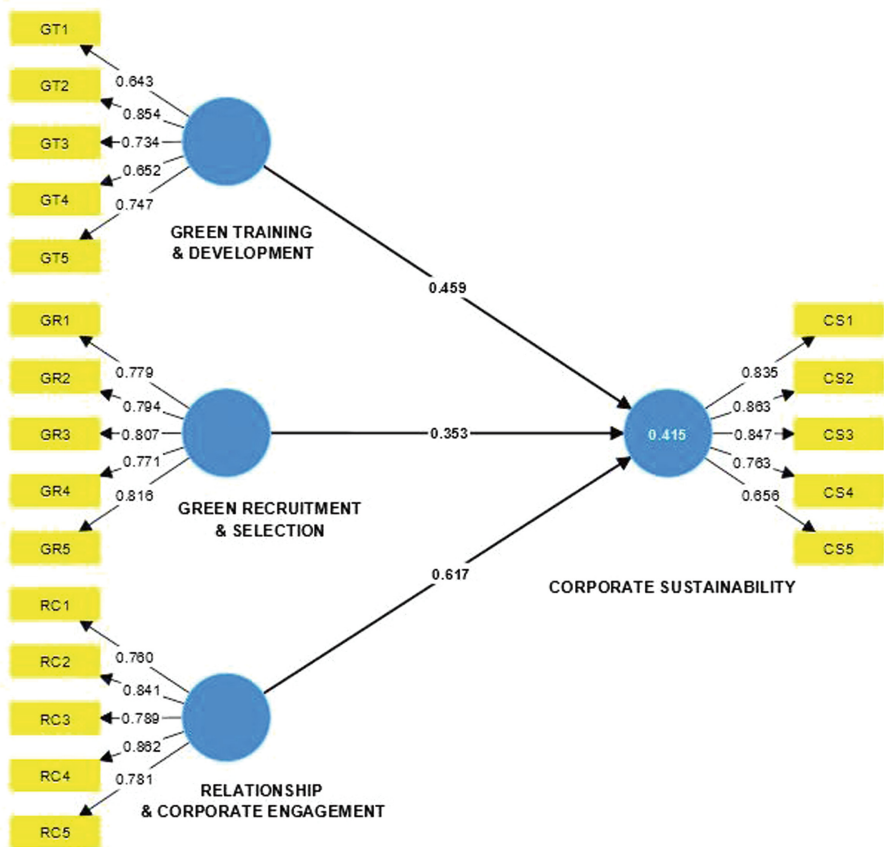
Reliability values for each of the constructs used in this study are shown in Table 3. As we can see from this table, our study constructs Cronbach's alpha values greater than 0.7. This means that our data is very reliable. The speculative model was put to the test with the SMART-PLS 4. One of the SEM software packages that researchers employ the most is SMART-PLS. Figure 2 displays the measurement model.

Table 3. Cronbach's alpha

	No. of items	Cronbach's alpha
Corporate Sustainability	5	0.856
Green Recruitment & Selection	5	0.854
Green Training & Development	5	0.779
Relationship & Corporate Engagement	5	0.867

12 Hypothesis Test

The strength of the Rule of 'R' is categorized as follows: it is classified as very weak when its value ranges from 0.0 to 0.20, weak when its value ranges from 0.20 to 0.40, moderate when its value ranges from 0.40 to 0.60, strong when its value ranges from 0.60 to 0.80, and very strong when its value exceeds 0.80 (Hossain, 2022).

**Fig. 2.** Measurement Model

The P value is a statistical measure that quantifies the possibility of receiving a result equal to or more extreme than the observed outcome under the null hypothesis of no impact or difference. In this context, the variable denoted by “P” represents the concept of probability, which quantifies the probability of an observed disparity between groups being attributed to random variation. The T-value quantifies the magnitude of the discrepancy with the dispersion seen in the sample data. In other terms, T denotes the computed contrast expressed in standard error units. As the size of T increases, the strength of evidence against the null hypothesis also increases (Russo & Stol, 2021). Table 4 shows the path coefficients.

Table 4. Path coefficients

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (IO/STDEVI)	P values
GREEN RECRUITMENT & SELECTION -> CSCORPORATE SUSTAINABILITY	-0.063	-0.060	0.067	0.947	0.344
GREEN TRAINING & DEVELOPMENT -> CSCORPORATE SUSTAINABILITY	0.229	0.234	0.076	3.005	0.003
RELATIONSHIP & CORPORATE ENGAGEMENT > CSCORPORATE SUSTAINABILITY	0.539	0.537	0.067	7.991	0.000

12.1 Hypothesis-1 (H₁)

There exists a significant relationship between green training-development and corporate sustainability.

Table 5. Regression Analysis (GT)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.571 ^a	.326	.286	.23

^aPredictors: (Constant), Green Training and Development

Table 5 demonstrates a moderate association between green training and development and corporate sustainability with R = 0.571. The R square is 0.326, or 32.6%. This shows that Green Training and Development explains 32.6% of corporate sustainability.

In this study, the first hypothesis is that green training and development significantly influences corporate sustainability in the financial industry in Bangladesh. The Smart

PLS analysis report shows in Table 4 that the 'P' value is 0.003 and the 'T' value is 3.005. When the p-value is less than 0.05 and the T-value is more significant than 1.96, the hypothesis is supported and is significant.

12.2 Hypothesis-2 (H₂)

Green recruitment and selection have a significant influence on corporate sustainability.

Table 6. Regression Analysis (GR)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.337 ^a	.114	.109	.83693

^aPredictors: (Constant), Green Recruitment and Selection

Table 6 demonstrates a moderate association between green training and development and corporate sustainability with $R = 0.337$. The R square is 0.114, or 11.4%. This shows that Green Recruitment and Selection is 11.4% of corporate sustainability.

In this study, the second hypothesis is that Green Recruitment and Selection significantly refused with corporate sustainability in the financial industry in Bangladesh. The Smart PLS analysis report shows in Table 4 that the 'P' value is 0.344 and the 'T' value is 0.947. The hypothesis is not statistically significant when the p-value is greater than 0.05, and the T-value is less than 1.96.

12.3 Hypothesis-3 (H₃)

Relationships and corporate engagement have a significant influence on corporate sustainability.

Table 7. Regression Analysis (RC)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.595 ^a	.354	.351	.371432

^aPredictors: (Constant), Relationship and Community Engagement

Table 7 demonstrates a moderate association between Relationship and Community Engagement and corporate sustainability with $R = 0.595$. The R square is 0.351, or 35.1%. This shows that Relationship and Community Engagement is 35.1% of corporate sustainability.

This study's third hypothesis, Relationship and Community Engagement, significantly influences corporate sustainability in Bangladesh's financial industry. The Smart PLS analysis report shows in Table 4 that the 'P' value is 0.000 and the 'T' value is 7.991. When the p-value is less than 0.05 and the T-value is more significant than 1.96, the hypothesis is supported and is significant.

13 Limitations

This study has some issues because of how it was done and its situation. These problems can also be used to guide future research.

The study looked at research setting in the banking industry, but the response was primarily from private banks. The study should have been done with both government and non-government employees. This means that the research results cannot be used in other situations. More research is needed to give us more proof on this topic. There are benefits to checking HRM practices and trustworthiness among all workers of a single company. Still, another approach could look at the same situation with data from different types of companies. The problem could also be looked at in future studies.

Second, more research could focus on continuous studies and data from many respondents to make the research more rigorous. Lastly, future research could look at how likely people are to trust when determining the link between HRM and casual trust.

14 Conclusion

Organizational sustainability is no longer a choice but a need for every firm in the current period, especially for the contemporary workplace. It underlines how it works as a tool to achieve corporate sustainability by emphasizing green HRM practices as an urgent requirement.

Green HRM typically encompasses two fundamental components: implementing environmentally friendly HRM practices and preserving knowledge capital. Incorporating green efforts with corporate social obligations is crucial. Green Human Resource Management (GHRM) has also transformed traditional policies and procedures, making a significant contribution to the field of HRM. Many highly industrialized nations, such as the United States, China, and the United Kingdom, are quickly implementing green human resource (HR) policies and practices. The results of this study revealed a statistically significant relationship between the factors influencing green human resource management (GHRM) and the concept of corporate sustainability within the banking sector of Bangladesh. Providing workers with sufficient pay for embracing corporate-friendly human resource practices will result in a heightened incentive to promote a sustainable environment. This will significantly contribute to the improvement of their work performance and productivity.

This study has practical implications due to the author's model of green HRM practices and organizational sustainability. This model could be used as a blueprint by regulators and a tool for aligning corporate practices with the national sustainability agenda. The empirical data presented in the research will aid public-sector decision-makers in understanding the elements that influence organizational sustainability.

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Intention to Become Whistleblowers: Moderated by Religiosity

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Abstract. This study aims to examine the factors that influence a person to be willing to become *whistleblowers* with religiosity as a moderating variable. The research sample was 153 government employees of Magelang City and Regency, Indonesia. The sample was selected through *convenience sampling* method. Data were obtained using a questionnaire distributed *offline*. The results showed that the factors of fraud seriousness, professional commitment, and *personal cost* had a significant positive effect on *whistleblowing* intentions; moral intensity and *reward* variables had no effect on *whistleblowing* intentions. Furthermore, the religiosity variable is unable to moderate the relationship between professional commitment and *personal cost* with *whistleblowing* intentions.

Keywords: *Whistleblowing* · Intensity-Moral · Commitment-Professional · Seriousness-Fraud · *Personal-Cost* · *Reward* · Religiosity

1 Introduction

1.1 Background

The results of a survey conducted by ACFE Indonesia on 239 respondents show that the biggest fraud that often occurs in Indonesia is corruption with a percentage of 64.4% or selected by 154 respondents. The second most common type of fraud is misuse of state and company assets/wealth with a percentage of 28.9% or selected by 69 respondents as well as financial statement *fraud* of 6.7% or selected by 16 respondents. The data shows that fraud is still widespread in Indonesia (Indonesia Corruption Watch, 2019).

The Indonesian government does not remain silent, many efforts have been made to eradicate corruption, the number of corruption cases that are still quite large shows that the efforts made by the government have not had a significant and effective impact. Therefore, efforts to fight corruption must be increased at all costs. This is very important considering that if undetected corruption is allowed to continue, it is likely that it will become bad behavior and will continue to grow. Therefore, detecting corrupt practices in

an organization is a crucial step that needs to be taken. One of the effective tools to overcome is by increasing employee awareness to become a whistleblower (Kurniawati & Aris, 2014).

To overcome this problem, the Indonesian government has developed a bureaucratic reform program that has been included in the National Long-Term Development Plan 2005–2025 through Law No. 17 of 2007. The goal of this program is to create a government with high integrity and a professional bureaucracy. The reform process began in 2008 and continues to this day. The President has also regulated this program in Presidential Regulation No. 81/2010, where one of the main focuses is to create a government that is clean and free from corruption, collusion and nepotism. Part of the implementation of this reform is the Bureaucratic Reform and State Apparatus Empowerment which requires ministries or state institutions to always prioritize the whistleblowing systems (Mulfaq & Serly, 2019).

This research has the advantage of using data on civil servants in Indonesia which represented by the city and districts of Magelang; meanwhile, previous researches mostly uses case studies in 1 (one) institution. Researchers chose the object of government institutions because in this institution *fraud* is susceptible to occur in the form of corruption. This may occur because in the Indonesian government the bureaucratic system is centralized, and superiors play a dominant role in authorizing any activities. This research aims to enable institutions to design effective whistleblowing systems and policies in accordance with the results and conclusions of this study.

2 Theoretical Framework

Theory of Planned Behavior (TPB) was discovered by Icek Ajzen in 1985 through his article entitled “From intentions to actions: A Theory of Planned Behavior” is an evolving theory of the Theory of Reasoned Action (TRA) which was first formulated by Martin Fishbein and Icek Ajzen in 1975. The purpose of Theory of Planned Behavior (TPB) is to predict and understand the consequences of behavioral intentions, recognize approaches to changing one’s behavior, and describe human actions in certain situations (Ajzen, 1991). In the Theory of Planned Behavior, the behavior shown by individuals arises as a result of their reference to the combination of attitudes towards the behavior and subjective norms. This suggests that individuals will tend to carry out a certain behavior if they have an attitude that supports that behavior and feel that subjective social norms direct them to do so.

2.1 Whistleblowing Intention

Whistleblowing is the act of providing information to parties with authority, both internal and external, regarding behavior that is considered unethical, immoral behavior, and violates the law, which can potentially harm related parties or organizations. Whistleblowing can also be interpreted as disclosing violations or actions taken by members or leaders of an organization that have the potential to harm the organization or interested parties to the leadership of the organization or other entities that have the authority to take steps against these violations (Dianingsih & Pratolo, 2018).

2.2 Moral Intensity

Moral intensity is describing the attitude toward behavior in the Theory of Planned Behavior. In this variable, individuals consider their perceptions of how they see the extent to which they are able to carry out certain behaviors while still considering morals. A person will take action or behave according to the attitude they have towards a behavior. They will determine the extent to which the behavior is considered good or bad (Valentine & Godkin, 2019). This control will also be influenced by two factors, internal and external factors. Internal factors are factors that come from the individual himself, while external factors come from the environment around the individual. Moral intensity is a moral aspect that affects one's ethical judgment and one's intention to do something (Suh & Shim, 2020). This study will test a hypothesis which is: H1. Moral intensity has a positive effect on whistleblowing intention.

2.3 Professional Commitment

Professional commitment is an important factor in the field of work. An employee's professional commitment significantly impacts the work they do. Commitment can serve as a strong foundation that leads a person to be better in the future. A strong sense of professional commitment to his/her work, spurs the person to carry out their duties with full devotion and a high sense of enthusiasm (Darjoko & Nahartyo, 2017). The hypotheses to be tested are: H2. Professional commitment has a positive effect on whistleblowing intentions.

2.4 Seriousness of Fraud

According to Miceli and Near (2017), individuals in an organization are more likely to whistleblowing for alleged violations if the violations are considered severe and serious. Marliza (2018) said that any considerations of the seriousness of fraud can be adjusted to the financial impact of the fraud. The seriousness of fraud can also be summarized as a person's view of how they see the impact of the fraud. According to Aida et al. (2019), the perception of the seriousness of fraud can be different for each individual. The formation of views regarding the seriousness of fraud is not triggered by the dollar amount of fraud that occurs, but is also closely related to the type of fraud that has occurred. The hypothesis to be tested is: H3. The level of seriousness of fraud has a positive effect on whistleblowing intentions.

2.5 Personal Cost

Personal cost refers to how an employee understands the consequences of what they do, such as retaliation from fellow employees in the organization, including even their superiors such as managers, supervisors, and colleagues who can influence their intention to report the fraud. Retaliation can materialize in various ways such as an uneven evaluation, delays in salary increases, transfers to unwanted positions, and even dismissal (Rachmawati et al., 2022). This research will test the hypothesis: H4. Personal cost has a negative effect on whistleblowing intentions.

2.6 Reward

Providing rewards to employees who report actions or employees as a whistleblower aims to encourage them to report cases of fraud for unethical behavior, with the hope of reducing the incidence of fraud for unethical behavior. Reward is concerned with the way individuals are valued and rewarded based on the contributions they have made to the organization. This reward can be divided into two types, namely: (1) financial rewards which include various forms of monetary compensation such as salary increases, bonuses, stock options, visits, and incentives based on what he has done. (2) non-financial rewards, which involve benefits other than money, such as welfare programs, career development opportunities, psychological well-being support, and social recognition (Dewi et al., 2020). This research will test the hypothesis: H5. Reward has a positive effect on whistleblowing intention.

2.7 Religiosity

According to Glock and Stark (1970) religious personality are defined as a person's religious devotion and commitment that can be implemented through an action and their behavior in relation to their beliefs. Religious character is considered a very important human characteristic, and if someone has the character of religiosity in their life then that person can uphold moral standards and make ethical decisions (Winchester, 2008). Basically, internal and external factors can affect a person's ability to regulate their behavior. Internal factors involve such aspects as skills, determination, and knowledge. Meanwhile, external factors include politics, culture, and religion. Therefore, an individual cannot fully control their own behavior (Kurniawati, 2021). The hypothesis to be tested in this study with regard to the moderating variable Religiosity are:

H6. Religiosity moderates the relationship between professional commitment and whistleblowing intention.

H7. Religiosity moderates the relationship between personal cost and whistleblowing intention.

3 Methodology

The population of this study were government employees in Magelang City and District from 20 local government organizations. The sample method was convenience sampling. Data was collected by questionnaires that were delivered to respondents directly by couriers from 3 February to 15 April 2023. Number of sample obtained was 153 and tested by SPLS version 3.

4 Discussion

4.1 Result of the Hypothesis Testing

Results of the data processing are presented in Table 1. Furthermore, the discussion of the results are presented in the several paragraphs below.

Table 1. Result of the hypothesis testing

Construct	Original Sample (O)	p values	Results
Moral Intensity => Whistleblowing Intention	0,109	0,215	Not supported
Professional Commitment => Whistleblowing Intention	0,262	0,000	Supported
Seriousness of Fraud => Whistleblowing Intention	0,398	0,000	Supported
Personal Cost => Whistleblowing Intention	0,260	0,000	Not supported
Reward => Whistleblowing Intention	-0,071	0,391	Not supported
Religiosity * Professional Commitment => Whistleblowing Intention	0,086	0,175	Not supported
Religiosity * Personal Cost => Whistleblowing Intention	-0,123	0,066	Not supported

4.2 The Effect of Moral Intensity on Whistleblowing Intention

The results of the path coefficients for moral intensity on whistleblowing intention has a parameter value 0.109, and the p-value 0.215 which are higher than 0.05. These results indicate that moral intensity has no effect on the variable moral intensity on whistleblowing intentions. Thus, the hypothesis that mentioned there is an influence of moral intensity on whistleblowing intention is not supported.

The results of this study are in accordance with the concept of perceived attitude towards behavior in the Theory of Planned Behavior. It can be explained that the individual refers to the perception of his ability to demonstrate his behavior. The individual will act or behave in accordance with the attitudes inherent in him. In addition, individuals will also determine the measure of good or bad of a certain behavior that will be carried out. What needs to be underlined is that becoming a whistleblower is not an easy task. The government's employees need courage to report or not to report an acts of abuse and fraud. This means that the courage of government's employees to report acts of abuse or fraud is still low. They tend to be reluctant to report it because they are worried about the risks associated with such actions. Moral intensity is not one factor or reasons that encourage government's employees to report an act of abuse or fraud.

4.3 The Effect of Professional Commitment on Whistleblowing Intention

The results for professional commitment to whistleblowing intentions produce a parameter with a value of 0.262, and the p-value obtained is 0.000 or smaller than 0.05. This indicates that there is a significant influence between moral intensity on whistleblowing intentions. Therefore, this hypothesis is supported.

The results of this study are in accordance with the concept of behavioral control in the Theory of Planned Behavior which explains to improve the welfare of individuals,

groups, or members in the organization by taking a useful action. The relationship with whistleblowing is that when a government's employee has a high commitment to his profession, he will tend to report fraud when he finds out about an act of fraud, the aim is to protect his organization from the losses incurred as a result of the fraudulent act. The professional commitment embedded in the government's employees to their profession is a very positive action, because when someone sees abuse or fraud in their workplace, they will immediately report it without hesitation. It can be concluded that the higher the professional commitment of government's employees, the higher the desire to take whistleblowing action.

4.4 The Effect of Seriousness of Fraud on Whistleblowing Intention

The path coefficient results for the seriousness of fraud on the whistleblowing intention variable obtained a parameter coefficient value of 0.398, and the p-value obtained is 0.000 or smaller than 0.05, which means that there is a significant effect. Therefore, this result proofed the third proposed hypothesis or the hypothesis is supported by the data.

The results of this study are in line with the principle of perceived behavioral control in the Theory of Planned Behavior. In this theory, individuals will form their views about the impact of fraudulent behavior. A high level of seriousness of fraud will tend to have a more detrimental impact on an organization or institution. Therefore, a government's employee who witnesses an act of fraud that has the potential to harm an organization or institution tends to have the confidence to take whistleblowing action. This means that the more serious the act of fraud committed by an ASN, the more likely employees in the organization are to take whistleblowing action.

4.5 The Effect of Personal Cost on Whistleblowing Intention

The path coefficient value for personal cost on the whistleblowing intention variable is 0.260, this indicates the influence of the influence between personal cost on whistleblowing intention. When a person's personal cost is high, the intention to do whistleblowing also increases. The results of this study show a p-value of 0.000 or means less than 0.05, this indicates that there is a significant influence. Therefore, this result is not in line with testing the fourth hypothesis proposed.

This finding is not in accordance with the Theory of Planned Behavior which focuses on subjective norm, which is an individual's understanding of the social pressure they feel when they decide to report or not report an act of fraud. In this context, government's employees who want to do whistleblowing often have to face risks or sanctions that they may receive. The social pressure they experience will increase when they decide to take action to report the fraud. However, the reality that occurs in the districts or cities is different from this because government's employees tend not to be afraid of the threats and risks of retaliation they receive in the future when they report the fraud. This shows that the higher personal cost of an employee, the higher the intention to do whistleblowing.

4.6 The Effect of Reward on Whistleblowing Intention

The path coefficients value for moral intensity on whistleblowing intention is -0.051 indicating that there is no influence between the reward variable on whistleblowing intention. The results of this study show that the p-value obtained is 0.542 or greater than 0.05 , which means that there is no effect of the reward variable on whistleblowing intention. Therefore, this result is not in line with testing the fifth hypothesis proposed.

In the Theory of Planned Behavior based on perceived behavior control, the purpose of a person taking an action is to prosper the individual, group, or organization. In reality, the rewards offered by the agency do not affect the intention of a government's employee to report fraud or violations that occur. The provision of rewards has no effect on whistleblowing actions presumably due to the views of employees who prioritize the interests and safety of the agency regardless of what rewards will be received if they report the deficiencies or violations that occur. In this case, government's employees who have the principle to always prioritize interests and safety without considering the incentives or rewards they might receive if they report acts of fraud or violations that occur. Logically, someone is willing to report fraud or violations that they know about without regard to the rewards provided by the agency or organization.

4.7 Religiosity Moderates the Relationship Between Professional Commitment and Whistleblowing Intention

The results of the path coefficients for religiosity can moderate the relationship between professional commitment and whistleblowing intentions obtained a coefficient value of 0.086 and a p-value of 0.175 or > 0.05 . These results indicate that there is no effect of religiosity variables moderating the relationship between professional commitment and whistleblowing intentions. Therefore, the sixth hypothesis is not in line with the proposed hypothesis which states that religiosity can moderate the relationship between professional commitment and whistleblowing intentions.

The results of this study are in line with research conducted by Kashif et al. (2017) and Satrya et al. (2019) which states that religiosity cannot moderate the relationship between professional commitment and whistleblowing intentions. This theory confirms the Theory of Planned Behavior which is strongly influenced by their belief in their ability to carry out these actions, which is included in the perceived behavior control category. In reality, government's employees even though they have a fairly good level of religiosity but they cannot apply the moral teachings of their religion, it will not change morals so that it has nothing to do with whistleblowing intentions. The religious behavior of an government's employees cannot be separated from two factors that can influence it, namely individual factors and situational factors. Individual factors include various aspects such as length of service, age, physical condition, gender, psychological state, and motivation in behavior. In addition, situational or external environmental factors include work conditions, work environment, and other factors.

4.8 Religiosity Moderates the Relationship Between Personal Cost and Whistleblowing Intention

The results of the path coefficients for religiosity can moderate the relationship between personal cost and whistleblowing intention obtained a value of 0.086, which indicates that the religiosity variable cannot moderate the relationship between personal cost and whistleblowing intention. The results of this study indicate that the p-value is 0.066 or greater than 0.05, which means that the religiosity cannot moderate the relationship between personal cost and whistleblowing intention. Thus, the hypothesis that religiosity can moderate whistleblowing intentions is not supported.

The results of this study are in line with research conducted by Rahmawati (2022) which states that religiosity is unable to strengthen the relationship between personal cost and whistleblowing intention. Based on the answers obtained by respondents regarding indicators of religious values, a person who has a high level of religiosity does not encourage that person to do whistleblowing. Their knowledge of religion is considered as a foundation to consider in decision making, but not external factors such as pressure and threats that still exist, which can affect a person's intention to make ethical decisions. Thus, religious understanding is considered as a basis and guideline in the decision-making process that can still be influenced by external factors, such as the risk of retaliation or even pressure and threats.

5 Conclusion

The results of this study indicate that the variables of fraud seriousness, professional commitment, and personal cost have a significant positive effect on whistleblowing intentions; moral intensity and reward variables have no effect on whistleblowing intentions; religiosity variables are unable to moderate the relationship between professional commitment and whistleblowing intentions; religiosity variables are unable to moderate the relationship between personal cost and whistleblowing intentions.

This study has several limitations that have the potential to affect the results obtained. First, this study shows that the R square is 0.491, which means that the variables of moral intensity, professional commitment, seriousness of fraud, personal cost, reward and religiosity as moderating variables have an effect of 49.1% on whistleblowing intentions. While the remaining 50.9% is explained by other factors from outside this study. Second, this research was not conducted on all OPDs in Magelang City and Regency. This research was only aimed at 24 offices located in both Magelang City and District. Third, the variable Personal Cost has only two items/questions which were valid.

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Precision Anthropometric Insights for User-Centric Mobile Phone Design

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Abstract. This research paper discusses the importance of hand anthropometry in designing user-friendly mobile phones. Hand anthropometry involves analyzing the dimensions and proportions of the human hand, including hand size, finger length and width, hand shape, hand mobility, grip strength, and hand orientation. Manufacturers must take these factors into account when designing devices to ensure that they are accessible and comfortable for a wide range of users. The paper also emphasizes the concept of designing for the thumb zone, highlighting the importance of considering the physical limitations and capabilities of users when designing digital experiences. The study suggests that by understanding how users interact with their devices, designers can create more intuitive, user-friendly experiences that improve engagement and satisfaction. The paper concludes by emphasizing the importance of considering ergonomics when designing mobile experiences to improve the usability and user experience.

Keywords: mobile phones · ergonomics · hand anthropometry · hand size · hand shape · hand mobility · grip strength · thumb zone · user experience · usability

1 Introduction

Mobile phones have become an integral part of our lives, which serve as a primary means of communication, entertainment, and work for most people. With the emerging new technologies and continuous growth of smartphones, it has become very important to design the devices that are convenient and user-friendly. One very important aspect of designing mobile phones, in relation to ergonomics is hand anthropometry, that involves the analysis of dimensions and proportions of the human hand.

The human hand is a complicated structure which comprises of 27 bones, 29 major joints and an intricate network of 40 muscles, tendons, and ligaments. The size and structure of hand is significantly varied among different individuals which influence usability and comfortability of mobile phones. Therefore, it is very important for the manufacturers to consider hand anthropometry while designing mobile phone devices to ensure they are user-friendly and have higher accessibility for a wide range of users in the global market.

Hand-size is a very important factor in hand ergonomics. Different individuals have different hand sizes, and individuals with larger or smaller hands have different accessibility and might have difficulty while handling mobile phones designed for average hand sizes. Important factor in hand anthropometry is finger length and width which can affect the ease with which users can access different areas of screen and press buttons. Individuals with shorter fingers usually struggle to reach the top ends of the screen while those with wider fingers might have difficulty pressing smaller buttons. If finger length and width is taken into consideration while designing the devices, mobile phones which are easier to use and are more comfortable for a wider range of users can be created.

Another crucial consideration in hand ergonomics is hand mobility. Limited hand mobility makes it difficult for the users to perform certain actions like pinching or swiping. All these factors must be considered by manufacturers to design devices that fit a wider range of population. Additionally, there are various other factors related to hand anthropometry that are very crucial in designing user-friendly devices. One of them is hand-orientation, that refers to the angle at which hand is held while using a mobile phone. People hold their devices in different ways, such as, with one hand which is mostly their dominant hand, or with both hands and at different angles. Another important factor is grip strength, which is the force exerted by an individual with their hand. It significantly varies among individuals, with older people and people with disabilities having lower grip strength than younger individuals.

In summary, hand anthropometry is a very crucial consideration in designing user-friendly mobile phones. Manufacturers must consider hand size, finger length and width, shape and orientation of hand, hand mobility and grip strength to design devices which are comfortable to use and easy to hold to a wide range of populations. This can help manufacturers to create devices that are more ergonomic, comfortable, and easier to use which will lead to a better user experience.

After establishing the importance of hand anthropometry in mobile phone design, this paper will proceed to discuss the intricacies of this crucial aspect. Following the discussion on how various elements of hand anthropometry impact the mobile phone design, the literature review will provide insights from various previous studies. Our methodology section will explain how data was collected to inform our findings. The main analysis section will explore the concept of designing for the thumb zone in mobile devices and how it affects user experience and the importance of ergonomics in interface design. Finally, we will conclude with recommendations, limitations and future implications emphasizing the significance of anthropometry and the thumb zone in designing user-friendly mobile devices.

2 Literature Review

The design and ergonomics of mobile devices have become a very important area of research and development as the number of people using these devices continues to increase. A very crucial consideration in designing of mobile phones is hand anthropometry, which involves analysis of dimensions and proportions of human hand. By understanding the anthropometry of human hand, manufacturers can aim to make devices that are easier to use, more comfortable and ergonomic and that can lead to a better user experience.

Several studies have investigated the relation between hand anthropometry and mobile phone design. One such study (Kim K. a. 2014) explored the impact of smartphone screen size on user adoption from utilitarian as well as hedonic perspective. They found that larger screens enhance both perceived control (utilitarian) and perceived affective quality (hedonic) perspective of smartphones. The practical implication of this study is that the manufacturers should take the positive effects of larger screens into account while designing products. However, finding the optimal screen size that can balance usability and mobility remained a challenge. (Gokalp-Yavuz 2015) investigated the factors that lead to user satisfaction during smartphone selection. Their results indicate that it is very important to consider user attributes related to dexterity and hand ergonomics for designers as well as consumers in global market.

Another study (Kamel, 2020) investigated the correlation between smartphones and hand measurements and the development of discomfort and pain in hand among university students aged 17 and 30 years and they concluded that the smartphone manufacturers must take users' comfort into consideration while designing their devices as it leads to hand pain and many other related musculoskeletal problems.

The paper "Paradigm Shift in Smartphone Designing Using Hand Anthropometry", (Sakshi Malhotra 2020) proposed a new approach to smartphone designing which considers hand anthropometry to improve the usability and comfortability of smartphones. In this paper, the authors argue that current smartphone designs are not optimal for the diverse hand sizes and shapes that leads to discomfort and potential ergonomic problems for the users. The study provides an overview of relevance of hand measurements in relation with smartphone designs.

Another study (Yu 2017) studied the hand anthropometry and touchscreen size of smartphones among 100 college students. They investigated the relation between screen size of smartphones and relative hand measurements of users which was based on the operation time, operation error rate and thumb fatigue. The results were indicative of an increasing trend from smaller to larger screen for small hand measurements and a slight decrease in trend first and then increase for larger hand measurements. They suggested the screen size of 5.0 inches for most people as this size was relatively suitable on the basis of the analysis of hand measurements and three performance evaluation indices.

One research (Nestor Pol Rasco 2015) evaluated how well the smartphones (locally or foreign designed) align with the ergonomic requirements and usability preferences of the Filipino users, while taking physical dimensions and button placements of mobile devices into considerations. Their results indicated that the locally designed brands performed the best with respect to the ergonomic measurements of the study participants. The most notable advantage of these locally designed phones was that their buttons were easily accessible as compared to the foreign-designed smartphones that enhance the user experience.

Hand anthropometry is crucial for developing other handheld devices like tablets, game consoles and smartwatches in addition to designing mobile phones. Any handheld gadget can benefit from the concepts of hand anthropometry to make sure that it is pleasant and usable for a variety of users. Physical discomfort and MSD risk can both be decreased in this way.

Additionally, hand anthropometry is crucial for creating user interfaces for mobile devices. The device's usability and accessibility may be impacted by the size and location of buttons and icons on the screen. For instance, those with smaller hands could find it impossible to reach some areas of the screen, while people with larger hands might find it challenging to push smaller buttons. Manufacturers may build user interfaces for mobile phones that are simple to use and navigate for all users by taking hand anthropometry into account.

Manufacturers must not only design for hand anthropometry but also consider, the various wants and preferences of their target market. For instance, older persons may demand larger buttons and icons on the screen since they may have different hand anthropometric characteristics than younger adults. Different interfaces or accessories could be necessary for those with physical limitations or disabilities to improve their user experience.

In general, hand anthropometry is an important consideration when building user friendly handheld devices like mobile phones. Other than hand anthropometry, manufacturers must consider various other factors in design process like display size, resolution, processing power, battery life and other software features which can affect the usability and overall user experience and this needs to be balanced with the physical aspects of the design of the device.

3 Methodology

This conceptual study aims to establish the connection between hand anthropometry, smartphone features like screen size and usability. The paper's importance comes from its examination of how ergonomics might affect user experience and from its suggestions for further study.

The data from the literature and the results of a thorough evaluation and analysis form the foundation of this study. A Google search engine was one of the many techniques and resources used throughout the investigation. Relevant data was gathered using the search phrases "Anthropometry", "Ergonomics", and "Screen size".

Various research investigations and tests carried out by different researchers in various locations throughout the world were evaluated to gather the data. A total of 27 periodicals and papers were examined, and the references contain quotes from the most pertinent ones. A review of related publications and websites was also conducted.

To assess the literature and reach pertinent findings, case studies, market surveys, and interviews with industry professionals were also examined. All these techniques were employed to compile through and varied data on the subject, which was afterwards evaluated and synthesized to establish the connection between hand anthropometry, smartphone features, and usability.

In conclusion, this study collected and analysed current data and literature on hand anthropometry, smartphone features and usability using a multifaceted approach. This made it possible to fully explore the subject and identify key links, which gave useful insights for future study and design considerations.

4 Main Analysis

Anthropometry is the study of human body measurements, and it is essential for creating mobile devices that are easy to use. Individual variances in hand, finger, and thumb size and shape should be considered while designing smartphones. To guarantee that users can engage with the gadget comfortably and easily, designers should also consider the device's size, weight, and position into account.

To make sure that buttons and icons are simple for the thumb to reach, designers must utilize anthropometric data to establish the size and location of interface components. The typical range of motion for the thumb, according to studies is around 54% of the device's width, hence interface components should be positioned within this range to enable pleasant and straightforward operation.

In addition to screen size, other aspects of mobile design should take the thumb zone into account. This includes significant buttons and interactive elements like input fields and calls to action. By placing these elements within the thumb zone, designers can make sure that users can interact with their smartphone easily and amicably.

Overall, the concept of designing for the thumb zone highlights the importance of considering the physical limitations and capabilities of users when designing digital experiences. By understanding how users interact with their devices, designers can create more intuitive, user-friendly experiences that improve engagement and satisfaction.

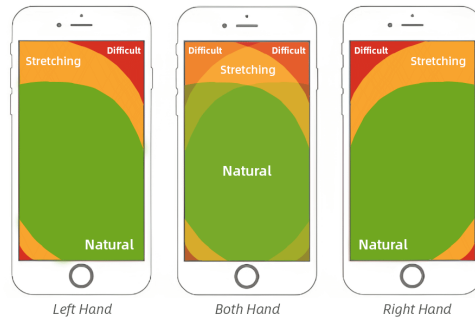


Fig.1. Shows how mobile phone screen is accessed by average Men and Women

Figure 1 highlights the importance of designing for the thumb zone when creating smartphones. The research findings of Hooper and Clark demonstrate that a significant percentage of users rely on their thumbs for interactions with mobile devices. By designing for the thumb zone, designers can create a better user experience and improve the usability of their applications.

Overall, it highlights the importance of considering the user's thumb zone when designing mobile applications. By doing so, designers can create a better user experience and improve the usability of their devices.

Hooper identifies five different ways that users typically hold their devices, including one-handed, cradled, two-handed, partially supported, and typing. Hooper's research (Hooper 2013) is based on the observation of more than 1,300 users and 14,000 holding

situations. The findings provide valuable insights for designers to understand how users interact with their mobile devices.

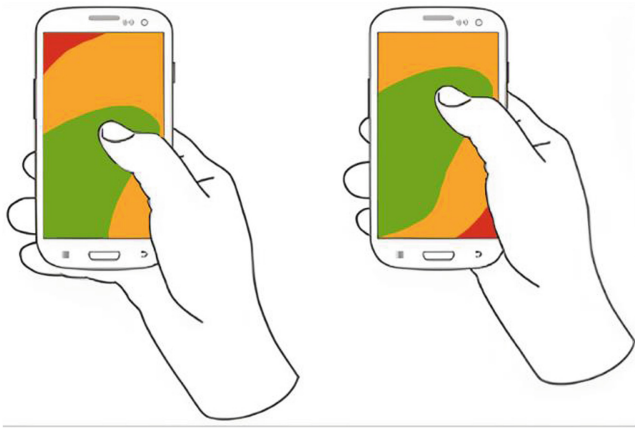


Fig. 2. One handed holding

One-handed holding is the most common way that users hold their devices, with users typically holding their devices with one hand and using their thumb to interact with the interface. This holding style is ideal for quick interactions and is commonly used when users are on the go (Fig. 2).

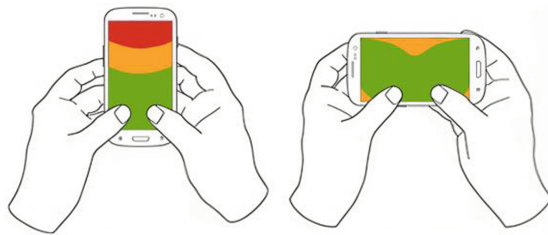


Fig. 3. Cradled holding

Cradled holding shown in Fig. 3 is another common way that users hold their devices, and it involves users supporting their device with one hand while interacting with it with the other hand. This holding style is ideal for prolonged use, such as watching videos or reading articles.

Two-handed holding in Fig. 4 involves users holding their device with both hands, and it is commonly used when users need to stabilize their device or when they are interacting with the interface using both hands. Partially supported holding involves users supporting their device with a surface, such as a desk or table, and using one hand to interact with the interface. This holding style is commonly used when users need to interact with their device for prolonged periods.

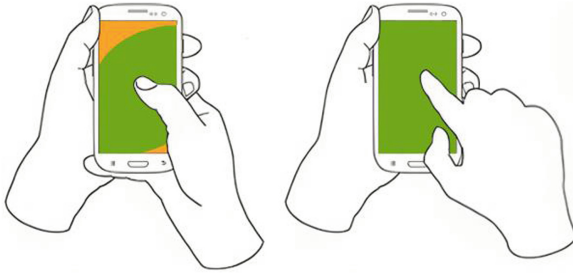


Fig. 4. Two-handed holding

This article emphasizes the importance of considering ergonomics when designing mobile experiences. By understanding how users hold their devices, designers can create interfaces that are optimized for the way that users interact with their devices. For example, if users typically hold their devices with one hand, designers can prioritize placing key interface elements within reach of the thumb.

Considering ergonomics in mobile experience design is crucial for creating user-friendly interfaces that align with how users physically interact with their devices. This involves taking into account hand anthropometry, which is the study of the measurement of the human hand and its physical characteristics. Understanding hand anthropometry is essential in optimizing the placement of interface elements for different types of users. Here's how these concepts are related:

1. **Hand Size and Reach:** Hand anthropometry involves studying the size and proportions of different individuals' hands. This information can help designers determine the comfortable reach of a user's thumb, which is often a primary interaction point on mobile devices. By knowing the average or common hand dimensions, designers can ensure that key interface elements, such as buttons or navigation menus, are positioned within easy reach for users when holding their devices with one hand.
2. **User Comfort and Efficiency:** Mobile users often use their devices for extended periods, making it essential to consider ergonomics for user comfort and efficiency. By tailoring the interface to accommodate various hand sizes, designers can reduce the strain and discomfort associated with using the device. This results in a more enjoyable and efficient user experience, as users can interact with the interface without having to stretch their fingers or adjust their grip.
3. **User-Friendly Design:** A user-friendly interface design that takes hand anthropometry into account is more intuitive and accessible to a broader range of users. Designers can avoid the common pitfalls of placing important elements too far away from the thumb's natural resting position, which could lead to frustration and decreased usability.
4. **Customization and Adaptability:** Considering hand anthropometry in mobile design doesn't mean creating a one-size-fits-all solution. Designers can also consider customization and adaptability by providing options for users to adjust the interface layout according to their hand size or preference. This could include features like

resizable buttons, customizable gesture controls, or different interface layouts for left-handed and right-handed users.

In summary, integrating hand anthropometry into mobile design aligns with ergonomic principles, improving the overall user experience by ensuring that interface elements are optimally positioned for user comfort and efficiency. This user-centered approach helps designers create mobile experiences that are more accessible and intuitive for a diverse user base.

4.1 Case Study

This research paper highlights the significance of hand anthropometry and ergonomics in the designing of user-friendly mobile phones. It also explored the various dimensions of hand anthropometry, stressing on the need for manufacturers to account for factors like hand size, thumb size or finger dimensions, orientation of hand, grip strength, grip preference and the importance of designing the devices according to the thumb zone, highlighting the physical limitations of the users which can influence usability. To illustrate the practical implications of these concepts, we conducted a case study in which we interviewed, Ms. Soumya Suhane who is a freelance design consultant and worked as Product designer in Xiaomi Technology in 2018. This case study exemplifies how the understanding of ergonomics can lead to the designing of a user-friendly device. It highlights the real-world application of the concept discussed in this paper. Following questions (with their subsequent answers) were asked:

1. Do you think hand anthropometry and ergonomics is an important aspect that should be considered while designing mobile phones for a particular population?

A: Yes, hand anthropometry and ergonomics are very important factors in designing the mobile phones, specifically, while targeting a specific population. Designing the mobile phones which fit comfortably in users' hands can enhance usability and reduce the risk of injury or discomfort and it also creates USP for the manufacturer/brand.

2. Do you consider hand anthropometry while you design mobile phones?

A: Most manufacturers do consider ergonomics and hand anthropometry during the designing process. They focus on analysing the size and shape of users' hand to design the devices which are comfortable to hold and operate. But this comes with some challenges including the costing of the device and lack of consumer awareness about ergonomically designed phones.

3. Is thumb-zone important in the design of mobile experiences?

A: Yes, thumb-zone is a very critical factor in mobile phone designing process. Most of the interactions on a smartphone must occur within the thumb's reach, so the designers focus to optimize user interfaces for single-handed use, particularly for global market.

4. How do you ensure that your devices are accessible and comfortable for a wide range of users?

A: We aim to make their devices accessible and comfortable for a wide range of users, which includes designing for different hand-sizes. To achieve this, they incorporate different features like reachability modes, and ensuring tactile feedback for physical buttons.

5. How do you balance the need for aesthetics and functionality while designing mobile phones?

A: This is a challenge that many designers come across. We aim to design visually appealing devices while ensuring the user-experience and ergonomics is not compromised. It is a very delicate balance that requires user-centric design.

6. What role does user research play in the process, particularly with regards to hand anthropometry and ergonomics?

A: User research play a very pivotal role in the whole designing process, especially when it is related to ergonomics. We try to collect data on users' hand sizes, grip preferences and usage habits to make informed decisions.

7. Have you come across any mobile phone which is ergonomically poorly designed? Would you be interested in telling the model and make?

A: Absolutely, there have been instances of a few poorly designed phones with respect to ergonomics. However, those models and designs change over time, and it is very essential to check the user feedback and reviews to have up-to-date information. Some of such models, in my opinion, are Google Pixel 3XL (which faced a lot of backlashes for its very large notch and heavy design, some users found it very awkward to handle); LG G5 (Its modular design was very innovative but it had a less cohesive and ergonomic feel made the users uncomfortable to hold it).

8. Any brand, that makes only ergonomically designed products.

A: There is no specific brand that focusses exclusively on ergonomically designed products but most of the manufacturers focus both on design as well as functionality. However, there are some brands which have launched devices known for their ergonomic details and user comfort. Few of them, in my opinion, are OnePlus (known for creating sleek and ergonomic designs); Samsung (which has been recognised for its ergonomic designs, with devices having curved edges, comfortable grips and even foldable features).

5 Conclusion

The widespread use of mobile phones in daily life necessitates the design of devices that are comfortable and user-friendly. A critical aspect of designing mobile phones with ergonomic considerations is hand anthropometry, which involves analyzing the dimensions and proportions of the human hand. The human hand is a complex and intricate structure comprising 27 bones, 29 major joints, and a network of muscles, tendons, and ligaments. The size and shape of the hand vary significantly between individuals, which can affect the usability and comfort of mobile phones. Designers must consider hand size, finger length and width, hand shape, hand mobility, hand orientation,

and grip strength when creating mobile phones to ensure that users can comfortably hold and use the device as shown in Fig. 5.

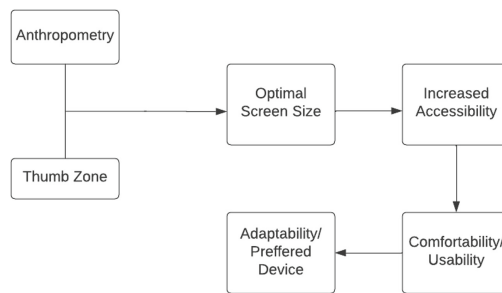


Fig. 5. Flow chart showing relationship between hand anthropometry, thumb zone and adaptability of a device.

5.1 Limitations

1. **Generalizability:** The paper focusses on the relationship between hand anthropometry and mobile phone design, but it is very important to acknowledge that individual preferences can vary widely.
2. **Methodological constraints:** the methodology relies heavily on existing literature and data analysis. This only provides the foundation for the study; user studies will offer deeper insights into actual user experience and practical implications.
3. **Evolution of Technology:** The paper focusses on mobile phone design at present. However, the technology is continuously evolving. Future advancements, like flexible displays, gesture control or augmented reality interfaces may introduce new dimensions to hand anthropometry and device design.

5.2 Recommendations

1. Design mobile phones that are comfortable and user-friendly, by taking hand anthropometry into account. This will ensure that devices are accessible to a wide range of users.
2. Consider hand size, finger length and width, hand shape, hand mobility, hand orientation, and grip strength in the design process to create mobile phones that are comfortable and accessible to a broad range of users.
3. Ensure that important buttons and interactive elements are placed within the thumb zone, as almost half of all smartphone users rely on their thumbs to interact with their devices.
4. Consider new design patterns such as the bottom navigation bar or the “hamburger” menu, which allow for easy access to key features while keeping them within the thumb zone.
5. Understand how users interact with their devices to create more intuitive, user-friendly experiences that improve engagement and satisfaction.

Overall, the considerations of hand anthropometry and thumb zone are critical in designing user-friendly mobile phones that enhance the user experience, increase productivity, and improve the overall usability of the device.

5.3 Future Implications

1. User-Centered Design: Future research should delve deeper into user-centered design methodologies that incorporate hand anthropometry.
2. Cross-Cultural Analysis: Investigating how cultural factors influence hand anthropometry and, consequently, mobile phone design preferences could be an intriguing avenue for research.
3. Advanced Technologies: As mobile technology continues to advance, researchers should explore how emerging technologies like augmented reality, virtual reality, and wearables interact with hand anthropometry. This includes studying how users with varying hand shapes and sizes interact with these technologies and how design can be optimized for inclusivity.
4. Sustainability: Investigating how design considerations related to hand anthropometry can contribute to more sustainable mobile device manufacturing is an important future research direction.

By addressing these limitations and exploring these research directions, future studies can contribute to a more comprehensive understanding of the intersection between hand anthropometry and mobile phone design, ultimately leading to more user-friendly, inclusive, and accessible mobile devices in an ever-evolving technological landscape.

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Intention and Attitudes to the Use of an ERP by the Organizations of the Province of Azuay, Ecuador

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Abstract. Technology has played a fundamental role throughout history, especially in organizations due to globalization, which is why Enterprise resource planning (ERP) systems are essential for the efficient use of Information Technology. Its implementation allows the organization to integrate the different modules and the exchange of data to manage the areas of the company efficiently; however, the expected results are not always obtained. For this reason, this study analyzes the intentions and attitudes toward using an ERP. For this, a survey was applied to 55 organizations in the province of Azuay, applying the convenience sampling technique to identify behavioral aspects regarding computer solutions. The results show that the level of education, the information needs, and the management of business resources positively influence the adoption of ERP systems.

Keywords: ERP · Enterprise Resource Planning · TAM · Technology Acceptance Model · BTP · Theory of Planned Behavior · Information Technology

1 Introduction

The use of Information and Communication Technologies (ICT) is evolving at a dizzying pace, giving rise to organizations exploring and offering new service quality, both from customers and users [1].

According to the study carried out by the Superintendence of Companies, Securities, and Insurance in 2015, the province of Azuay ranked third in the participation of the highest utility generated between large and micro, small, and medium-sized companies (MIPYMES); large companies obtained the participation of 66.62% and MSMEs 33.38%. Consequently, in Azuay, Ecuador, large companies obtained sales revenue of \$3,320.55 million with a participation of 75.25%, while MSMEs reached 24.75% in the same year. In addition, the city presented a business growth of 6%, with 2,413 firms in total, 139 large companies, and 2,274 MSMEs, reaching participation of 4% MSMEs

use different software than an ERP but maintain similarity with the modules that include: i) accounting, ii) purchases, and iii) sales. The study mentions that ERP software can be implemented in companies of any size to reduce maintenance costs, thus increasing growth and expansion possibilities [3]. In Ecuador, MSMEs form as follows: (1) microenterprises, with a participation of 98%, (2) small companies, with a participation of 1.2%, (3) medium-sized ones, 0.6% and (4) large ones, 0.2% [4].

Likewise, the segment with the highest participation by several active companies is microenterprise, with 91.90%. That is, MSMEs concentrate 99.5%. Thus, MSMEs reached a level of sales equivalent to 27.60%. On the other hand, when analyzing the distribution of registered employment positions, micro, small and medium-sized companies register 60.40%; for all these reasons, this segment of companies is essential for the economy of Ecuador [5].

Currently, ERPs have been implemented by companies of all kinds worldwide, emphasizing the positive impact on business management processes that they generate. However, the costs and complexity in the implementation phases have become vital for adopting an ERP system. In the research, as demonstrated, it is mentioned that 20% of ERP software causes adverse reactions in end users, and in the contribution of Goos et al. [6, p. 123–130], it is stated that the implementation and adoption factors of a system in an organization is a complex problem, concluding that one of the critical aspects in adoption is the appropriation of the system by internal users.

In the same way, other research indicates that the main problems related to implementing new systems are: i) lack of discipline, ii) human errors, and iii) lack of commitment on the part of employees. Likewise, they highlight that i) technological development, ii) the life cycle of technology, and iii) generic solutions do not allow organizations' objectives to be achieved.

For this reason, the research aims to determine utility characteristics, ease of use, and perceived usability. This article is organized as follows: i) a systematic review of the literature, ii) the application of a survey to companies and tabulation of the results, iii) an analysis and discussion of the results. Finally, to know the intentions and attitudes of using ERP systems in companies in the province of Azuay.

2 Theoretical Framework

The ERP systems are the pillar of the organization's information systems since they can integrate the procedures and operations of the different departments and reallocate company resources. Therefore, their objective is to optimize business management processes. Thus, the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) can explain and identify the factors influencing the implementation process.

The TAM is an extension of the rational theory of actions, the central factor of the theory of planned behavior: the individual's intention to have a specific behavior. The intentions assume certain factors that motivate the individual's behavior, and the TAM model constitutes the attitude towards the behavior, the subjective norm, and the perceived behavioral control; intentions and perceptions of control explain behavioral variation.

The model focuses on the acceptance of users to new technologies. The research results confirmed that the impacts of management capacity would contribute to good management and provide sufficient training for employees to comply with the new business process. [10]. The TAM model is considered one of the most important and most used models in management education research to explain, identify and test the most relevant and critical factors that affect the intention to adopt an ERP system, the behavioral intention, and the use of ERP systems.

However, the literature also presents the Theory of Planned Behavior (TPB), in which the individual's perception that facilitates or hinders the generation of behaviors of interest is defined as the presence or absence of the necessary resources and opportunities, that the performance of a behavior is correlated with the ability of an individual to perform a particular behavior. Also, the theory is based on past experiences and second-hand information through the exchange of information between friends and relatives that can control the perceived difficulty level for the behavior.

On the other hand, this theory proposes to prevent behaviors in situations where the individual lacks control or has an internal or external barrier to action. Furthermore, perceived behavioral control can be differentiated from actual behavioral control since it is based on an individual's perception, not the intention to assume a behavior.

It is essential to indicate the situation of the companies in the province of Azuay since the investigation focuses on the organizations that carry out their economic activities. At the business level, it is among the provinces with the country's highest density of productive units.

According to the Technical Bulletin of the Ecuadorian Institute of Statistics and Censuses, the number of active companies has varied from 873,243 in 2016 to 846,265 in 2020. In addition, sales have increased from 104,102 million dollars in 2016 to 114,957 million dollars in 2019. Meanwhile, the province of Azuay is the third in participation in total sales and employment generation at the national level between 2018 and 2020.

3 Methodology

The experimental technique was applied because it provides information and an understanding of the intentions and attitudes of ERP use in organizations in the province of Azuay. In addition, the Systematic Literature Review (SRL) technique was used, thus identifying the TAM and TPB methods and theories, determinants of the acceptance and use of ERP systems. Also, a simple cross-sectional study was applied. The descriptive design implies obtaining information only once, which was used to describe the characteristics of the group and calculate the percentage of the units of the study sample that show certain behaviors. [14].

In the investigation, a non-probabilistic sampling technique called convenience sampling was used. According to [14, pp. 341], convenience sampling seeks to obtain a sample of convenient elements in the right place and time. In addition, the sampling units are accessible and cooperative. The investigation used this sampling technique due to the lack of cooperation on the part of the managers of the companies. Finally, the research was addressed to a group of 56 organizations from the province of Azuay, but one of the responses was suppressed since one response was null, which is why it was

decided to eliminate it so as not to present bias in the results. The slope was designed and structured using Google Forms. The information collection activity occurred between March 14 and June 29, 2022. The research group consisted of managers and owners of the companies to which access was had.

The survey was made up of i) two multiple-choice questions to define the maximum level of education and the economic sector in which they carry out their activity; ii) 23 questions with a classification scale per item, called the Likert scale, in which questions related to behavior towards computer solutions were reflected, such as the intention to use, appreciation of utility and satisfaction of needs. The purpose was to collect relevant information to identify behavior towards computer solutions, such as the intention of use, appreciation of utility, and satisfaction of needs.

The survey was sent to 56 organizations, but null responses were found in the tabulation of the data. Therefore, the group of researchers eliminated this survey so as not to present biases in the results and in their interpretation. We worked with 55 surveys, these data were collected and exported from Google Forms in an Excel file, and the R software was used to analyze the results as a statistical and graphic tool.

An ANOVA was applied to the data collected in the study to assess the statistical validity of the results. This technique was used to determine if the differences found were statistically significant. A p-value less than the significance level (0.05) would indicate significant differences between the economic groups.

4 Results and Discussion

Once the information of the 55 organizations in the province of Azuay was obtained, it was processed and analyzed to know the intention and attitudes of using Enterprise Resource Planning (ERP) systems. The most relevant survey results are presented:

Results Analysis

In Fig. 1, it can be seen that the companies are concentrated in the manufacturing sector with 23 organizations, followed by 13 from the service sector and 9 from commerce. Likewise, it is seen that the managers or owners of the 52 companies have a minimum level of education (undergraduate studies). That is, the organizations' administrators have high academic preparation.

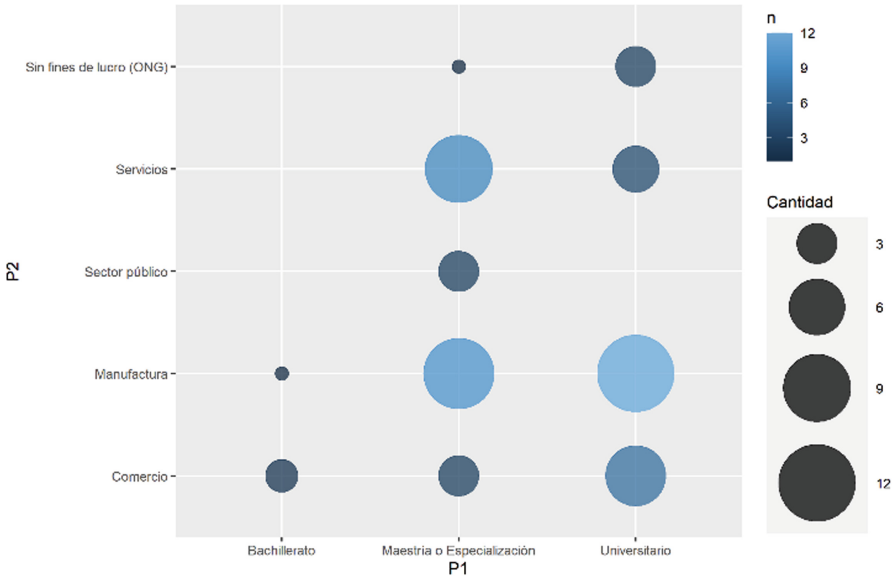


Fig. 1. Sociodemographic characteristics.

Note: The questions in the figure represent:

P1: economic activity of the organization.

P2: maximum level of studies reached by the manager of the organization.

In Fig. 2. it can be seen that, according to the Likert scale used to formulate the questions, most companies have responded positively to the intention, appreciation, utility, and satisfaction of using ERP systems.

When carrying out a more specific analysis, it can be said that in the question of whether ERP systems satisfy the organization’s information access requirements, 91% affirm that they agree and agree. However, question 8 refers to the clarity of the objective of ERP systems, where 25% of the organizations mention being in a Neutral position, indicating a lack of knowledge about using ERP systems. In addition, this answer is reinforced by question 13, which expresses satisfaction with the management of the system, where 22% of the organizations are in a Neutral position. It is also important to mention that 95% of organizations agree that knowledge of technology facilitates the use of ERP systems, and 89% of organizations consider that ERP systems facilitate business management.

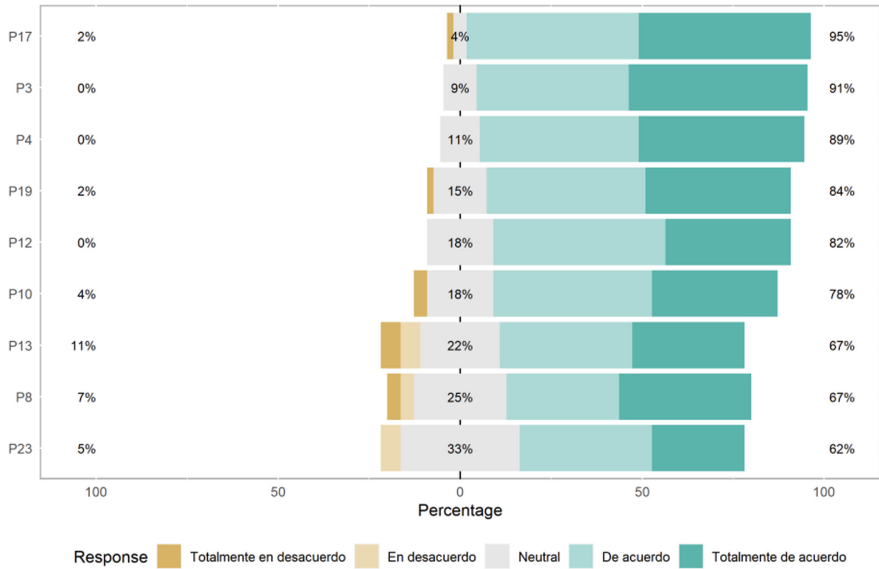


Fig. 2. Analysis of ERP use intentions and attitudes, Likert scale.

Note: The questions in the figure represent: P3: ERP systems meet your information access needs; P4: ERP systems facilitate business management; P8: The use of ERP systems is explicit; P10: The ERP system is easy to use; P12: It has support for managing the ERP system; P13: You enjoy using the ERP system; P17: Knowledge of technology facilitates the management of the ERP system; P19: Is the use of an ERP system reliable; P23: The needs of users are considered in ERP systems.

The results of this ANOVA analysis by economic sector show the acceptability of the system; that is, it does not differ between the different study sectors (commerce, manufacturing, public sector, services, and non-profit), verifying that there is an average equal to the responses, as observed in Table 1.

Table 1. ANOVA analysis

Ask	Detail	P (value)
P3	ERP systems meet your information access needs	0.964
P4	ERP systems facilitate business management	0.6
P8	The use of ERP systems is explicit	0.371
P10	The ERP system is easy to use	0.767
P12	It has support for managing the ERP system	0.392
P13	You enjoy using the ERP system	0.624
P17	Knowledge of technology facilitates the management of the ERP system	0.138
P19	Is the use of an ERP system reliable	0.978
P23	The needs of users are considered in ERP systems	0.876

Comparison of the Results with Other Cases

According to [15], in an investigation carried out on a total of 232 ERPs in the cloud, the study identified, based on the TAM model, that 81.04% of the participants are university students or are at the master's or specialty level, which indicates that it is part of the three components of the Organizational Environment of Technology, comprising an essential role in the adoption of systems. This research reveals a similar level of education since 94% of the surveyed organizations have tertiary education levels. It could be said that a predominant factor for adopting business systems is the level of education of the managers of the organizations.

In the same way, the study indicated that technology and innovation components explain 58.4% of the adoption of cloud-based ERP systems. Compared with the results of this investigation, 95% of the participants consider that technology is a crucial point for adopting ERP systems in their organizations.

In another study, an investigation is carried out to determine how companies adopt ERP systems, using two theoretical lenses in which the critical factors of adoption are identified through the Theory of Planned Behavior and the progression of each factor through Etlie's multi-stage adoption model; evidencing the relationship between the attitude of the owners, the subjective norms and the perceived behavioral control to adopt an ERP, obtaining a positive and significant relationship towards the intention of adopting an ERP. This aspect is due to the predominant influence of subjective norms (pressure exerted on SMEs by the government and other regulatory bodies) and a positive attitude held by the organization's manager [16].

In the same way, the results obtained in the survey applied to organizations (P3 and P4) can be contrasted; it emphasizes the information needs and better management by the employer but with a positive attitude maintained by the owner.

5 Conclusions

Innovation and technology have allowed organizations to improve their business management processes, generating a competitive advantage. For this reason, technological tools such as ERP systems allow the integration of the information generated throughout the organization, so the objective of this research was to determine the aspects that influence the intention to use ERP systems through a systematic review of the literature and establish the TPB as methodologies to develop the survey.

It can be concluded that the characteristics of use and perceived usability focus on i) knowledge of technology, ii) access to information in the organization, iii) reliability in the use of computer tools, results obtained from the application of the survey to the 55 organization of the province of Azuay. However, it is demonstrated that there is still ignorance in handling this type of tool and, in a particular way, its benefits.

The research process had limited access to information since the managers or owners did not respond promptly. In this manner, it was decided to work with a convenience sample after monitoring through telephone calls.

This study opens the way for new research on the intention and attitudes of ERP use in the Ecuadorian business field since the research found in the literature is theoretical or applied internationally, so models such as the TAM could be used, and TPB to identify the constructs that positively or negatively influence the use of these computer tools in specific companies.

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Credit Card and Compulsive Buying Behavior Among the Generation Z (Gen Z) in Malaysia

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Abstract. Compulsive buying behavior, especially among young adults, presents significant challenges with far-reaching consequences. It can profoundly affect multiple aspects of their lives, including their financial well-being, mental health, and overall quality of life. Through a quantitative approach, we collected and analyzed data from a sample of 276 respondents belonging to the Gen Z cohort. The findings reveal the key determinants and contributing factors to compulsive buying behavior using credit card, shedding light on the influence of financial literacy, technology advancement and peer and social media influence. These insights can be valuable for policymakers, financial institutions, and educators in developing strategies to promote responsible financial behavior among Gen Z and mitigate the negative consequences associated with compulsive buying.

Keywords: Compulsive buying behavior · Credit card usage · Malaysia

1 Introduction

Credit card usage has become increasingly common in our society, offering the convenience of cashless transactions. However, this ease of use can sometimes lead to impulsive buying behavior, which, in turn, can result in higher consumer debt and pose risks to mental health (Akram et al. 2018). The attraction of credit cards lies in their ability to postpone immediate payments, making it easy for users to lose track of their spending. This issue is made worse by the high interest rates associated with credit card use (Zainudin et al. 2019). Situational factors, such as the availability of time and money, also influence impulsive buying behavior. The presence of credit cards and other payment innovations can further fuel the urge to make impromptu purchases (Pallikkara et al. 2021). While credit cards offer convenience, they can inadvertently promote impulsive spending habits, leading to financial and mental health challenges, especially among millennials. Situational factors also play a role in encouraging impulsive buying. Therefore, it is essential for individuals to be mindful of their spending habits and to use credit cards responsibly.

One substantial factor closely linked to the emergence and worsening of compulsive buying behavior is the use of credit cards. Credit cards have seamlessly integrated

into our modern consumer culture, offering convenience and flexibility in shopping. However, their effortless accessibility and deferred payment options can foster impulsive buying tendencies and the accumulation of debt. An essential concern associated with compulsive buying behavior is its adverse impact on financial stability. Compulsive buying can lead to excessive spending and the accrual of debt, which can have a detrimental effect on one's financial health (Lichtenstein et al. 2017). It is crucial to recognize these challenges and their consequences, especially among young adults, to promote responsible spending habits and maintain overall well-being.

Malaysian Finance Minister, Tengku Datuk Seri Zafrul Abdul Aziz, has provided insights indicating that a substantial proportion of millennials, approximately 40%, are engaging in expenditures that surpass their financial means. Additionally, he referenced data sourced from Bank Negara Malaysia (BNM) to assert that a noteworthy 47% of Malaysian youths are burdened with elevated credit card debt (Pui Yin 2021). The influence of credit card usage on compulsive buying behavior extends beyond the individual level.

While there has been extensive research on credit card usage and impulsive buying behavior, most studies tend to focus on older generations. In the context of Gen Z (those born from the mid-to-late 1990s through the early 2010s), the relationship between credit card usage and impulsive buying behavior is relatively unexplored. Compulsive buying behavior is a growing problem among Generation Z, particularly with the increased use of credit cards (Ningtyas and Vania 2022). This generation has grown up with technology at their fingertips, which includes easy access to online shopping and digital payment methods. The convenience of credit cards may contribute to impulse purchases, as the immediate financial impact is often not felt or understood. Moreover, this generation may lack the financial literacy needed to understand the long-term ramifications of credit card debt. Many Gen Z consumers favor cashless transactions, virtual credit cards, and mobile payment apps over traditional credit cards. With the increasing influence of social media and online influencers, the way they shape Gen Z's impulsive buying behavior is an under-researched area. The research objective is to explore the relationship between credit card usage and compulsive buying behavior among Malaysian Gen Z while identifying the influential factors shaping their financial decisions.

2 Literature Review

2.1 Financial Literacy

Financial literacy is crucial in understanding and practicing healthy financial behaviors. Allgood and Walstad (2013) highlighted that credit cards can facilitate impulsive buying due to the immediate gratification they offer. Their research revealed a significant relationship between credit card misuse and impulsive buying among lower-income adults, expounding that better credit knowledge is needed to steer such behavior positively. Furthermore, scholarly work by Uddin (2021) revealed that financial literacy directly influences credit card-related decisions. A significant finding from this study was that higher levels of financial literacy decreased the probability of making late payments, exceeding credit limits, and making only the minimum payment. This implies

that financial literacy could moderate credit card misuse, a key driver of impulsive buying. As financial literacy significantly impacts credit card habits and impulsive buying, Johan et al. (2021) argued for the implementation of programs centered on increasing financial awareness, particularly among younger generations whose credit card usage rates are higher. They proposed that these measures would help in curbing impulsive buying behaviors and promote better credit card management. In summary, the literature indicates that financial literacy critically mitigates impulsive buying behavior propelled by credit card use.

2.2 Technology Advancement

The advancements in technology, particularly in digital payment methods like credit cards, have rapidly transformed consumer behavior. This technology has made buying items more convenient, but it also has implications such as fostering impulsive buying behavior. According to Boden et al. (2020), technological advancements in credit card systems have reduced the “pain of paying,” leading to increased impulsive purchases. The ease of online transactions and the psychological distance created by digital payments can result in consumers making decisions with less consideration for their financial state. Yadav and Chaturvedi (2021) explore the impact of mobile payment apps on impulsive buying. They argue that the convenience, speed, and ease of mobile payments have reduced the friction in transactions, thus increasing opportunities for impulsive purchases, especially among younger consumers who are more likely to embrace these technologies. Bansal and Kumar’s (2018) study highlighted how technology, specifically targeting and personalization made possible by cookies and data tracking, has the potential to exacerbate impulsive buying. Targeted marketing can lead consumers to purchase items on impulse, causing them to spend more than they initially intended. In a nutshell, while technological advancements have brought benefits to consumers in terms of convenience and speed, they have also led to increased impulsive buying due to the ease of transactions, targeted marketing, and the psychological distance they create. The role of technology in consumer decision-making remains a critical area for study.

2.3 Peer Influence and Social Media

Social media and peer influence, major drivers in contemporary consumer behavior, have reshaped credit card usage and amplified impulsive buying among consumers, particularly among Gen Z and younger millennials. The correlational research by Hoang and Khoa (2022) demonstrates that peer influence impacts Gen Z’s impulsive buying behavior. A higher rate of credit card usage among individuals who frequently engage with social influencers gives insight into the strong sway of peer influence over credit habits (Khandelwal et al. 2022). Further, social media plays a significant role in facilitating credit card use and impulsive buying. The study emphasized the subtle marketing strategies of social media where firms showcase consumer experiences or ‘unpacking’ sessions, which invariably trigger impulsive buying. Such promotional approaches often lure individuals into depending heavily on credit for such purchases. Sharma and Sonwane’s (2014) research underlines the influence of the “fear of missing out (FOMO)” propagated by social media and peers on increased impulsive buying behaviors. Their

findings proposed that the FOMO effect was associated with higher credit card utilization rates as people tried to fit into the socially constructed norm of consumer behavior.

2.4 Psychological Factors

Indeed, psychological factors play a role in impulse buying, particularly in conjunction with the use of credit cards. Bilgihan et al. (2016) found that emotions significantly affected unplanned purchases, illuminating the correlation between intrapersonal psychological factors and impulsive purchases. The immediate gratification made possible by credit cards could enhance these feelings, promoting impulsive buying. Moser (2020) scrutinized the role of self-control in impulsive buying decisions and found that participants with lower self-control had a higher tendency to make impulse purchases, primarily when credit cards facilitated the buying situation. This illustrates how self-control, a crucial psychological element, can directly influence impulsive buying aided by credit cards. Moreover, Atlas et al. (2019) underscored the role of cognitive biases on spending behavior. These findings suggest that credit card usage plays a crucial role in the development and exacerbation of compulsive buying behavior. The availability and ease of credit card use may lead individuals, particularly college students, to engage in impulsive and excessive buying. Consumers often overestimate their ability to repay their credit card debt, a trap known as overconfidence bias. This bias can increase impulsive purchases, as consumers think they will pay off the balance sooner than they actually can. In conclusion, various psychological factors trigger impulsive buying, especially when credit cards facilitate the procuring process. A greater understanding and awareness of these factors could potentially aid in the development of successful interventions targeted at reducing impulse buying and promoting healthier financial habits.

3 Methodology

3.1 Research Design and Sampling

This study uses a cross-sectional web survey based on a convenience sample. The primary reason for employing convenience sampling is its sheer practicality. It offers a quick and cost-effective way to gather data, making it an attractive choice for researchers operating under limited time, budget, or personnel constraints. When resources are scarce, or the research environment is less than ideal, convenience sampling can still yield valuable insights. The online link containing the study's survey was distributed to all participants via email and/or social networks. Before accessing the study questions, participants were informed about the objectives of the study, the voluntary nature of their participation, the benefits and risks, and the confidentiality of the information collected. The response rate for this poll was 87%, involving the distribution of 317 questionnaires to young adults in southern Malaysia. The total responses received were 276. In this study, the respondents were requested to rate their level of agreement and confidence using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Data collection and analysis were conducted using questionnaires in two sections. The first section focused on obtaining information about respondents' demographic profiles, including gender, age, education level, course of study, and ethnicity.

3.2 Data Analysis Technique

Statistical Package for Social Science (SPSS) software version 22.0 was used for data analysis. A reliability test was carried out by observing Cronbach's alpha value with a cut-off point of 0.60. The multiple regression analysis was conducted to examine the influence of independent variables, which are financial literacy, technology advancement, peer influence and social media, and psychological factors.

4 Results and Findings

4.1 Reliability

To test the reliability of the questionnaire, there is a way to use Cronbach's alpha. Cronbach's alpha can calculate and prove the reliability of the questionnaire. According to Bujang et al. (2018), if the Cronbach's alpha value of the variable is more than 0.70, then the variable is considered reliable. The higher value represents the stronger relationship between the question and a particular variable. Overall, all the variables in this study exhibit good reliability, as evidenced by the values presented in Table 1..

Table 1. Reliability analysis.

Variables	Cronbach's alpha	No of items
Credit card and compulsive buying behavior	0.848	4
Financial literacy	0.817	5
Technology advancement	0.767	4
Peer influence and social media	0.782	5
Psychological factors	0.851	5

4.2 Demographic Profiling

The demographic data comprises the frequency and percentage distribution of respondent profiles, including age, gender, education level, course of study, and ethnicity. A detailed tabulation presenting this demographic data is provided below.

Table 2. offers a detailed snapshot of the demographic and educational composition of the surveyed population. Firstly, in terms of age, it is evident that the respondents span a wide range, with the majority falling into the 23–25-year-old category, constituting nearly 40% of the sample. The second-largest age group consists of individuals aged 20–22 years old, comprising approximately 31%. There are also respondents below 20 years old (13%) and above 25 years old (9%), signifying a diverse age distribution.

Secondly, the gender distribution is roughly balanced, with females accounting for 54% and males making up 46% of the sample, indicating a representative mix of both genders. Regarding educational levels, the data showcases a substantial portion of respondents with bachelor's degrees (47%), indicating a relatively highly educated group. The

Table 2. Profiles of respondents' demographic information.

Variables		Frequency	Percentage (%)
Age	Below 20 years old	36	13.04
	20–22 years old	85	30.80
	23–25 years old	110	39.86
	Above 25 years old	25	9.06
	Total	276	100.00
Gender	Male	128	46.38
	Female	148	53.62
	Total	276	100.00
Education level	Diploma	45	16.30
	Bachelor	130	47.10
	Postgraduate	101	36.59
	Total	276	100.00
Course of study	Engineering	38	13.77
	Applied Science	25	9.06
	Business and Management	108	39.13
	Art	41	14.86
	Others	64	23.19
	Total	276	100.00
Ethnicity	Malay	116	42.03
	Chinese	100	36.23
	Indians	50	18.12
	Others	10	3.62
	Total	276	100.00

second-largest group holds postgraduate qualifications (37%), further highlighting the educational attainment of the sample. A smaller segment has a diploma (16%), which adds a layer of diversity to the educational backgrounds of the participants. The table also delves into the field of study pursued by respondents. Business and management emerge as the most popular field, with 39% of respondents following this path. Engineering (14%) and Art (15%) are the next most common areas of study. Additionally, there is a significant category labeled “Others” (23%), indicating a wide array of academic disciplines within the surveyed population, which contributes to the richness and diversity of the sample. Lastly, the table provides insight into the ethnic composition of the respondents. Malays constitute the largest ethnic group (42%), followed by Chinese (36%), Indians (18%), and a smaller “Others” category (4%). This diversity in ethnicity underscores the representation of various cultural backgrounds within the sample.

4.3 Coefficient Analysis

Table 3. shows the model summary, which points out the correlation coefficient (R) value of 0.882, which demonstrates an association between financial literacy, technology advancement, peer influence social media, and psychological factors towards impulsive buying by the usage of a credit card. Moreover, the adjusted R square value generates 0.751, which proves that 75.1% of this model can be explained by independent variables for this study and 24.9% cannot be explained in this study, which might be affected by other factors.

Table 3. Model summary.

Model	R	R Square	Adjusted R Square	Significant F change
1	0.882	0.789	0.751	0.00

Table 4. below demonstrates the regression analysis results. In this section, all the variables were tested to investigate the relationship between independent variables, which were financial literacy, technology advancement, peer influence and social media, and psychological factors.

Table 4. Table of coefficients.

Model	Unstandardized coefficients		Standardized coefficients	T	Sig
	B	Std. Error	Beta		
Credit card and compulsive buying behavior	0.595	0.122		4.889	0.000
Financial literacy	-0.391	0.020	-0.064	-4.810	-0.031
Technology advancement	0.417	0.024	0.290	9.871	0.000
Peer influence and social media	0.363	0.031	0.267	7.532	0.000
Psychological factors	0.213	0.033	0.314	8.787	0.07

With a coefficient of -0.391 , financial literacy exhibits a statistically significant negative impact on compulsive behavior arising from credit card usage. Higher levels of financial literacy are linked to lower levels of compulsive behavior in relation to credit card usage. This implies that individuals who possess a better understanding of financial concepts and prudent money management practices tend to engage in less compulsive behavior with their credit cards, research by Henager and Cude (2019) found a reduced tendency for impulsive buying among respondents who had high financial literacy. This

makes sense as informed consumers are more likely to realize the long-term impacts of accruing credit card debt, including high interest rates and potential damage to their credit score, thereby modifying their purchasing behavior to avoid credit card misuse.

Technological advancement with a coefficient of 0.417, demonstrates a highly significant positive influence on compulsive behavior stemming from credit card usage. As technology advances, individuals tend to engage in more compulsive behavior associated with their credit cards. Chen et al. (2021) explored the sustainability of credit-based internet consumer finance platforms and the continuous use intention of Chinese users. The study found that impulsive buying behavior could mediate the relationship between credit card use and misuse. This suggests that advancements in technology, particularly in the online shopping environment, can impact consumers' impulsive buying tendencies when using credit cards.

The variable peer influence and social media with a coefficient of 0.363, has a statistically significant positive effect on compulsive behavior related to credit card usage. When individuals are influenced by their peers and are exposed to social media content, they are more likely to exhibit compulsive behavior in their credit card use. One study by Anindito and Handarkho (2021) investigated the impact of personality traits and social experience on youngsters' intention to purchase impulsively from social commerce platforms. The study found that individuals tend to adopt information from their online peers, which encourages impulsive purchase behavior.

Psychological factors appear to have a positive influence on compulsive behavior arising from credit card usage, as indicated by a coefficient of 0.213. However, it is important to note that the statistical significance at a significance level of 0.07 is somewhat weaker compared to the other variables. According to Yu (2022), people were more likely to make impulsive purchases during the COVID-19 pandemic. It shows that negative emotions, such as anxiety and depression, played a role in this behavior. The study also found that certain thinking patterns, such as being uncertain about the future and being flexible in one's thinking, were connected to impulsive buying.

5 Conclusions

The geographical focus on Malaysia offers a fresh perspective as most existing research concentrates on Western populations. Firstly, the research identifies a clear link between credit card use among Gen Z in Malaysia and compulsive buying behavior. Given the digital fluency of Gen Z and contentious marketing practices, this finding has key implications for financial institutions and regulators, urging them to adjust credit policies and financial literacy programs. Secondly, this research sheds light on the lack of financial literacy among young consumers and its impact on their spending patterns and credit usage. This notable finding emphasizes the need for focused financial education, particularly in relation to credit card use, tailored for Gen Z consumers in Malaysia. The findings in this area significantly contribute to the expanding discourse on the psychological impacts of compulsive buying and consumer debt. Lastly, the study proposes potential interventions like mandatory credit counseling and reinforced regulations pertaining to credit card issuance to younger consumers. These suggestions offer a practical roadmap for policymakers and credit card companies to help curtail the issue, emphasizing the

research's applicability. This aligns the study's application directly with policy formation, giving legislators and financial institutions solution-oriented insights to remedy this pressing issue.

In providing these contributions, this research lays a solid foundation for future investigations in related areas, such as online shopping addiction among Gen Z, the impact of social media on spending habits, or the long-term consequences of financial strain on mental well-being in young adults. Consequently, it promises to have a profound and wide-reaching impact on academia, financial institutions, policy formation, and above all, the financial well-being of Gen Z in Malaysia.

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Literature Review: Regulation on Greenhouse Gas Emission Management in Indonesia

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Abstract. As the world's sixth largest greenhouse gas (GHG) emitter, Indonesia is highly vulnerable to climate change's impacts. As a member of the G20, Indonesia has committed to ratifying the Paris Agreement through its Nationally Determined Contribution (NDC), which sets a 32% emissions reduction target. This literature review comprehensively examines GHG emissions management regulations in various vital sectors. Using a qualitative analysis approach and thematic analysis method, this study reveals that efforts to reduce emissions and mitigate the impacts of climate change have been carried out through regulations in five primary GHG emitting sectors: energy sectors, FOLU sector, agricultural sector, waste sector, and IPPU sector. Laws aimed at unraveling emissions, reducing emissions, and minimizing climate change impacts are mostly explicit in the energy and waste sectors. This paper critically assesses that more than existing regulations are needed to achieve the Net Zero Emission target in 2060.

Keywords: GHG Emissions · Regulation · Sector

1 Introduction

1.1 Background

Indonesia is a tropical country with a population of 275.77 million along the Pacific Ring of Fire. It has the 3rd longest coastline in the world, making it vulnerable to the impacts of climate change [1, 2]. Indonesia has also solidified its global economic capabilities by becoming a member of the G20 and hosting the 2022 Summit. One of the focuses of discussion at the summit is how G20 members can work together to manage greenhouse gas (GHG) emissions [3]. As a country that has ratified the Paris Agreement into Law No.16 of 2016 as a form of Nationally Determined Contributions (NDC), Indonesia has committed to reducing GHG emissions by 32%. However, despite the many policies implemented to achieve this target, Indonesia is still the sixth-largest GHG producer in the world [4].

The sectors that contribute the most significant GHG emissions in Indonesia can be identified in five main categories, namely the energy sector 44.05%, Forestry and Other Land Use (FOLU) 33.83%, agriculture 10.46%, waste 9.36%, and Industrial Process and

Production Use (IPPU) 2.3% [4]. The Indonesian government has sought various GHG emission management policy implementations for each sector. Emission management focuses on reducing and mitigating GHG emissions and minimizing the negative impacts of climate change [3].

The Indonesian government has also established a carbon tax policy stipulated in Law No.7 of 2021 (Harmonization) to strengthen GHG emission management policy instruments to encourage low-emission consumption behavior [5, 6]. However, the implementation rules still need to be drafted, so the implementation plan, which was initially planned for 2022, must be postponed until 2025. During this delay, the President and the Ministry of Energy and Mineral Resources (MEMR) took concrete steps by implementing carbon trading using the cap and trade method [7, 8]. With the policies implemented in various GHG emitting sectors and efforts to harmonize carbon tax and carbon trading, it is expected to encourage Indonesia to transition to a low-carbon economy to achieve Net Zero Emission in 2060.

There have been many in-depth studies of carbon taxes and carbon trading in Indonesia. However, most research focuses on identifying implementation barriers, evaluating effectiveness, and analyzing distributional effects. Yet long before that, the Government of Indonesia has implemented various GHG emission management policies. Therefore, this study aims to provide a comprehensive overview of current and planned regulations to reduce and mitigate GHG emissions and minimize the negative impacts of climate change.

2 Theoretical Framework

Greenhouse gas (GHG) emissions release certain atmospheric gases from various human activities on Earth. The gases act like a ‘glass’ that lets sunlight in and warms the earth’s surface but limits the amount of heat that can escape. The result is a long-term increase in temperature and changing weather patterns, often called climate change. These changes will directly impact the environment and human life [9].

2.1 GHG Emissions in the Energy Sector

The energy sector provides energy, which consists of the exploration and extraction of energy resources, transformation into energy, power transmission and distribution, and energy consumption. It includes companies involved in trading energy-related products or services. The sector’s biggest challenge is the dependence on fossil fuels to meet energy needs and the limited use of renewable energy, which makes the sector produce the most GHG emissions [10]. This is also influenced by the lack of low-emission technologies, which leads to inefficient energy use.

Energy resource exploration and extraction refers to obtaining information and exploiting resources by mining, processing, refining, and supporting businesses. Exploitation requires large-scale land clearing (deforestation), which affects the loss of carbon sequestration and groundwater pollution [10]. Not only that, in the exploitation process, mining, processing, and refining equipment also produce GHG emissions. Furthermore, the energy transformation process using conventional energy conversion

machines also has waste, including exhaust gas from combustion. Then, energy transmission and distribution activities, such as electricity through a long and complex transmission network from power plants to consumers, often the cables and electrical equipment capture heat. Finally, energy consumption activities, especially in fossil energy directly carried out by consumers, such as oil fuel, can produce high-emission exhaust gases [11].

2.2 GHG Emissions in the Forest and Other Land Use (FOLU) Sector

The FOLU sector covers the use of forests and land for human activities. Emissions from this sector are heavily influenced by deforestation, peatland degradation, land use change, wildfires, and unsustainable land use practices [12]. More than 60% of GHG emissions in this sector come from land use change through deforestation and peatland degradation. That is due to the loss of carbon sequestration capability from the atmosphere and the release of carbon previously stored in soils and vegetation. These two factors also lead to soil erosion and water pollution due to the loss of the function of forests and peatlands in maintaining soil and water quality. In addition, wildfires are also a significant contributor to GHG emissions by releasing high-emitting gases from combustion directly into the air and affecting the health of surrounding municipalities [13]. Lastly, unsustainable land use practices, such as oil palm cultivation, can produce 20–25 tons of CO₂e per hectare over a year.

2.3 GHG Emissions in the Agriculture Sector

The agricultural sector is a human activity in preparing food and raw materials a country needs, including farming, plantation, livestock, and fishery activities. Emissions from this sector are strongly influenced by rice cultivation, cattle breeding, synthetic fertilizers, and agricultural waste issues [14]. Farming activities contribute significantly to GHG emissions of up to 22.7%. For example, rice cultivation creates emissions from land clearing, using inorganic fertilizers and pesticides, applying lime to reduce soil acidity, and burning rice straw waste. Furthermore, livestock activities produce emissions, mainly from enteric fermentation and manure management [15]. For example, cattle, which are ruminants, contribute the most to methane gas (CH₄), which has an emission factor 20–30 times higher than carbon dioxide (CO₂). Finally, fisheries activities contribute fewer emissions than farming and livestock activities. Still, the use of fossil fuels in vessels, waste management, and energy use in fish management facilities also cause GHG emissions.

2.4 GHG Emissions in the Waste Sector

The waste sector includes residues from various industrial activities and daily human activities. This sector produces GHG emissions from several activities, such as open burning, anaerobic decomposing waste in landfills, biological processes in composting activities, and marine debris [15]. Landfills accommodate 60% of solid waste without segregation and treatment, making it the most significant contributor to methane emissions in Indonesia. Furthermore, the composting process for food waste also produces

GHG emissions [16, 17]. Indonesia is ranked second globally as a food waste-producing country, with an average person disposing of 115–184 kg per year [18]. Unfortunately, this happens even though on the global hunger index, Indonesia is ranked 70 out of 107 countries. Finally, marine debris, which consists of plastic waste that does not decompose, can threaten aquatic ecosystems and generate GHG emissions through its decomposition process. 3R (Reduce, Reuse, Recycle) measures are needed to reduce GHG emissions in this sector, increasing waste processing in landfills and utilizing waste as an energy source [12, 15].

2.5 GHG Emissions in the Industrial Price and Production Use (IPPU) Sector

The IPPU sector encompasses various industrial activities and processes that impact GHG emissions. Industrial processes strongly influence emissions from this sector, emitting products and waste management. Industrial processes, such as cement, steel, paper, and petrochemical production, produce carbon dioxide (CO₂) emissions from the combustion of fossil fuels during the production process [19]. Furthermore, emitting products generated from the IPPU sector, such as plastic products, create emissions in the manufacturing and transportation stages of the supply chain. These processes also involve using energy and fuel to increase the final carbon footprint and industrial waste management, which can generate emissions from the waste decomposition process. It is necessary to use more green technology and reduce the use of emitting products.

3 Methodology

This research was conducted using a qualitative and thematic analysis approach. The data collection process consisted of two stages; the first involved reviewing normative documents related to GHG emissions management. The second stage involved reviewing relevant journals, paying attention to current issues in Indonesia, and collecting other supporting information. This study focuses exclusively on analyzing regulations related to GHG emissions management. The analysis results are then reviewed to see if they have been able to encourage the achievement of the Net Zero Emission target in 2060.

4 Discussion: GHG Emissions Management Regulations

4.1 Energy Sector

Regulation of GHG emission management in the energy sector starts with Land Use and Land Use Change forestry (LULUCF) policies for energy extraction activities [20]. The government has long regulated the application of the principle of preservation of environmental functions in its extraction activities, as stated in Law No.32 of 2009, Law No.21 of 2014, and ESDM Regulation No.20 of 2017. Then, in 2019, Presidential Instruction (PI) No.5 2019 officially authorized a permanent ban on issuing new licenses for clearing primary natural forests and peatlands. That, known as the Forest and Peatland Moratorium, aims to protect the remaining 66.2 million hectares of land.

Next, companies exploiting energy resources, whether in drilling, mining, power generation, or other uses, must comply with regulations to reduce flare and fugitive gas emissions. Some of these regulations are:

1. Drilling and mining - MEMR Regulations No.22 of 2019, No.5 of 2021; No.15 of 2022 and No.2 of 2023; and Government Regulation (GR) No.96 of 2021
2. Power generation - MEMR Regulation No.16 of 2022 and Presidential Regulation (PR) No.112 of 2021
3. Other uses - Ministry of Environment and Forestry (MoEF) Regulation No. 11 of 2021

Furthermore, in the energy transformation process, the government focuses on regulations to transition to renewable energy, as stated in MEMR Regulation No.50 of 2017 and PR No.11 of 2023. Finally, in the activities of transmission, energy distribution, and energy consumption, researchers only found that regulations can indirectly contribute to emission reductions through better management practices (MEMR Regulation No.12 of 2021) and setting exhaust emission standards for motor engines (Sect. 206 of GR No.22 of 2021). Remember, to support companies to invest in low-emission technologies, the government provides incentives for renewable technology development facilities that are green technology (Minister of Finance Regulation No.192/PMK.01/2014).

4.2 FOLU Sector

Regulations in the FOLU sector primarily target the suppression of emissions from human activities in using forests and peatlands and the functioning of forests as carbon sinks (MoEF Regulations No.14 of 2020, No.16 of 2020, No.1 of 2022, and Guidelines for the Implementation of National GHG Inventory). The national program evidences that ‘FOLU Net Sink 2030’ stipulated in PR No.98 of 2021, is a planning document that outlines targets, policies, and work steps for GHG emission reduction until 2030 [12, 15]. MoEF also issued Regulation No.7 of 2023 to support this program on carbon trading procedures in the forestry sector. Furthermore, the government regulates fire prevention guidelines to address GHG emissions from forest and land fires (GR No.4 of 2001, Law No.32 of 2009, and many Regional Regulations). As for unsustainable land use activities such as oil palm plantations, the government implemented the Indonesian Sustainable Palm Oil (ISPO) certification system (PR No.44 of 2020) to promote sustainable practices and accelerate GHG reduction [21]. At the global level, Indonesia also participates in the Reducing Emissions from Deforestation and Forest Degradation (REDD +) program, part of the Forest Carbon Partnership Facility (FCPF) [22].

4.3 Agriculture Sector

Regulations governing agricultural activities still need to be improved in their implementation in Indonesia as most communities still practice traditionally. This limitation reflects that the government is still in the process of developing comprehensive guidelines to regulate agricultural activities that are more modern, sustainable, and eco-friendly [21]. To date, the research found only a few regulations that focus on specific aspects of the agricultural sector, such as action plans, synthetic fertilizer use, agricultural waste management, environmental impact assessment and rehabilitation, and mitigation technology development schedules (Ministry of Agriculture (MoA) Strategic Plan 2020–2024, PI No.6 of 2019, Minister of Industry (MoI) Regulation No.6 of 2019,

MoI Regulation No.50 of 2020, MoEF Regulations No.18 of 2020 and No.4 of 2021, Ministry of Marine Affairs and Fisheries (MMAF) Regulation No.26 of 2021, MoA Regulation No.10 of 2022, and PR No.64 of 2022).

4.4 Waste Sector

Regulations in the waste sector emphasize monitoring and evaluating emissions, encouraging low-emission technologies, setting standards for emitting engines, and regulating waste management. That is done to reduce negative impacts on the environment and maintain the sustainability of the living environment. Some relevant regulations include Ministry of Public Works (MPWH) Regulation No. 03/PRT/M/2013, Ministry of Environment and Forestry (MoEF) Regulations No. P.87 of 2016, P.70 of 2016, P.20 of 2017, No.5 of 2021, and No.27 of 2021, GR No.22 of 2021, Law No.15 of 2021, and Ministry of Home Affairs Regulation No.7 of 2021. In addition, the government has also developed the ‘Technical Guidelines for the Compilation of Air Pollution Emission Inventory in Urban Areas’, which helps stakeholders calculate the emission burden from stationary sources and contribute to air quality. Then, there is the ‘Guideline for the preparation of GHG Inventory Activity Data for Local Government’ to estimate the sources and amount of emissions from waste management activities in landfills, biological treatment (composting), and open burning at the local level. As for emission regulations related to marine debris management, the government has just planned the 2018–2025 national action (PR No.83 of 2018).

4.5 IPPU Sector

Regulations related to emissions in the IPPU sector need to be clearly stated in the regulations, but the Ministry of Industry has been advocating for decarbonization of the industrial sector. The Ministry of Industry is developing an action plan and roadmap for realizing green industry standards and providing incentives for technological restructuring (Law No.3 of 2014). Decarbonization is not just about requiring industries to comply with emission standards by managing emissions, installing pollution control devices, qualifying workers, and monitoring and reporting to the MoEF in real-time. However, it also uses the monitoring results to calculate emission load combustion performance, develop emission mitigation strategies, and invest in green technology. Decarbonization is promising due to consumers’ increasing green lifestyle awareness, climate change vulnerability, and export activities that require sustainable practices [23]. The industry is also encouraged to accelerate the use of renewable energy and avoid emission products by the MEMR. As for industrial waste management, some regulations have been set, such as MoEF Regulation No. P.56 of 2015, No.6 of 2021, and Ministry of Industry Regulation No.46 of 2020.

4.6 Carbon Pricing

Carbon pricing is a market-based strategy to reduce GHG emissions by imposing a cost of emissions on society. The polluter pays principle encourages changes in fossil energy

consumption behavior to sustainable energy. There are two main types of carbon pricing: Emission Trading System (ETS) and carbon tax [24]. ETS is a market mechanism set by the government to regulate and limit emissions in specific economic sectors, and the sector can trade the difference in quota (tradable). Meanwhile, the carbon tax is a fiscal burden on GHG emissions generated in economic activities.

Indonesia's carbon tax policy first appeared in the Harmonization Law No.7 of 2021. The regulation states that the tax object is emissions that have a negative impact on the environment; the tax subject is an individual or entity that purchases carbon-containing goods and performs activities that produce carbon emissions in a certain amount and time; when payable is when the goods are purchased, the end of the calendar year period of the activity that produces carbon emissions, and other times regulated by GR. Finally, the rate per kg CO₂e must be higher or equal to the carbon price in the carbon market and at least IDR 30 per kg CO₂e. This regulation is detailed in PR No.98 of 2021 and Sects. 69 and 70 of GR No.55 of 2022, which explain the implementation of rights and fulfillment of carbon tax obligations. However, considering the maturity of the implementation rules, post-Covid-19 economic conditions, and global energy instability, the Ministry of Finance postponed the carbon tax implementation until 2025.

During the postponement of the carbon tax, the Indonesian government still initiated the ETS with the cap and trade method stipulated in Presidential Decree No.98 of 2021 and MEMR Regulation No.16 of 2022. These regulations established emissions trading through the Indonesia Carbon Exchange (IDX Carbon) in three phases: the first in 2023–2024, the second in 2025–2027, and the third in 2027–2030. This first phase is participated by 99 coal-fired power plants from 42 companies that contribute 81.4% of the national electricity. This trade requires an agreement that the trade should not be conducted between the same companies. The government hopes implementing a carbon tax and ETS for all sectors can help reduce emissions by encouraging companies to reduce their carbon footprint and invest in decarbonization and renewable energy.

5 Conclusion

The government has many regulations that prescribe emission management in the energy and waste sectors. These regulations have specifically explained how to reduce and mitigate emissions in the drilling, mining, power generation, and other energy-using industries. Regulations in the waste sector have also targeted waste management to have minimal environmental impact. The government is focusing heavily on regulating the acceleration of the energy transition as a commitment to addressing the global energy crisis by targeting renewable energy of 23% of total energy sources by 2025. However, according to the research institute Center of Economic and Low Studies (Celios), the government still needs to strengthen regulations to encourage energy transition by making climate change laws. Suppose you look at the conditions in the field related to the planned retirement of coal-fired power plants. In that case, many regional governments need more time to be ready to make an energy transition, and it is feared that it will pressure the labor and income of people who depend on the PLTU supply chain. The Ministry of Energy and Mineral Resources must encourage equitable energy transition

by drafting regulations at the level of laws and technical plans in the form of the Comprehensive Investment and Policy Plan (CIPP) and the Just Energy Transition Partnership (JETP).

Regulations that implicitly affect emissions management are mainly in the FOLU, agriculture, and IPPU sectors. The FOLU sector intensely focuses on regulating land use and GHG emission reduction by enabling forests to participate in REDD+. Furthermore, regulations related to emission management have yet to be found in the agricultural sector because most agrarian practices in Indonesia are conventional. The government needs to develop and implement comprehensive regulations to ensure that agricultural activities in Indonesia can contribute positively to the environment, sustainability, and mitigation of greenhouse gas emissions. In the IPPU sector, regulations still need to be improved because the government is still drafting regulations to support the decarbonization of the industrial sector.

With the limited scope of existing regulations for emissions management, the government regulates carbon pricing to be applied to all sectors that produce emissions. Both carbon trading and the carbon tax will make companies feel the direct impact of negative externalities and be motivated to decarbonize by investing in renewable energy technologies. It also increases the consumption price of emitting products, making consumers switch to low-emission products. The Indonesian government is determined to realize the Net Zero Emission target in 2060.

This research has limited time to access regulations related to emission management, so the literature review may need to be more comprehensive. Furthermore, the author's lack of knowledge of legal perspectives may lead to different perspectives in drawing conclusions and comparative effectiveness. Therefore, care needs to be taken when understanding the content of the regulations listed. Then, with the new regulations that will be implemented, future research can further analyze whether these regulations are relevant and effective in realizing the Net Zero Emission target. Finally, this literature review is still comprehensive in scope, so it requires further study to examine regulations that focus on each sector, especially the agricultural and IPPU sectors, which still need to be explored.

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

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The Role of Green Human Resource Management and Managerial Concerns for Environment in Enhancing Green Innovation: Evidence from Indonesia

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Abstract. Recent sustainability literature has presented green innovation as a vital factor in enhancing sustainability. Most researchers explored the outcomes of green innovation. However, scant literature has been found that explores the antecedents of green innovation. The prior literature revealed that GHRM and managerial environmental concerns may be the potential antecedents of green innovation. Therefore, we further the existing literature by not only testing the direct relationship of GHRM and managerial environmental concerns with green human capital but also the mechanism of green human capital that serves as an intervening variable between the direct relationship of GHRM and managerial environmental concerns. The data was collected through surveys of 320 managers of Indonesian organizations. The data was analyzed using SmartPLS 3 software. The findings of the study suggest the positive association of GHRM practices and managerial environmental concerns with green human capital and an indirect effect of GHRM and managerial environmental concerns on green innovation.

Keywords: Managerial concerns for environment · green HR practices · green innovation · green human capital

1 Introduction

Expeditious industrial growth has contributed to numerous environmental challenges, with policymakers and corporations now realizing the value of environmental protection for social and economic development [1]. Today, green human resource management (GHRM) practices are integrated with organizational policy to boost the firm's image and meet sustainability targets, under demand from states, environmental laws, and stakeholders [2]. In order to enhance environmental efficiency and achieve a comparative edge, GHRM activities are thus becoming vital [3].

GHRM is gradually being used as a critical instrument for the adoption of green policies and environmental protection activities [4]. GHRM applies to “HRM environmental management aspects” [3]. This provides a range of HRM practices intended to increase environmental efficiency (green recruitment and engagement, green recruiting, and green performance and compensation) [5]. Such green HR practices will encourage the expertise and enthusiasm of workers and provide them with opportunities to engage in green activities [6]. These activities represent a company’s emphasis on environmental sustainability and show a set of environmentally friendly HR practices [7]. They will also boost the image of the organization and strengthen its sustainable environmental efficiency [8].

Given the significance of GHRM in deciding the viability of an organization, its histories and findings have been thoroughly explored and further established [3]. The association between GHRM and employee actions and operational performance has been explored in the GHRM literature [2, 9–11], for example, has built a GHRM calculation and evaluated its effects on employee green behavior. They noticed that GHRM has a beneficial impact on employee green activity and indirectly influences employee green behavior through a mentally green atmosphere [11]. [12] considered GHRM to have a beneficial impact on the psychological pro-environmental resources that lead to the pro-environmental actions of its employees. Several reports have concentrated on how GHRM affects the actions of workers [2] and [3]. The latest research has explored how GHRM has a beneficial impact on the environmental efficiency of businesses. [13] noticed that GHRM may develop a green corporate culture that influences the environmental and sustainable development efficiency of the firm positively. While researchers have researched the impact of GHRM on company results at employee and corporate levels, it is still important to investigate how and when GHRM impacts green corporate innovation.

Previous experiments have investigated whether environmental creativity is favorably influenced by HRM or high-performance job activities, and “paradox theory” was utilized to explore the effect of HRM on the environmental dimension of corporate sustainability [14]. The GHRM-Green Innovation partnership has, however, gained inadequate methodological consideration. Following human capital theory (HCT) in discussing how GHRM influences green creativity, we resolve this gap in the existing literature. Considering HCT, [9] introduced the idea of GHC, which applies to the collection of abilities, expertise, intelligence, experience, responsibilities, etc. of workers for environmental security. GHRM may improve employees’ capacity, incentives, and opportunities through green recruitment, green pay and compensation, green engagement, and so on to boost corporate “human capital,” impacting the company’s green process, product, or creativity. Hence, as a crucial intervening variable to explore the influence of GHRM on the firm’s green creativity, we chose “green human capital” (GHC). By introducing green HR procedures, top management issues have a beneficial impact on the pace at which businesses start environmental initiatives [14]. Therefore, the management that shows concerns regarding the environment plays a key function in linking the GHRM and GHC of an organization in “environmental management.”

2 Objective and Structure of Research

The objective of this study is to test and analyze the influence of The Role of Green Human Resource Management and Managerial Concerns for Environment in Enhancing Green Innovation. This study has three sub-main part, namely:

- Introduction, which explains the theoretical issue and business fact that is related to green Human resources management and Green Innovation in manufacturing company context.
- Literature Review and Methods, including GHRM and Green innovation, Green Human Capital and Managerial environmental concern. Methodology includes data collection through questionnaires, population and sample, and data analysis techniques
- Results, discussion, and research limitations. Interpretation the results of the study and discuss and explain the limitations of the research.

3 Literature Review

GHRM and Green Innovation

Companies must proactively implement procedures to resolve environmental issues under strain from environmental laws and policies [15]. To enhance environmental sustainability, the GHRM is increasingly considered a central policy for green management procedures [2]. Therefore, several authors have examined the impact of GHRM on environmental efficiency, which may consequently enhance firms' competitiveness [9]. In this regard, [11] showed that the relationship between "stakeholder pressures and environmental performance" is mediated by GHRM. [9] found that financial efficiency is influenced positively by GHRM. Though limited studies have considered the relationship between "GHRM and green innovation,"

The literature highlights that green innovation condense ecological detrimental effects while at the same time meeting the environmental targets of an organization and delivering environmental benefits [16]. Previous research has also shown that HRM will strengthen the understanding, expertise, and willingness of workers to facilitate the product and service innovation of the business [17]. We say that GHRM favorably impacts green engineering on the basis of this argument. Second, green recruiting increases the attractiveness of the organization's "environmental management." Being employed by workers that are tuned to ecological impact would cause them to partake in more environmentally sustainable practices [18]. Individuals at the workplace with increased ecological potential and understanding levels can produce more useful and innovative environmental policy innovations, thus improving the green creativity of the organization. Companies can also employ workers who are deeply engaged with sustainability activities to build and support green creativity [3].

Second, corporate training and engagement activities should provide workers with prospects to gain the skills and expertise needed to develop their creativity [19]. In particular, when an organization focuses on sustainability training and engagement that will help its workers develop expertise and skills in the environment, it can encourage the development of innovative concepts for green manufacturing or process innovation [16].

Employees will help recognize environmental problems through green preparation and are more willing to partake in suitable programs to promote green creativity. Furthermore, green engagement will build a context that increases the green actions of workers and offers an incentive for employees to utilize their green expertise and skills, thereby promoting green creativity [20, 21].

Third, green performance monitoring and incentive procedures may better balance the actions of workers with the company's environmental priorities [3]. While "green innovation" is the feature of ecological control that tackles ecological issues specifically, "green performance management" is an important method to increase the ecological engagement of workers and therefore their ability to participate in environmentally sustainable innovation. In addition, a corporate atmosphere for creativity may be generated by rewarding sustainability initiatives and new concepts for renewable goods or processes [2]. Organizational leaders should empower workers to be innovative in this sense, deprived of distress or disappointment in environmental goods or creativity procedures [22, 23].

Lastly, past studies show that HRM structures may have a beneficial impact on innovation in goods or procedures, indicating that the complementary usage of HR practices may have a stronger impact on innovation than specific practices alone [17]. The dimensions of GHRM activities as a whole, which lead to green creativity, are therefore regarded. GHRM activities may enhance the skills, incentives, and rewards of workers through the above-mentioned reasoning, thus improving their specific awareness of green product or process creativity.

Green Human Capital as a Mediator

According to the theory of human capital, human capital is the amount of employees' experience, expertise, and talents that can generate value and the core assets of businesses, contributing to a sustainable competitive advantage [24]. Because human capital is special to each organization, it provides important resources and skills for the competition of the business and is impossible for other businesses to replicate [25]. In the context of environmental pressures, businesses will see ways to change the atmosphere and pursue constructive measures to address environmental concerns and attitudes toward them [26]. [27] built a GHC variable that utilizes human capital as a base and sums up employee expertise, talents, capacities, behaviors, perspectives, commitments, creativity, and so on to handle and resolve environmental concerns. Some scholars are also beginning to explore the past of GHC, such as corporate environmental ethics and corporate social responsibility [26]. However, the correlation between GHRM and GHC was not identified in any studies.

Previous research has demonstrated that HRM activities can offer effective methods to build and turn market talent into human capital and support organizations in meeting their corporate priorities and goals [28]. We suggest that GHRM will affect GHC positively. Second, to confront external environmental challenges, businesses embrace green HR activities as an effective tool to build human resources to tackle environmental concerns [14]. To meet sustainability expectations, businesses attract renewable workers and encourage their desire to protect the atmosphere in order to boost the renewable ability of corporations and help them reach their environmental objectives [29].

Secondly, executive preparation and engagement will improve the supply of human resources [30]. Companies should also invest in improving workers' special abilities and expertise through means of training programmed that build inimitable core potential and thereby improve their intellectual resources [19]. Green education will increase employee capacity particularly in the light of environmental pressures [4], thus improving the company's ability to address environmental problems with GHC. In addition, as organizations encourage workers to take part in organizational decisions, employees are encouraged to share their know-how and abilities with their colleagues which contributes to an increasing exchange of knowledge [24]. Green engagement practices will build an atmosphere where workers interact with environmental concerns, provide them with opportunities to share their green awareness and environmental management skills. Green communication activities will therefore encourage the GHC of an organization.

Third, performance evaluation and compensation are essential human resources activities that increase the human capital of the business [26]. By offering workers input about their expertise and knowledge, performance assessment helps preserve and enhance the importance and individuality of human organizational resources [31]. Compensation practices can also boost intellectual resources through the attraction and development of valuable workers and the motivation to gain skills [32]. Green success monitoring and benefit strategies can affect the intellectual resources of an organization according to the same logic. Green success improvement methods will direct green actions in line with environmental organizational goals [9]. As businesses face environmental challenges, a green performance evaluation will give workers input on environmental achievements, encouraging them to achieve the environmental awareness and expertise needed to create GHC. In addition, environmental management pay policies are successful in generating workers' engagement and contributions on behalf of environmental management, thus maximizing GHC. In brief, under growing environmental constraints, businesses may gain and maintain renewable human capital by pursuing complementary GHRM practices.

Previous researchers found that intellectual resources encourage creativity [33]. In this report, we say that renewable human resources will have a significant effect on green innovation. Next, green HR activities will boost the green resources of the organization. GHC is the amount of expertise, talents, capacities, and so on of employees committed to environmental management that provides an atmosphere for tolerating green innovation failure and danger [17]. Companies use staff awareness, expertise, and openness to errors and ambiguities, which have a positive effect on green creativity. Second, the operational expertise and skills required for environmental sustainability, which are incorporated into staff and administrators, are essential for developing renewable creativity in green human resource management [2]. [34]. Companies experience environmental risk by stressing renewable engineering to solve external environmental issues and by creating fresh innovations for green goods or processes. Finally, the core resource of a company's human resources is creativity [17]. GHC is a unique advantage to businesses because green expertise and skills workers will build and expand prospects for green creativity.

H1: GHRM has a significant direct influence on GHC

H2: Managerial environmental concern has a significant direct impact on GHC

H3: GHC has a significant direct impact on green innovation

H4: GHRM has an indirect impact on green innovation through GHC

H5: Managerial environmental concern has an indirect impact on green innovation through GHC

4 Research Methods

In order to validate our theory, a questionnaire survey was used to gather data in many sectors for the purpose of this study. Because of the heavy pollution induced by Indonesia's rapid industrial growth, the government has recognized the social, economic, and environmental value of green development. In this scenario, in many sectors, the government has increased environmental legislation, giving greater importance in particular to the retail, utility, and high-tech and new-tech industries. Data was collected from managers working in Indonesian organizations of manufacturing companies in Indonesia. The respondent was medium- or upper-level managerial. The researcher clarified the intent of the study related to the GHRM activities and "green innovation" of the business. Medium or upper managers were the respondents. A total of 320 questionnaires were delivered. The single-factor Harman's test was utilized to determine the "common method variance" (CMV). The outcome shows that the existence of four variables, as compared to a unique element, suggests that our findings are unquestionably influenced by CMV.

The GHRM questionnaire modified from [35]. The items are "Employee selection based on environmental criteria," "employee attraction through environmental commitment," "employee involvement on environmental issues," "Environmental training for employees," "Environmental training for managers," "Managers evaluation includes environmental performance," "Employees evaluation includes environmental performance," "non-monetary incentives for environmental performance" and "Variable compensation based on environmental performance."

The managerial environmental concern questionnaire was modified from [36]. The items are "environmental innovation is an important component of the firm's environmental management strategy," "most environmental innovations are worthwhile," "environmental innovation is an ineffective environmental management strategy," and "environmental innovation is not necessary to achieve high levels of environmental performance."

The GHC questionnaire was modified by [37]. The items are "the managers in the company can fully support their employees to achieve the goals of environmental protection," "the employees 'competence in environmental protection in the company is better than that of its major competitors,'" "the cooperative degree of team work about environmental protection in the company is more than that of its major competitors" and "the productivity and contribution of the employees about environmental protection in the company is better than those of its major competitors."

The green innovation questionnaire was modified by [38]. The items are "the company uses the fewest amount of materials to comprise the product for conducting the product development or design," "the company uses the fewest amount of materials to comprise the product for conducting the product development or design," "the company would circumspectly deliberate whether the product is easy to recycle, reuse, and decompose for conducting the product development or design," "the manufacturing process of

the company effectively reduces the emission of hazardous substances or waste,” “the manufacturing process of the company reduces the consumption of water, electricity, coal, or oil” and “the manufacturing process of the company reduces the use of raw materials.” All questionnaire items used five Likert scales. The statistical techniques using SmartPLS 3 software.

5 Result

The reliability and validity of variables are further examined. In order to determine the convergent validity of all variables, this research used composite reliability (CR) and extracted the average variance (AVE). The CR values of all constructs were 0.826, 0.773, 0.799, and 0.806, which were higher than the baseline of 0.70 (1994). All constructs had AVE values of 0.511, 0.563, 0.503, and 0.513, which were above the 0.5 threshold. The findings revealed that there was acceptable convergent validity for each construct. We tested the discriminant validity further. The square root of all AVE variables must be greater than the similarities between each pair of constructs to satisfy the criterion of discriminant validity [39, 40]. The result can be shown on Fig. 1.

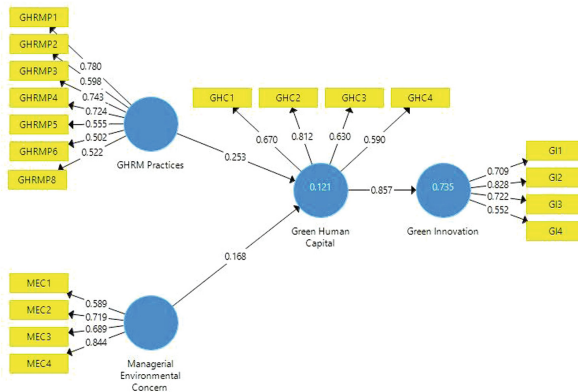


Fig. 1. Estimations of Measurement Model

Before exploring the theory of mediation, we explored the key impacts of GHRM on GHC. Table 1 and Fig. 2 displays the results. In the research model ($\beta = 0.252$, $t = 4.652$, $p < .05$), the GHRM had a favorable impact on GHC and thus supported Hypothesis 1. Managerial environmental concerns ($\beta = 0.168$, $t = 3.140$, $p < 0.05$) were favorably associated with green innovation, and Hypothesis 2 was thus endorsed. Regarding hypotheses 3 and 4, the analysis has found a significant indirect effect of GHRM practices ($\beta = 0.216$, $t = 4.274$, $p < 0.05$) and managers’ environmental concerns ($\beta = 0.144$, $t = 3.139$, $p < 0.05$) on green innovation through GHC. Table 1 displays the results.

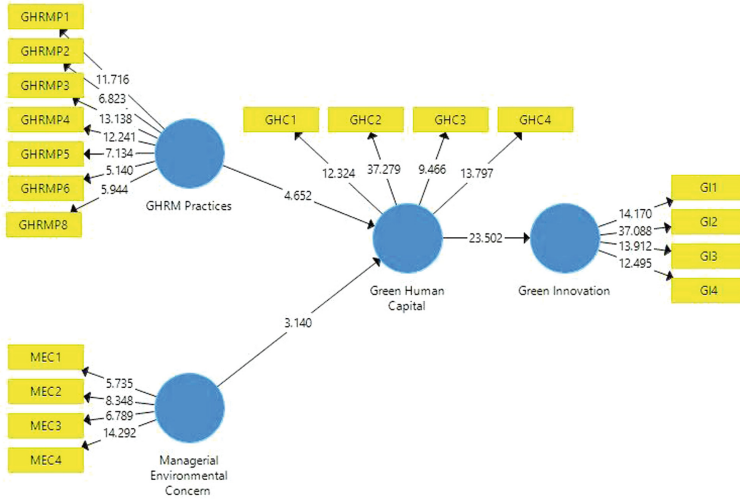


Fig. 2. Estimations of Structural Model

Table 1. Hypotheses Results

Hypothesis	Beta	S.E	T Value	P Value	Decision
GHRM Practices - > GHC	0.252	0.054	4.652	0.000	Supported H1
GHC - > GI	0.857	0.036	23.502	0.000	Supported H2
MEC - > GHC	0.168	0.054	3.14	0.002	Supported H3
GHRM Practices - > GHC - > GI	0.216	0.051	4.274	0.000	Supported H4
MEC - > GHC - > GI	0.144	0.046	3.139	0.002	Supported H5

Note: GHRM = Green Human Resource Management, GHC = Green Human Capital, GI = Green Innovation, MEC = Managerial Environmental Concern

* Significance level < 0.05

6 Discussion

A move to investigate the process of how GHRM affects green creativity has been taken by the current report. Previous research mostly investigated how GHRM influences environmental efficiency or green actions of employees [2]. Second, [2] examined the mediating impact of GHRM on green creativity, focusing on the principle of human resources. Third, the impact of the managerial environmental concerns on green innovation has been further revealed. Finally, [2] has examined the indirect impact of managers' environmental interests on green creativity. Previous research also outlined the GHRM dimensions and components and how they impact the environmental efficiency and financial performance of the business [3]. Nevertheless, few studies have explored the link between GHRM and green innovation. Our results showed that GHRM positively affects the green innovation of the business, suggesting that by implementing green HR

practices, businesses will boost their green innovation. Recent research on how GHRM affects the results of the business at the corporate level, which led to the HRM hypothesis, is also backed by our results.

Second, our results show that renewable human capital is favorably influenced by GHRM, which in turn stimulates green creativity. This discovery reflects a major addition to the philosophy of human resources. Previous research has demonstrated that HRM activities can offer helpful opportunities to increase and turn the wealth of the enterprise into human capital, thereby maximizing its operational performance. This research used the principle of human resources in its analysis to investigate the GHRM mechanism for green innovation. The findings show that the connection between GHRM and green innovation has been partly mediated by GHC, which implies that GHC plays a critical role in its partnership. This research also broadens recent studies on how GHRM impacts pro-environmental psychological resources and improves pro-environmental actions of workers, supporting the sustainable growth of the organization [9]. This research also includes analytical analysis to establish the function of its association. The findings further expand the background and outcomes of GHC, which allow us to better understand how green HR activities improve the green creativity of the enterprise and add to recent studies about how GHRM impacts organizational results.

Third, in addition to the relationship between GHRM and GHC, the research further shows the influence of managerial environmental concerns. The findings reveal that GHC was favorably influenced by managerial environmental concerns, which indicates that the management of the top manager was very significant in addressing environmental problems for human capital achievement. The observations further expand the precedents of GHC. Furthermore, in conjunction with “green innovation,” managerial environmental concerns have an important role. The finding indicates that managerial environmental concerns will boost the green innovation of the business through GHC, particularly when the top managers of the manufacturing company appear to be concerned about environmental problems.

7 Limitations and Future Research Agenda

There are several drawbacks we can fix. Next, this research obtained knowledge from numerous sectors. And if this would guarantee the generalizability of our conclusions, with such markets, this research cannot offer information into how the outcomes could vary. Thus, this research can test one form of sector, such as construction, in future research, which could need further green innovation to tackle environmental issues. Second, it may take time for green HR practices to affect the green innovation of a firm. At one point in time, this research gathered evidence that could have generated a possible CMV issue and contributed to variation not completely clarified by the GHRM-green relation of creativity. Therefore, this research used one element of the Harman to test the impact of CMV, which was not a significant problem for our observations.

This research suggests experimental experiments to examine their partnership to overcome this constraint. Third, in the Chinese sense, we investigated and evaluated this model. Thus, because of the cultural background, the generalizability of our results can be restricted. This research proposes that the results in the Western cultural sense

should be examined in future research. Operational policy, organizational environment, and other organizational variables that may influence the correlation between GHRM and green innovation should be considered in future research.

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Dynamic Adaptive Intrusion Detection System Using Hybrid Reinforcement Learning

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Abstract. The research aims to develop a novel Intrusion Detection System (IDS) using computational intelligence, specifically focusing on a hybrid reinforcement learning approach. Unlike traditional IDS that rely on static rule-based approaches, this IDS will dynamically adapt and learn from network traffic patterns, allowing it to detect and respond to emerging threats effectively. By developing an IDS based on hybrid reinforcement learning that can dynamically adapt to emerging threats, this research can significantly contribute to the field of cybersecurity and aid in building more robust and proactive defense mechanisms for network security. The concepts of Deep Q-Networks (DQN), Proximal Policy Optimization (PPO), and Monte Carlo Tree Search (MCTS) are reinforcement learning algorithms that can be applied in a Dynamic Adaptive Intrusion Detection System (IDS) to enhance its adaptability and decision-making capabilities. Each algorithm contributes unique strengths to different aspects of the IDS's dynamic adaptation process.

Keywords: Dynamic adaptive Intrusion Detection System · Deep Q-Networks · Proximal Policy Optimization · Monte Carlo Tree search

1 Introduction

A Dynamic Adaptive IDS is an intelligent network security mechanism designed to adapt its detection strategies and decision-making processes in response to changing network conditions, traffic patterns, and emerging threats. In contrast to conventional static IDS systems, a Dynamic Adaptive IDS utilizes machine learning and reinforcement learning methods to continuously learn from its surroundings and enhance its detection capabilities as time progresses. By integrating machine learning and reinforcement learning techniques, the IDS can learn from experience, adapt to changing network dynamics, and continuously improve its detection capabilities to defend against evolving cyber threats [1].

Before diving into the details of DQNs, it's crucial to lay the groundwork by developing a fundamental comprehension of reinforcement learning (RL). RL belongs to the realm of machine learning, encompassing scenarios where an agent acquires the ability to make a series of decisions by engaging in interactions with its environment. The primary aim of the agent is to optimize its cumulative reward signal as time progresses. In the realm of intrusion detection, the agent, driven by observed network traffic, strives to minimize the consequences of intrusions [2].

Q-learning constitutes a pivotal reinforcement learning technique through which the agent acquires knowledge about Q-values associated with each state-action pair. These Q-values represent the expected cumulative reward the agent can achieve by taking a specific action from a given state. They are updated iteratively using the Bellman equation [3], which relates the Q-value of a state-action pair to the Q-values of future states [4].

DQN is an advanced reinforcement learning algorithm that integrates deep neural networks with Q-learning, a widely used method for addressing Markov Decision Processes (MDPs).

In the context of a dynamic adaptive Intrusion Detection System (IDS), a Deep Q-Network (DQN) serves as a reinforcement learning model with diverse applications, including its relevance in intrusion detection systems (IDS).

Within this context, DQNs serve the purpose of instructing an IDS to recognize and respond to potential cyber threats [5]. DQNs amplify Q-learning's capabilities through the application of deep neural networks for the purpose of approximating the Q-value function. Within an IDS driven by DQNs, the agent continuously assesses the network's state and makes decisions pertaining to whether to allow, block, or alert concerning incoming network traffic. Its Q-values are perpetually updated based on the rewards and penalties ascribed to its actions. Over time, the DQN progressively learns to render decisions that enhance the overall security of the network by offering more effective identification and mitigation of intrusions.

Proximal Policy Optimization (PPO) is a reinforcement learning algorithm used for training agents to make sequential decisions in an environment. It's a powerful and popular method for training agents in scenarios where making multiple decisions over time is necessary. PPO is an improvement over traditional policy gradient method like Trust Region Policy Optimization (TRPO). It addresses some of TRPO's limitations by making more efficient use of collected data, providing better stability during training, and offering strong convergence guarantees. The core idea behind PPO is to update the policy in a way that improves it without straying too far from the current policy, thus ensuring stability and preventing catastrophic performance drops during training. PPO accomplishes this through a surrogate optimization objective that encourages small policy updates. It constrains the policy update step to be "close" to the previous policy, typically using a clipped probability ratio [6].

Monte Carlo Tree Search (MCTS) is a decision-making algorithm that's widely used in game-playing and optimization tasks. It has found applications beyond gaming, particularly in fields where decision-making under uncertainty is a key challenge. MCTS is well-suited for complex environments, making it a valuable tool in intrusion detection

systems (IDS), where network data is dynamic, and the landscape of threats is constantly evolving [7].

2 Related Work

Review some of the most current methods for applying hybrid reinforcement learning for dynamic adaptive intrusion detection system in this section.

In the paper referenced as [8], the author explores the concept of a context-aware and resilient intrusion detection system that harnesses the capabilities of deep reinforcement learning. The primary objective is to tackle the complexities associated with identifying and preventing intrusions within enterprise networks and systems. The research endeavors to create an intrusion detection system (IDS) that possesses the capacity to adapt to novel and intricate attack strategies while upholding a high level of accuracy and a minimal false positive rate (FPR). The proposed approach introduces a context-adaptive IDS that relies on the collaboration of multiple independent deep reinforcement learning agents distributed throughout the network infrastructure. The system is purposefully engineered to withstand adversarial attacks and incorporates the principles of a denoising autoencoder. To assess its effectiveness, the model underwent testing using three benchmark datasets: NSL-KDD, UNSW-NB15, and AWID. The results demonstrated superior accuracy and a reduced FPR when compared to existing systems. In essence, this research addresses critical challenges within the field of intrusion detection and offers a robust and adaptable solution for enhancing network security.

In reference to research labeled as [9], the primary focus revolves around the utilization of Deep Reinforcement Learning (DRL) algorithms in the realm of intrusion detection systems (IDS) by leveraging labeled datasets. The authors' core objective is to illustrate the enhancements in intrusion detection performance achievable through DRL when juxtaposed with existing machine learning and deep learning techniques. The experimentation in this study encompasses four distinct DRL models, namely the Deep Q-Network (DQN), Double Deep Q-Network (DDQN), Policy Gradient (PG), and Actor-Critic (AC), with the DDQN model yielding the most favorable results. A notable contribution of this research lies in the introduction of an innovative approach. It involves the replacement of the conventional live environment within the classic DRL paradigm with a sampling function centered on recorded training intrusions. Furthermore, the study delves into the significance of the discount factor within the domain of DRL. It emphasizes the meticulous selection of the discount factor's value for optimizing intrusion detection outcomes. The paper posits several merits associated with employing DRL for intrusion detection. These advantages include the simplicity and expeditious nature of the neural networks utilized, the adaptability of the reward function, and the inherent capacity for continuous online learning.

In research documented as [10], the focal point is the growing complexity of Network Intrusion Detection Systems (IDS). The escalating volume of network traffic and the ever-evolving landscape of attack vectors have rendered traditional IDSs susceptible to challenges concerning adaptability and performance. The authors present a novel solution, the Intrusion Detection Hyperparameter Control System (IDHCS), which harnesses Proximal Policy Optimization (PPO) within the framework of reinforcement learning.

The IDHCS comprises two integral components Deep Neural Network (DNN), feature extractor and a k-means clustering module. The DNN feature extractor is engineered to dynamically select pertinent features from network traffic, while the k-means clustering component identifies intrusion activities. The PPO-based reinforcement learning model diligently refines the system, endowing it with the innate capability to autonomously adapt to evolving network environments. This paper brings to the forefront the limitations associated with misuse-based and abnormal behavior-based IDSs. Furthermore, it subjects existing machine learning and deep learning approaches for IDS to critical examination. It underscores the exigency of a system capable of accommodating diverse datasets and network scenarios, which precisely encapsulates the overarching goal of the IDHCS. Empirical validation was conducted using two distinct datasets: CICIDS2017 and UNSW-NB15, resulting in noteworthy F1-scores of 0.96552 and 0.94268, respectively. Of particular significance is the amalgamation of these datasets to create a more intricate testing environment, yielding an F1-score of 0.93567. These results serve as a testament to the adaptability of IDHCS, which demonstrates an ability to confront novel attack types and augment IDS performance through perpetual learning. The research culminates with a resounding assertion regarding the effectiveness of reinforcement learning for hyperparameter optimization in IDS. This approach proffers a robust and agile solution to the multifaceted challenges posed by the ever-changing landscape of network environments.

The study described in [7] is primarily centered on augmenting the capacity to detect adversarial examples, specifically in the context of cross-site scripting (XSS) attacks. The authors introduce an algorithm denoted as MCTS-T, derived from Monte Carlo Tree Search (MCTS), designed to generate adversarial examples that can effectively circumvent conventional detection systems. A central feature of this algorithm is its ability to provide a reward value, indicative of the probability that the generated examples will remain undetected. Furthermore, the paper presents the incorporation of a Generative Adversarial Network (GAN) in the quest to enhance the detection model, thereby bolstering its precision in the identification of adversarial examples. It is noteworthy that while deep learning models have exhibited promise in the realm of intrusion detection, they remain susceptible to adversarial examples. These instances have the capacity to mislead machine learning models into making erroneous classifications, making their mitigation a pressing concern. The primary objective of the research is to mitigate this issue by deploying the MCTS-T algorithm for the generation of adversarial examples and harnessing GANs to enhance detection rates. The MCTS-T algorithm operates with careful consideration of two pivotal factors: ‘modification position’ and ‘modification action’ to guarantee the effectiveness of the generated adversarial examples. Additionally, the algorithm incorporates an improved version of the Upper Confidence Bounds (UCB) technique, referred to as UCB-T, in the selection phase of the MCTS-T algorithm.

3 Methodology

Designing a custom reinforcement learning architecture tailored for IDS involves creating a system that integrates deep learning techniques and traditional rule-based methods. This architecture is capable of learning from both labeled data (to detect known

attacks) and unlabeled data (to detect unknown attacks). It forms the core of the IDS's decision-making process.

3.1 Dynamic Feature Extraction

Proposing innovative methods for dynamic feature extraction [11] is essential to keep up with the evolving nature of network attacks. These methods should allow the IDS to extract relevant features from network traffic data, ensuring it can effectively represent complex attack patterns as they emerge in real-time.

3.2 Hybrid Reinforcement Learning

This research delves into a fusion of reinforcement learning algorithms, combining model-free techniques like Deep Q-Networks (DQN) capable of learning from data with model-based approaches such as Proximal Policy Optimization (PPO) and Monte Carlo Tree Search (MCTS) designed to optimize the decision-making process. The overarching objective of this hybrid methodology is to enhance the robustness and adaptability of Intrusion Detection Systems (IDS).

DQN operates by employing a deep neural network as a function approximator tasked with estimating the Q-function. This neural network takes the current environmental state as its input and produces Q-values for all feasible actions within that state. DQN introduces a pivotal technique known as "experience replay" to heighten data efficiency and stabilize the learning process. During training, the agent accumulates its experiences, encompassing state, action, reward, and next state, within a memory buffer referred to as the replay buffer [12]. Instead of learning from experiences sequentially, the agent randomly samples mini-batches of experiences from the replay buffer. This practice effectively mitigates temporal correlations within the data and guards against overfitting.

To address training instability, DQN introduces a target network. This network mirrors the primary Q-network but retains fixed parameters for a predetermined number of steps. The target network plays a crucial role in approximating the target Q-values for the Bellman equation, thus promoting more stable learning. At regular intervals, the primary Q-network parameters synchronize with the target network.

DQN employs the mean squared error (MSE) loss function to minimize discrepancies between the predicted Q-values and the target Q-values. Each target Q-value for a specific state-action pair is computed utilizing the Bellman equation:

$$Q(s, a) = r + \gamma * \max Q(s', a') \quad (1)$$

In the context of DQN:

- 'r' signifies the immediate reward acquired when a particular action 'a' is executed within the state 's'.
- 's' corresponds to the subsequent state.
- 'γ' stands for the discount factor, which dictates the significance of future rewards in the decision-making process.
- 'max Q(s', a')' denotes the highest Q-value associated with the following state 's'.

The training process of a DQN can be summarized as follows:

1. Initialize both the Q-network and the target network with random weights.
2. Observe the current state 's' provided by the environment.
3. Utilize the Q-network to choose the action 'a' with the highest Q-value in the state 's' (typically following an ϵ -greedy policy).
4. Execute action 'a' in the environment and observe the resulting reward 'r' and the subsequent state 's'.
5. Record this experience (s, a, r, s') in the replay buffer.
6. Randomly select a mini-batch of experiences from the replay buffer.
7. Compute the target Q-values for the mini-batch by using the target network and the Bellman equation.
8. Adjust the parameters of the Q-network via gradient descent to minimize the mean squared error (MSE) loss between the predicted Q-values and the target Q-values.
9. At regular intervals, synchronize the parameters of the target network with those of the Q-network.
10. Iterate through steps 2–9 for multiple episodes or until convergence is achieved.

3.3 Adaptive Decision Thresholds

Creating mechanisms to dynamically modify decision thresholds is of paramount importance. These thresholds need to take into account the present condition of the Intrusion Detection System (IDS) as well as the seriousness of identified threats [13]. This adaptability plays a pivotal role in preserving equilibrium between false positives (incorrectly identifying non-threats) and false negatives (overlooking genuine threats).

The clipped surrogate objective in Proximal Policy Optimization (PPO) is employed to promote minor adjustments in the policy and deter substantial alterations. It is defined as follows:

$$L(\theta) = E[\min(r_t(\theta) * A_t, \text{clip}(r_t(\theta), 1 - \epsilon, 1 + \epsilon) * A_t)] \quad (2)$$

Where:

- $L(\theta)$ represents the clipped surrogate objective used within the PPO framework.
- $r_t(\theta)$ stands for the ratio of the probability of taking action 'a_t' in state 's_t' under the new policy π_θ , compared to the probability under the old policy $\pi_{\theta_{old}}$.
- A_t signifies the estimated advantage for the state-action pair (s_t, a_t).
- ϵ is a hyperparameter that governs the range of the clipping, ensuring that policy updates remain small.

The advantage estimate A_t is determined by computing the disparity between the Q-value and the state-value function as follows:

$$A_t = Q(s_t, a_t) - V(s_t) \quad (3)$$

In this equation:

- A_t denotes the advantage estimate for the state-action pair (s_t, a_t).
- $Q(s_t, a_t)$ represents the Q-value associated with taking action 'a_t' in state 's_t'.
- $V(s_t)$ corresponds to the state-value function, which signifies the anticipated cumulative reward when situated in state 's_t' and adhering to the policy π_θ .

4 Results and Discussions

4.1 Real-Time Simulation Environment

To effectively train and evaluate the IDS, a realistic simulation environment is essential. This environment should replicate real-world scenarios by using datasets that include historical and live network traffic [14]. It allows the system to learn and adapt in a controlled setting before deployment.

The study utilized two datasets: CICIDS2017 [15] and UNSW-NB15 [16]. Each dataset was independently employed for experimentation. Moreover, a combined dataset, merging both CICIDS2017 and UNSW-NB15, was tested to ascertain whether the reinforcement learning algorithm could effectively discern intrusions based on alterations in the network environment.

Here is a discussion of the characteristics of each dataset:

1. **CICIDS2017 Dataset:** The CICIDS2017 dataset comprises seven distinct attack types: brute force, Denial of Service (DoS), Heartbleed, web attacks, infiltration, botnet, and Distributed Denial of Service (DDoS). Notably, this dataset was created by capturing network packets during regular working hours, specifically from 9:00 a.m. to 5:00 p.m., over a five-day period that began on Monday, July 3, and concluded on Friday, July 7, 2017.
2. **UNSW-NB15 Dataset:** In contrast to CICIDS2017, the UNSW-NB15 dataset does not originate from a real-world setting. Instead, it comprises genuine contemporary normal activities and incorporates synthetically generated attack behaviors facilitated by IXIA PerfectStorm [12]. The UNSW-NB15 dataset encompasses nine distinct attacks, including DoS, worms, backdoors, and fuzzers.

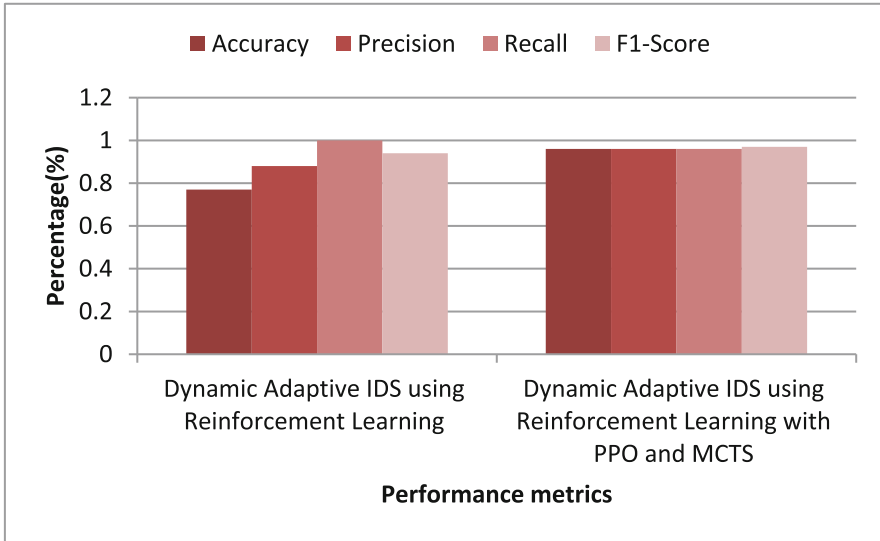
Due to the substantial variance in the types of attacks featured in these two datasets, their combination offers comprehensive coverage of diverse attack types. Consequently, when simultaneously employing both dataset types, it proves highly advantageous in evaluating the performance of the Intrusion Detection System concerning its capability to identify novel attack types.

4.2 Performance Evaluation

To assess the effectiveness of the dynamic adaptive IDS, quantitative performance evaluation is conducted. Standard metrics like accuracy, false-positive rate, false-negative rate, and F1-score are used and displayed in Table 1 and Fig. 1. These metrics help in comparing the proposed IDS with traditional IDS approaches and other reinforcement learning-based methods.

Table 1. Performance evaluation for the proposed methodology

Method	Accuracy	Precision	Recall	F1-Score
Dynamic Adaptive IDS using Reinforcement Learning	0.77	0.88	1	0.94
Dynamic Adaptive IDS using Reinforcement Learning with PPO and MCTS	0.96	0.96	0.96	0.97

**Fig. 1.** The results of the IDS detection model.

5 Conclusion

The research investigates techniques to improve the IDS's generalization capabilities, enabling it to detect novel attacks. It also assesses the IDS's transfer learning abilities, examining how well it can adapt to different network environments. This is crucial for scaling its applicability. With the implication of DQN which is a deep neural network as a function approximator to estimate the Q-function. The neural network takes the current state of the environment as input and outputs the Q-values for all possible actions in that state. It's essential to note that while DQN, PPO, and MCTS has significantly enhanced the dynamic adaptation of the IDS, each algorithm comes with its own hyperparameters and implementation considerations. After combining these algorithms, thoughtful design, hyperparameter tuning, and potential integration with other components of the Dynamic Adaptive IDS, such as feature extraction, anomaly detection, and the overall reinforcement learning framework. In conclusion, the proposed model was successful in achieving better performance in terms of detection accuracy (96.12%) better than the comparison algorithm's accuracy of 77.98%. Potential results of future research in this


domain may involve employing intelligent agents to improve decision-making and to accelerate data communication.

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The Impact of Using Digital Technologies on Internal Control Systems in the Banking Sector

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Abstract. Analysis of the impact of digital technologies on internal control systems within the banking sector is an intricate endeavor in the contemporary business world. Additionally, there is a nexus between enhanced operational efficiency and the complexities introduced by technologies like Artificial Intelligence, blockchain, and the Internet of Things that impact business. While facilitating improved risk management and fraud prevention, the integration of these digital technologies concurrently instigates challenges in cybersecurity, data privacy, and regulatory compliance. The study employs a systematic review of literature to identify the opportunities and dilemmas presented by digital adoption in banking and offers a strategic framework that navigates through technological and regulatory landscapes, ensuring sustainability, security, and compliance amidst the digitalization of global financial landscapes.

Keywords: Digital technologies · internal control and banking sector

1 Introduction

The precipice of the fourth industrial revolution heralds an era where the symbiosis between emerging digital technologies and traditional banking structures is not merely transformative but paradigm-shifting. Integrated technologies, encapsulating process automation, artificial intelligence, and decision support systems, unveil new horizons, crafting a redefined interface between humans and technology, particularly within the accounting sector (Helmerich et al., 2021). This nexus precipitates a revolutionary shift in the planning, analysis, and design of accounting systems, infusing them with novel elements such as robotics and Blockchain, thereby integrating them into the accounting information system cycle and heralding an era where accounting professions glimpse towards automation.

Digital technologies in accounting have ushered in a data-centric era, emphasizing the meticulous connectivity between financial and non-financial information, necessitating provision with paramount accuracy and timely relevance (Burlacu et al., 2021). This revolution empowers stakeholders, enabling them to extract pivotal information with simplified digital ease, augmenting accessibility and decision-making efficacy. The

present study conscientiously selects a cadre of prevalent digital technologies, elucidating their profound impact on the general accounting system, with a spotlight on their utilization or prospective adoption within banking accounting systems.

The banking sector, given its inherent digital service nature, expansive customer base, and the variegated nature of transactions underscored by global operational tendrils, adopts these technologies prolifically. However, a discerning exclusion is noted in the realm of virtual digital currencies, owing to their prohibition by the Jordanian Central Bank, as of the time of research conceptualization (Asante et al., 2021). This research, therefore, seeks to dissect the multifaceted impact of these digital technologies on internal control systems within the banking sector, unraveling threads of operational efficiency, risk management, and regulatory compliance and proffering strategic pathways that navigate future integration, management, and evolution, ensuring sustainability, security, and compliance within the ambitiously digitalizing global financial landscape.

2 Background

The infiltration of digital technologies into the banking sector has markedly altered its operational and managerial ecosystems, transforming how institutions navigate their internal and transactional processes. In yesteryears, the banking world leaned heavily on manual internal control systems, whereby myriad checks, balances, and regulatory compliance measures were executed through human interaction and paper documentation (Bheemaiah, 2017). Although these manual systems were sufficiently functional, they invariably encountered impediments related to efficiency, precision, and transparency, not to mention a certain susceptibility to fraudulent activities. Moreover, with the continual expansion of global financial markets and the parallel amplification in transaction complexity and volume, the demerits of conventional internal controls surfaced quite evidently (Lopez et al., 2022). This necessitated an evolution towards frameworks that were notably more fortified, secure, and capable of handling the emerging complexities of financial transactions and management.

Digital technologies, namely AI, Blockchain, and IoT, heralded an avenue for this requisite evolution, each introducing transformative capabilities into the banking sector. Artificial Intelligence (AI) brought to the table enhanced predictive analytics, enriched customer service experiences, and the automation of decision-making processes, significantly refining operational workflows within the banking milieu (Brunetti et al., 2020). Blockchain illuminated pathways toward heightened transactional transparency and security, decentralizing control and thereby reducing the susceptibility of operations to fraud and unauthorized interventions (Trushkina et al., 2020). Furthermore, the Internet of Things (IoT) enabled real-time monitoring and data analysis capabilities, elevating the responsiveness and efficacy of internal control systems within banks. However, this transition from conventional to digital, while abundantly beneficial, has also unmasked a new paradigm of challenges and complexities, especially in terms of cybersecurity, data privacy, regulatory compliance, and ethical considerations, all of which demand meticulous exploration, management, and ongoing adaptation to ensure the sustained relevance and integrity of financial institutions in a dynamically digital era.

The profound impact of digital technologies on banking has not only streamlined operations but also reshaped the strategic trajectories of financial institutions globally.

According to Kitsios et al. (2021), as the digital realm continues to expand, newer technologies are on the horizon, bringing with them not just advantages but also new challenges. For instance, quantum computing promises unprecedented computational speeds, which can revolutionize transaction processing and risk modeling, yet its implications for encryption and security are still being understood (Rodrigues et al., 2023). Likewise, the integration of augmented reality (AR) and virtual reality (VR) into customer service models is reimagining client interactions, offering immersive banking experiences but also raising concerns regarding data visualization security and potential misrepresentation. Furthermore, the burgeoning realm of 'neobanks' - digital-only banks without traditional banking infrastructures - signifies a shift in customer preferences towards wholly digital financial experiences (Wang et al., 2022). This evolution highlights an urgent need for established banks to innovate continually, ensuring they remain competitive amidst a landscape dotted with agile, digital-first entrants (Naimi-Sadigh et al., 2021). As the delineation between technology companies and banks blurs, a holistic understanding of these emerging technologies and their potential implications becomes imperative. Future-proofing financial institutions in this rapidly evolving ecosystem requires an amalgamation of technological foresight, regulatory prudence, and a commitment to ethical and transparent digital integration.

3 Problem Statement

The pervasive integration of digital technologies, including AI, Blockchain, and IoT, has revolutionized the banking sector's internal control systems, introduced enhanced operational efficiencies, and bolstered security while also presenting notable complexities and challenges. While these technologies have optimized and secured operations, managing the associated risks and regulatory complexities remains an intricate issue. Financial institutions face dilemmas surrounding cybersecurity, data privacy, technology obsolescence, and regulatory compliance amidst leveraging technological capabilities for improved efficacy and control. This research seeks to intricately explore and strategize the multifaceted impact of digital technologies on the internal control systems within banks, encompassing operational efficiency, risk management, regulatory compliance, and ethical considerations in a continually evolving digital financial environment.

4 Research Objectives

Main Research Objective.

To determine the impact of using digital technologies on internal control systems in the banking sector.

Specific Research Objectives.

1. To explore the impact of digital technologies on the operational efficiency of internal control systems in the banking sector.
2. To evaluate the effectiveness of digital technologies in risk management and fraud prevention within banking internal control systems.
3. To explore the challenges and complexities of maintaining regulatory and ethical compliance when implementing digital technologies in banks' internal control systems.

5 Justification

The inherent development of digital technologies, especially in the banking industry, calls for a thorough evaluation supported by a diverse rationale based on operational, strategic, regulatory, and social considerations. Artificial intelligence (AI), the Internet of Things (IoT), and Blockchain all provide tangible improvements in operational efficiency and transparency, but they also need careful analysis to successfully negotiate the complexity and hazards inherent in their installation and management inside internal control systems (Verma et al., 2022). Recognizing the best way to integrate these technologies to strengthen internal controls and guarantee continued competitiveness is crucial from a strategic perspective in the increasingly digital and competitive banking industry. For regulatory purposes, it is crucial that banking internal control systems be not only compliant but also adaptable to future regulatory alterations since worldwide authorities are constantly adjusting frameworks to technology evolutions. It is crucial to the protection of financial assets and the maintenance of stakeholder confidence that digital technologies be implemented in a way that is secure, dependable, and morally sound. In light of these complexities, this study sets out to chart a course for the banking industry to follow in order to integrate digital technologies in a way that is safe, efficient, legally compliant, and ethically resolute; this will inform future policy and strategy decisions and improve the industry's ability to adapt to shifting technological and regulatory environments.

6 Literature Review

The digital technological revolution has pervaded the global banking sector with a compelling narrative of transformation, seamlessly weaving threads of innovation, security, and optimization into the existing financial framework. The integration of sophisticated technologies, such as Artificial Intelligence (AI), Blockchain, and the Internet of Things (IoT), has seeped into the infrastructural capillaries of banking internal control systems, accentuating the manifold implications, opportunities, and challenges inculcated within such digital integration. The labyrinth of technological interplay within these systems, as underscored by numerous scholarly endeavors and intellectual discourses, traverses the nuances of impact, application, prospective challenges, and foreseen trajectories within the overarching umbrella of the banking industry. Amidst the swirling vortex of the digital era, these technologies have not merely punctuated traditional banking operations but have effectively recalibrated the foundational mechanics, regulatory frameworks, and strategic methodologies deployed in financial transactions and management. Thus, a critical and multilayered exploration into the digital transmogrification of the banking sphere necessitates a comprehensive, nuanced, and multifaceted approach, one that dives deep into the empirical and theoretical repositories of knowledge and innovation.

7 Impact of Digital Technologies on Operational Efficiency

The vast expanse of literature accentuating the profound impact of digital technologies on operational efficiency within the banking sector navigates through the myriad layers of technological application, data management, customer experience, and

optimization narratives. The operational efficiency within the banking sector, as elucidated by Al-Khasawneh (2022), is intricately entwined with the implementation and management of digital technologies. For instance, the realm of Artificial Intelligence (AI) unfurls a tapestry of capabilities, where automating decision-making processes emerges as a pivotal component, thereby systematically untangling complex operational workflows and propelling customer experiences into new dimensions of convenience and personalization (Jagadeesh & Chandra, 2020). Concurrently, the incorporation of IoT technologies heralds an era of unparalleled real-time data collection and analysis, dynamically shaping decision-making processes and sculpting operational efficiencies with precision and foresight previously unattained (Li et al., 2018). While the literature unfailingly espouses the bountiful potential of these digital technologies to amplify and refine operational efficiencies, it also gingerly traverses through the fields of risks and challenges, strategically spotlighting the indispensability of adept management and mitigation strategies to navigate through the intricate webs of digital transformation and technological innovation.

8 Digital Technologies and Risk Management

Profoundly explorative, the voluminous literature focusing on the role of digital technologies in crafting, reshaping, and enhancing risk management within the fast-evolving banking sector addresses a duality, encapsulating both the potent applications and inherent limitations of these technological marvels. Bhatt et al. (2023) delve into the phenomena of fraud, particularly in the context of Internet banking, echoing the imperatives of aligning digital transformations with robust risk management strategies. Blockchain technology, meticulously characterized by its inherently decentralized and robustly secure transactional capabilities, arises within the literary and practical landscapes as a formidable tool for diluting and mitigating fraud while bolstering transactional security and trust (Tapscott & Tapscott, 2016). Parallely, the realms of AI and machine learning unmask their potential as pivotal entities, adeptly enhancing predictive analytics and systematically facilitating the birth and execution of proactive, dynamic, and resilient risk management strategies within banking ecosystems (Arner et al., 2016). Nevertheless, the vast sea of literature also casts shadows upon inherent challenges, delicately unveiling concerns related to technology management, the spectral entity of cybersecurity, and the multi-faceted ethical considerations. These challenges necessitate meticulous, insightful, and judicious management to optimize their potential and sculpt robust, future-ready risk management capabilities within the digitally-imbued banking sector.

9 Regulatory and Ethical Compliance

In a world increasingly engrossed in the digital epoch, the regulatory terrain associated with integrating digital technologies within the banking sector's internal control systems burgeons into a realm of intricate complexities and multifaceted challenges (Kitsios et al., 2021). Scholars punctiliously dissect both the broad expanse of global considerations and the nuanced peculiarities of regional perspectives, embroidering a rich tapestry of insights and discourses that contemplate issues related to data privacy, transactional

transparency, and ethical use of technology. The literature converges on focal points that elucidate the significance of astutely navigating through regulatory frameworks while simultaneously ensuring a beacon of ethical and socially responsible technology management remains alight, effectively guiding strategies and policies (Zohar, 2015). Further, these academic explorations do not remain stagnant but undulate with the dynamic and perpetually evolving nature of both the technological and regulatory landscapes. Within this ecosystem, they spotlight the pivotal necessity of adaptability and a proactive stance in managing regulatory and ethical compliance, ensuring that as the digital tide continues to rise, banking institutions are neither engulfed nor left stranded but adeptly ride the waves of progress and responsibility.

10 Strategic Management and Future Trajectories

Strategic management in the realm of digital banking is not merely confined to the current technological landscape but profoundly leans into anticipating and adapting to future technological trajectories. A vibrant dialogue presented by Rogojanu and Badea (2014) underscores the relevance of adaptive and resilient strategies in navigating through the diverse technological and regulatory futures that loom ahead. Betti and Sarens (2020) similarly espouse the significance of understanding and sculpting the internal audit function to align with the dynamically digitalized business environment, thereby advocating for strategies that are not only relevant in the current digital era but also inherently adaptive to future advancements.

11 Integration and Collaboration with Ecosystems

The incorporation and synchronization of digital technologies within banking's internal control systems also necessitate consideration of collaboration with broader ecosystems. Adiloglu and Gungor (2019) spotlight the impact of digitalization on the audit profession, implicitly underscoring the necessity for collaborative integrations between technological implementations and professional functionalities. Furthermore, Betti et al. (2021) analyze the ramifications of organizational digitalization on internal audit practices, effectively highlighting a necessity for strategic alignments between digital transformations and internal audit functionalities, ultimately nurturing an ecosystem where technological advancements and professional practices coalesce seamlessly.

12 Research Gap

From the literature review, a research gap was identified in the amalgamation of the multifaceted impact of digital technologies on banks' internal control systems, specifically in optimizing operational efficiency and fortifying risk management while concurrently navigating through the complexities of regulatory and ethical compliance. Additionally, the available literature does not depict a strategic framework to synthesize practical and theoretical knowledge that aids in implementing and managing digital technologies for a balanced perspective on the efficiency, security, and compliance in the banking sector's digital transformation journey.

13 Materials and Methodology

Important data to the current study was integrated through a judicious blend of automated and manual methods. Therefore, the researcher adopted a meticulous desk research method with a distinct emphasis on secondary data collection. The rationale behind this methodological choice stems from the rich availability of existing literature, archival data, and institutional reports, which cumulatively hold a plethora of insights and data pivotal for a coherent and multi-faceted exploration of the subject matter. Data was systematically garnered from a plethora of secondary sources, including, but not limited to, peer-reviewed articles, government and institutional reports, global and regional banking statistics, and digital transformation trend reports within the banking sector. A wealth of insights into operational efficiencies, regulatory frameworks, ethical considerations, and strategic management concerning digital technologies in banking were extracted, providing a substantial empirical and theoretical foundation upon which the research is anchored.

14 Screening and Selection of Relevant Articles

The study followed the defined protocol for the screening and selection of articles to ensure methodological rigor and significance to the study objectives.

Inclusion criteria.

The research included the following sources:

1. Empirical and non-empirical papers and peer-reviewed articles.
2. Articles published within the last decade to ensure relevance and contemporaneity in the rapidly evolving digital landscape.
3. Articles composed in English.
4. Sources that address elements related to digital technology integration within banking internal control systems.

Exclusion criteria.

1. Unavailable articles through the institutions' access.
2. Sources related to generalized digital adoption without a specific focus on the banking sector.
3. Sources that did not provide empirically validated findings or substantive theoretical discussions.

15 Data Analysis

Employing a qualitative content analysis approach, the extracted data was systematically categorized, compared, and contrasted based on pre-determined themes reflective of the research objectives, such as operational efficiency, risk management, regulatory compliance, and strategic management. The synthesis of these diverse data points enabled a thorough exploration and analysis of the overarching narrative concerning the integration of digital technologies within the banking sector's internal control systems, thereby contributing a rich, contextually rooted, and empirically informed perspective to the existing body of knowledge.

16 Results and Discussion

The current aim is to determine the impact of digital technologies on the operational efficiency of internal control systems in the banking sector. The finding revealed that the infusion of Artificial Intelligence (AI) and the Internet of Things (IoT) significantly enhanced operational efficiency within banking internal control systems by optimizing data management, decision-making processes, and customer experience. The integration of digital technologies yielded streamlined workflows, reduced operational costs, and expedited financial processes.

Digital technologies, especially Blockchain, were identified as pivotal in fortifying risk management strategies and mitigating fraud within the banking sector. These technologies provided encrypted, decentralized, and transparent transactional environments, thereby dampening the potency of fraudulent activities and safeguarding financial assets and data.

The research shed light on several complexities and challenges, notably the precarious balancing act between adopting digital innovations and ensuring regulatory and ethical compliance. Varied global regulatory landscapes, evolving cybersecurity threats, and ethical considerations emerged as substantial hurdles in harnessing digital technologies within the established banking frameworks. Finally, the data underscored a critical need for a strategically molded framework, emphasizing adaptability, robust risk management, ethical considerations, and regulatory compliance to navigate the digitally transformed banking horizon successfully.

17 Discussion of Results

The integration of digital technologies, notably AI and IoT, in enhancing the operational efficiency of internal control systems in the banking sector corroborates the initial hypothesis of the study that these technologies possess the potency to streamline, optimize, and innovate traditional banking operations. The meticulous incorporation of such technologies accelerates operational processes and culminates in improved customer experiences and service delivery, echoing the findings of previous studies and industrial reports (Betti & Sarens, 2021). Furthermore, Blockchain emerged as a particularly formidable force in mitigating risks and preventing fraud, aligning with its characterized features of enhanced security, transparency, and decentralized control, thereby endorsing its potential role as a foundational element in future banking systems.

The complexities and challenges enveloping the regulatory and ethical compliance of digital technologies within the banking sector unfold as multi-faceted, intertwining with aspects of technological advancements, cybersecurity, and globalized financial operations. The variances in global regulatory landscapes and the perpetual evolution of technological capabilities present a nuanced dilemma, requiring an adept navigation strategy to ensure compliance while fostering innovation (Ahmad & Saxena, 2022). This segues into the critical necessity of establishing a comprehensive and adaptive strategic framework, which anticipates and mitigates present challenges and is inherently equipped to evolve alongside future technological advancements, regulatory shifts, and emerging risks within the digital banking ecosystem (Cazazian, 2022). Consequently,

crafting a strategic framework that is adaptable, resilient, and compliant emerges as a pivotal step in successfully sailing through the digital currents shaping the future banking landscapes.

18 Conclusion

This research illuminated the intricate relationship between digital technologies and the banking sector's internal control systems, revealing substantial enhancements in operational efficiency and risk management while concurrently unmasking challenges in regulatory and ethical compliance. The findings underscore the indispensable role of a strategic, adaptive, and comprehensive framework that successfully integrates digital technologies but also navigates through the nuanced regulatory, ethical, and cybersecurity landscapes. Consequently, as banks stride towards a digital future, intertwining robust strategies with technological innovations will be pivotal in harnessing the full spectrum of digital capabilities, ensuring sustained growth, security, and compliance in the evolving digital banking ecosystem.

Future research endeavors should expansively explore the ethical implications of implementing advanced digital technologies in the banking sector's accounting and internal control systems. A meticulous examination of global regulatory landscapes and their impact on digital technology adoption across diverse banking environments is imperative, providing a holistic understanding of varied compliance challenges. Moreover, probing into the longitudinal impacts of these technologies on operational efficiency and risk management, particularly in relation to emergent technologies like Quantum Computing and Edge Computing, could offer invaluable insights. Additionally, investigations into the socio-economic ramifications, including job displacement and requisite skill transformations within the banking sector due to technological advancements, would furnish a comprehensive perspective on the broader impacts of digital integration.

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Technology Acceptance Model in the SMEs and Moving Forward: A Systematic Literature Review from 1986 to 2021

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Abstract. This paper aims to review literature on Technology Acceptance Model (TAM) to develop insights into how the research is developing, especially on Small and Medium Enterprises (SMEs), offer a review of the research to date and form future research directions. The review to identify, select and analyze the present TAM literature on SMEs. In total, 75 articles were included in the review process. The paper focusses only on research published in English. Consequently, the scope of review has been limited as some works published in other languages English may be excluded. The finding that, research on TAM in SMEs is dominantly carried out by quantitative methods, and is also dominant in the management issues. In terms of research locations, the dominant countries as research locations are Southeast Asia, the Middle East and Europe. In addition, it was also found that TAM in SME also liked other theories, namely TOE, TIB and DOI. This paper provides one of the pioneering workouts to systematically review the research on TAM for SME, especially for the period 3 decade. There are still many unexplored areas of model potential application that could contribute to SME.

Keywords: Technology acceptance model (TAM) · Small and Medium Enterprise (SME) · Literature review

1 Introduction

This article aims to review the development of literature on the Technology Acceptance Model (TAM) to gain insight into research analysis specifically on the use of TAM in Small and Medium Enterprises (SMEs) and shape future research directions. The theory was first introduced by Fred D. Davis, Jr, as part of his dissertation research. Initially, the research aimed to develop and test a theoretical model of the effect of system characteristics on user acceptance of computer-based information systems (Davis: 1985). TAM makes the initial assumption of the mediating role of two variables called perceived ease of use and perceived usefulness in the complex relationship between system characteristics (external variables) and potential system use. Derived from the psychology-based Theory of Reasonable Action (TRA) and Theory of Planned Behavior (TPB), TAM has taken a leading role in explaining user behavior towards technology (Marangunic: 2015).

TAM, in its development to date, has been used as a model to measure user acceptance of technology used by entities and has been applied to various uses of various electronic-based information technology issues, including the use of wireless technology (Yen: 2010), Electronic Government (Lie: 2011; Shareef: 2011), E Commerce (Chooprayoon: 2007), Digital Learning Technology (Sayaf: 2022), and various other issues.

In addition to various technological issues, the study of TAM is also conducted on various business scales, ranging from large to small scale. In the scale of small businesses, which are usually referred to as SMEs, studies on TAM have also been carried out on various issues. This is interesting, because SMEs are usually business sectors that have many obstacles in using electronic-based technology, including in using various applications that are currently developing, including audio / video conferencing applications, cloud-based work support applications, social media applications, online tax management applications, and online accounting applications, and other applications.

SMEs are one of the groups of business units that make a major contribution to the State, where the existence of SMEs in each country is usually one of the pillars of the nation's economy. However, sometimes the limited knowledge of SMEs as newcomers to the use of information technology has become their main obstacle in developing their business (Inayatulloh: 2020).

A thorough literature review was conducted to provide an overview of the theoretical background by analyzing the basic theories and models that have influenced the development of TAM, followed by a brief description of the methodology for the literature review of the concepts of two psychological theories that represent the theoretical background for the emergence of TAM. In its development, TAM has undergone many evolutions, including the generation of TAM2 (Marangunic: 2015), (Li: 2010), TAM Extension (Li: 2010), Unified Theory of Acceptance and Use of Technology or known as UTAUT (Donmez: 2019), (Song: 2020) and (Salimon: 2021).

TAM measurements that began in 1986 are still being carried out. This study uses the time period up to 2021. The selection of a time period that reaches 35 years is on the basis of since the TAM Model was published by Davis until the time this research was conducted. This is done by presenting and organizing 75 selected scientific publications in three main categories, namely: (1) literature review, (2) development and extension, and (3) modification and application of TAM. This classification well supports the presentation of TAM research so far.

To the best of the researcher's knowledge, there is no research that describes the use of TAM in the SME sector using a span of 35 years, namely from 1986 to 2021. In recent decades, the interest of the research community has resulted in the development of a number of theories and models of technology acceptance (TAM) and effective use (Marangunić: 2015). Marangunic has conducted a literature review on TAM from 1986 to 2013. In his research, he suggested one of them is an objective outcome measure on the target group. Furthermore, it was found in identifying a large amount of literature that reported inconsistent results between theory and TAM (Li: 2010), so he suggested further research needs to be done to find out why these inconsistencies exist.

Another study mentioned that a review has been conducted on the use of technology in SMEs with a focus on technology types, such as information technology, telecommunications, transportation, finance, education, and other technologies (Zamani, 2022). However, further, it was found that Zamani conducted a review of the use of technology adopted by SMEs, by not mentioning in detail and explicitly the number of articles using TAM, TPB and UTAUT.

Based on this, this study aims to fill this important gap by systematically analyzing the literature on the use of TAM in the SMEs. The article concludes by suggesting future directions and research possibilities, based on the recognition of the fact that there are still many unexplored areas of potential applications of the model that could contribute to the validity of TAM. Please note that the first paragraph of a section or subsection is not indented.

2 Methodology

This Systematic Literature Review follows the suggestions of Marangunic (2015) and Wen (2022), especially in terms of identification, selection and analysis of research related to the measurement of the Technology Acceptance Model (TAM) in Small and Medium Enterprises (SMEs). The methodology of this article is based on a qualitative method focused on the content of articles related to TAM, and SMEs. Articles were collected through a detailed search engine, using TAM and SME keywords in stages. The use of these keywords is in accordance with the title of the study to be carried out. Based on this application, in the initial stage, using the Technology Acceptance Model keyword to limit the research period from 1986 to 2021, 1,139 articles were obtained. Then a filter process was carried out using 2 keywords, namely TAM and SME, which resulted in 169 article titles. Based on this number, the next filter was carried out by assigning codes. Coding with no 1 is given to articles that are considered very significant to the topic being searched. No. 2, for articles that are considered doubtful topics to be used as references, and 0 for articles that are considered completely unrelated to the topic. Based on the filter of articles that match the topic written based on the title and reading the abstract at a glance, the titles of 96 articles were obtained (Stage2). In stage 3, download the article and then read the article in full, so that at this stage the number of articles that were successfully obtained was 75 articles. As many as 21 article titles, were not successfully found by using various access to various journals. The article search was carried out until April 2022, which was then continued with the identification and reading of the literature articles. For more details, the process can be described as follows: (See Fig. 1).

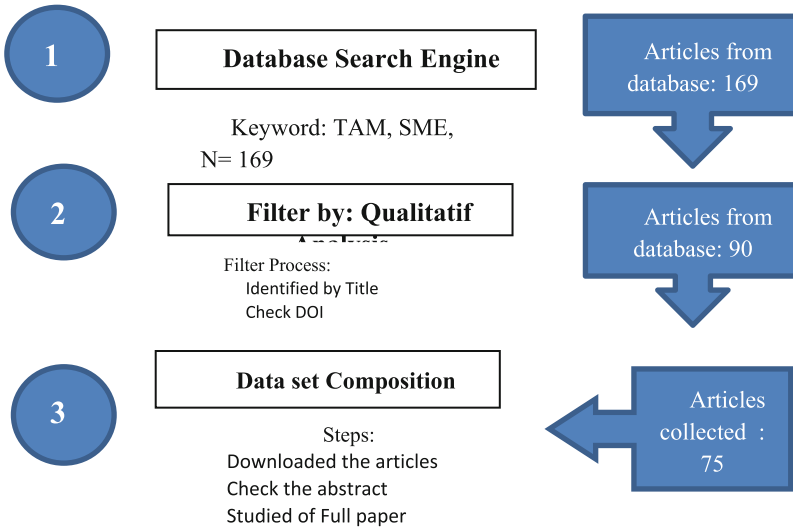


Fig. 1. Conceptual Model

3 Characteristics of Reviewed Articles

The research approach taken can be explained, among others, by identifying publications that have been made from 1996 to 2021 based on the number of articles that have been published by year. Based on Fig. 2, it can be seen that from year to year the number of publications related to TAM research for SMEs is increasing. This is natural, where currently the use of technology has increasingly become a demand for all parties, including the SME sector.

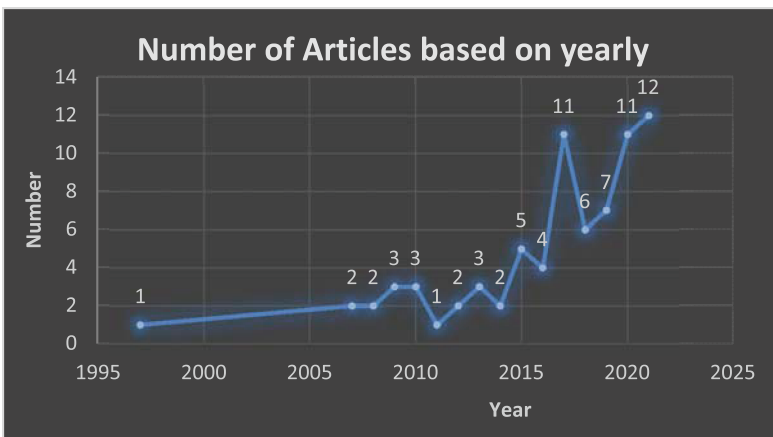


Fig. 2. Number of Articles based on yearly

Articles that have been reviewed can also be categorized based on the type of publication (see Fig. 3). Based on this, the number of articles published through reputable journals is 52 articles or 69%, while the remaining 23 articles or 31% are articles that have been published in proceedings and presented at certain conferences.

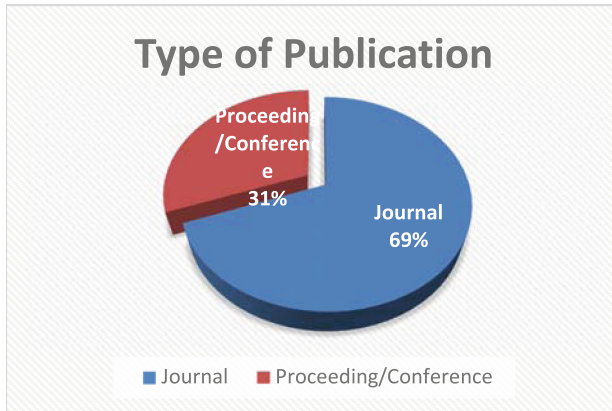


Fig. 3. Type of Publication

4 Findings of the Reviewed Publications

Based on the articles that have been reviewed, several interesting things were found to be analyzed, the findings include: The context of the research, the country of research location, the research methods used, the variables studied, other theories involved in the research, and research suggestions for further research. Finding from the context or issue under study, it can be explained based in Table 1:

From the figure it can be seen that so far research in the field of TAM in the SMEs dominated in the field of management, for example in E-Commerce, E Business, M-Commerce, Cloud Computing, which in general this field can be included in the field of management information systems. The table also shows that there is very little research related to accounting.

Furthermore, when viewed from the location of the country where the research was conducted, as seen from Table 2, the largest number of studies were conducted in Southeast Asia, consisting of Malaysia, Singapore, Thailand, Indonesia and Vietnam. In addition, research related to TAM and SME is also widely carried out in Middle Eastern and European countries.

An interesting review is also found in the classification of research in terms of Research Methods. it shows that the most dominant method in TAM and SME research is to use Quantitative methods, which is 62%, while for qualitative methods it is 37%.

Furthermore, the variables used in the development of this research, it can be seen in Table 3. In principle, the variables used in previous studies are divided into two parts: the

Table 1. Number of Articles Based on Object/Context

No	Object/Context	Number of Articles
1	E_Commerce, B2B,E_Trade	14
2	E_Business	1
3	ERP	7
4	Internet Banking	2
5	AIS	9
6	Accounting software/Cloud	8
7	E_Gov	1
8	M_Commerce	3
9	Mobile App/Sos Media	7
10	Industri 4.1/cloud	4
11	IFRS	1
12	CSR	1
13	VAT	1
14	Cloud Computing	4
15	CSR	2
16	Firm_TAM	2
17	Others	8
	TOTAL	75

Table 2. Number of Article Based on Country

Country	Number of Articles
Amerika, Canada, ecuador	6
Middle East	11
South East Asia	31
Taiwan, Korea, China	7
Europe (UK, Italy, Spain)	11
Australia	3
Bosnia	1
Nigeria, Afrika	4
Ghana	1

Table 3. Variables

USING VARIABLES	
Basic Variables	Perceived Usefulness
	Perceived Ease of Use
	Attitude
	toward use; Behavioral
	intention to use
Additional Variables	satisfaction
	Confirmation
	Top management support, Technical capability of IS personnel,
	Steering committees, Organization size, User involvement, User training and education
	Understanding of Accounting Information System, Organization culture, Continuous improvement Budget
	Customer Relationship Management (CRM) and Cloud-Based CRMs;; Trust
	Strategic Value: (Operational Support, Managerial Productivity, Strategic Decision Aids); E-commerce Adoption (Organizational Readiness)
	Technological factors (Perceived credibility, Relative advantage)
	Organizational factor (Management Support) Environmental factors (Government support, Mimetic pressures)
	Familiarity; Perceived Technology Risk; Owner ICT Knowledge and Innovateness; Organization Support; Managerial Productivity; Competitive Pressure; Government Policy; Intention to Adopt

basic TAM variables and additional variables. The addition of these variables follows the evolution of user acceptance and interest in the adoption of technology.

In line with the advancement of technology and human behavior towards technology utilization, research has also followed these developments. From the review results, it is found that research in the field of TAM in SMEs has also evolved with the addition of variables, as explained above. These variables are derived from theories that are currently evolving. The theories used in these studies are as follows:

1. Technology-Organization-Environment (TOE):

This theory states that adoption is influenced by technological developments (Kauffman and Walden, 2001); organizational conditions, business, and organizational reconfiguration (Chatterjee et al., 2002); and industry environment (Kowtha and Choon, 2001). The technological context explains that adoption depends on the set of technologies inside and outside the company and the perceived relative advantages (benefits), compatibility (both technical and organizational), complexity (learning curve),

trialability (experimentation), and observability (visibility). The organizational context encompasses the business scope of the company; top management support; organizational culture; managerial structure complexity measured in terms of centralization, formalization, and vertical differentiation; human resource quality; and size-related issues such as internal slack resources and specialization (Jeyaraj et al., 2006; Sabherwal et al., 2006; Tornatzky and Fleischer, 1990). The environmental context relates to factors that facilitate and hinder operations in the operational area (Awa: 2015) and (Salimon: 2021).

2. Theory of Planned Behaviour (TPB):

TPB was developed to enrich TAM by adding usage and placing premiums on specific settings and external variables that influence the technology adoption process. This was also mentioned by Taylor and Todd (1995), that the explanatory and predictive utility of TPB is improved by extending and integrating it with TAM. In other words, TPB implements TAM and provides a more comprehensive model for understanding technology use or utilization (Mezghani: 2019) and (Awa: 2015).

3. Diffusion of Innovation (DOI):

Diffusion of Innovation was developed by Ajzen in 1991. In addition to the two theories mentioned above, in the development of information technology and computers, various theoretical frameworks have emerged to support the understanding of user behavior within an organization, and one of these theories is the Diffusion of Innovation (Awa: 2015).

5 Discussion

The development of TAM has been rapid, both on various issues and at various levels of business scale. This systematic review has specialized on the application of TAM in the small business sector (SME) that has occurred in the last 35 years. Based on the review, it was found that research has been conducted on various aspects of using technology including E_commerce, E_Business, M_Banking, ERP, and other aspects.

With the development of current technology, research related to TAM has also been reviewed from other theories, including TOE, TPB and DOI. The use of this theory of course adds more variables that can be tested, so that TAM is also evolving with the emergence of TAM2, Extended Tam and UTAUT.

6 The Path for Future Development

In accordance with the suggestions and feedback derived from the above articles, the steps that can be taken for future research development are as follows:

1. Expand and clarify the sample. This is necessary because, in some countries, the sample, in this case, SMEs, may have several levels with different criteria, such as distinguishing between small and medium-sized enterprises based on asset and revenue size. Therefore, it is recommended for future research to differentiate these groups when processing data and analysis.





2. Expand the research area or context to address other issues that have received limited attention. For example, in accounting issues, especially in financial reporting systems that adopt technology, including the use of mobile applications for financial reporting.
3. Integrate TAM with SMEs using other theories, especially those related to user adoption and acceptance of technology.

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Using Norm Activation Theory to Predict External Participation Toward New Product Development Batakness Handwoven Ulos: A Proposed Conceptualization

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Abstract. In most of the studies about external participation in new product development, limited empirical research has been conducted on the utilization of the extended norm activation model to investigate external involvement in the process of developing a new product. This study took awareness of consequences, the ascription of responsibility, and personal norms of external participation in the development of the new product to broaden the norm activation mode to explore external participation to develop batakness handloom ulos. The purpose of this research is to investigate the role that external factors, such as customers, suppliers, and retailers play in the creation of new product outputs within the context of the investigation into the ideal development of the norm activation model. This research was qualitative in its approach. The conceptual framework for this study was developed through the use of a content analysis. References are made to the relevant body of literature, which contains summaries, implications, theoretical and practical contributions, as well as the limitations of the study. It is hoped that the findings will shed light on we analyze how participants' engagement in the perspective of the norm activation theory may be affected by external participation in new product development batakness handwoven ulos.

Keywords: the norm activation model · external participation · new product development

1 Introduction

The significance of new product development (NPD) cannot be overstated in terms of a firm's ability to maintain a competitive edge [1]. It has been estimated that approximately 40% of newly introduced products experience failure upon launch, despite undergoing

extensive development and testing. Furthermore, the success rate of new-product concepts is found to be as low as one out of every seven to ten, indicating a significant level of commercial failure. Additionally, a mere 13% of companies report that their overall new product endeavors successfully meet their annual profit objectives [2].

Reviewing a new product For product development, external performance should be considered, not just internal performance [3]. Innovation through external engagement increases product development [4]. Since no corporation can have all fresh information in-house, firms collaborate with players to get input for new inventive ideas and access new technologies. Companies cooperate with network and supply chain partners on product development. This study examines the less-studied role of stakeholders (customer, supplier, retailer) in handwoven ulos development. Compare how different stakeholders contributed to new product development. The benefits and risks of internal and external involvement in new product development are still unclear, and strategic priorities and contextual circumstances may affect the degree of involvement [5].

The Norm Activation Model (NAM) is a psychological method for finding personal traits that influence behavior [6]. This study uses NAM to examine how need awareness, accountability, and result efficacy shape personal standards for external product creation. In some handicraft centers, attachments to external parties include dependence on suppliers for thread raw materials, retailers for financing, and retailers' interaction with customers. Nam's theoretical approaches like personal norms, awareness of consequences, and responsibility strengthen external roles in product development.

The purpose of this study is to investigate the role that external factors, such as customers, suppliers, and retailers, play in the creation of new product outputs within the context of the investigation into the ideal development of The Norm Activation Model. A deeper understanding of this issue, we will investigate the dynamic that exists between customers, suppliers, and retailers in the context of the creation of new products, as well as the roles that are performed by external actors in this dynamic at the micro and small-scale organizational levels. As a result, we make two major contributions: (1) the utility of NAM as one of the success factors of NPD in understanding external roles in small businesses; and (2) we advance a better understanding of the external relationship participation-NPD that highlights the role of external variables such as (customers, suppliers, and retailers) in small businesses.

2 Theoretical Development

2.1 New Products Development (NPD)

Both large firms and SMEs benefit from NPD [7]. However, NPD in SMEs may differ from those of major enterprises [8]. New products include products that have been generated through an organization's research and development activities as well as new brands, improved products, changed products, and improved products [9]. New products are those that are genuinely inventive and fill unmet requirements [10]. They also include replacement products that are significantly dissimilar from current ones in terms of design, function, and benefits offered, as well as copycat products that are novel for the organization but not novel for customers.

A sequence of activities that entail transforming product concepts, market potential, and technical presumptions into goods that can be sold can be referred to as the new product development process [11]. There are several phases of new product development in SMEs: concept development, product development, and implementation [12, 13].

2.2 External Participations

Co-creating goods with consumers, suppliers, rivals, universities, and research organizations gives companies access to a wealth of information, insights, and ideas [14]. The presence of a wide range of external resources, characterized by plurality and diversity, has the potential to enhance the development of goods that align more closely with consumer needs. Consequently, this can lead to a reduction in the risk of new product rejection within an increasingly competitive market environment [15].

In addition, engaging in partnerships with several external stakeholders to acquire their resources may enhance the technical skills of the company in the long run. This, in turn, facilitates the utilization of technology in collaborative efforts, while also decreasing the duration and costs associated with product development [15]. Co-creation is anticipated to offer several advantages to organizations, such as enhanced innovation performance, by mitigating the risks associated with non-acceptance of new items in the marketplace, as well as decreasing product development length and costs [16], which is usually operationalized with financial measures, such as sales, turnover, profits, and return on investment [17]. This line discusses the extension of the resource-based perspective framework to encompass cooperative firm relationships with external stakeholders [18] and suggests that the availability of external resources allows companies to integrate internal and external information, insights, and ideas in unique arrangements, hence potentially enhancing their innovation performance [19].

2.2.1 Customer Participation

Customer participation is the process of involving customers in the design and production of goods and services, whereas innovation is understood to be the creation of new goods. Customer participation, which is more widely utilized in the literature and is inclusive [20].

Using the product as ethnic clothing will indicate the ethnic identity of the user [21]. The study found that ethnic identity played a significant role in predicting both the consumption of traditional costumes and the attribution of feelings and meanings to such consumption [22].

The Impact of Customer Involvement on New Product Development as an information source and the more active form of customer involvement as co-developers [23]. Customer participation is integrated into some or all NPD activities, including product design, business evaluation, team building, and concept screening [24], then as a source of information, as a co-developer, as an innovator [25], and customer participation in the ideation stage, the development stage, dan pada the launch stage [26].

From various studies, customer participation [27] has been validated in SMEs [28]. Therefore, customer participation can be seen from 4 items: high frequency of meetings with customers, how frequently are customers consulted, to create a product, certain

clients are invited to participate, how many tools each productive operation uses [27, 29].

2.2.2 Retailer Participations

In a supply chain that is primarily driven by the needs of the customer, like that in the apparel sector, retailers are important businesses that play a crucial role [30]. Customers are the “operant resource” in the context of consumers and merchants [31]. This is because customers must specify many features in the context of their needs. To meet consumer needs, retailers must manage their relationships with suppliers [32]. Few NPD studies have been done in the textile and apparel industry, and those that have been done have mostly evaluated NPD from the retailer’s point of view [33]. When all products are made by artisans at home and design is usually done by retailers, artisans have little control over NPD [34].

Due to restricted information exchange between customers and craftspeople, consumers typically engage with shops [35], especially when buying products. This engagement will assist artisans in improving the product with suggestions and comments. Thus, retailer-craftsperson NPD coordination is vital [36]. Customer engagement may be measured by how much time is saved in product development, how adaptive the process is, and how much the merchant helps coordinate the organization’s efforts to meet market demand [37].

2.2.3 Supplier Participation

Supplier participation in the NPD process is the degree to which suppliers participate in the NPD process of the business. Incorporating capabilities, investments, information, and expertise from suppliers into NPD is known as supplier engagement [38]. Lowered development costs, component standardization, improved new product quality, fewer defects, and a shorter time to market are all advantages of early supplier involvement in NPD [39]. Supplier participation in a company’s NPD does not necessarily ensure success, despite the potential advantages [40]. Supplier participation involves suppliers in new product development, involve suppliers in product redesign, suppliers providing input on new products created concerning specifications used in the creation of new products [41].

2.3 Theoretical Framework

2.3.1 The Norm Activation Theory

The level of domestic product engagement influences customer desire to purchase domestic products [42]. This study examines the relationship between integrity, vanity, status consumption, and product knowledge as predictors of attitudes toward the purchase of real Banarasi silk clothes. Additionally, it investigates the impact of attitudes on the intention to purchase authentic Banarasi silk apparel. [43]. The NAM holds significant relevance in the field of social psychology as it provides a framework for examining altruistic conduct. Which is widely used to look at intentions and behaviors such as studies in environmental contexts [44–47].

Consequence awareness is also a person's level of conviction that a decision made or unmade can exacerbate a situation [48]. Consequence awareness, measured from a utilitarian perspective and relating to the difference between the advantages and costs associated with a behavioral outcome, is a word that is frequently used to describe a person's instrumental attitude [49]. Personal norms are triggered by the assignment of responsibility in addition to being aware of the consequences. When these two circumstances come into play, one's norms will be awakened, creating a sense of responsibility that directs action [50]. Initially, ascription of responsibility was defined as feeling responsible for the negative consequences of not behaving pro-socially [51, 52].

2.3.2 Hypothesis

Expanding the theory of norm activation involves developing an existing framework by incorporating new factors, variables, or perspectives that can enhance the strength of the explanation or its application in different contexts. Nam's theory is not just about participation in the development of new products, namely how externals become psychologically aware and internalize social norms, which in turn influence their behavior to develop new products. Moderation of external costs negatively impacts personal norms and behavioral intention [53] and moderation of policies and publicity positively impacts personal norms and behavioral intention [54].

Personal norms are generated by the awareness of consequences and the perception of responsibility [55]. On the contrary, if the level of consciousness regarding the potential outcomes and the corresponding sense of obligation diminishes, the conduct exhibited will deviate from the established individual standards. While prior studies have confirmed the applicability of the NAM model in various contexts, such as predicting environmentally friendly travel intentions [56], and willingness to buy fair-trade products [57]. Hence, the hypotheses below were formulated:

Assumption H1a: Awareness of consequences positively affects external participation toward new product development *batakness handwoven ulos*;

Assumption H1b: Ascription of responsibility positively affects external participation toward new product development *batakness handwoven ulos*.

The establishment of personal norms is a significant factor influencing individuals' engagement in the process of new product development. Consumers are bound by personal norms, which impose a moral responsibility to adhere to specific behavioral standards. This moral obligation can catalyze the inclination to participate in product creation [58, 59]. The influence of personal norms on consumer purchasing about fair practices has been highlighted in previous studies [60]. Therefore, the following hypotheses were formulated:

Assumption H1c: Personal norms positively affect external participation toward new product development *batakness handwoven ulos*.

Figure 1 shows the conceptual framework.

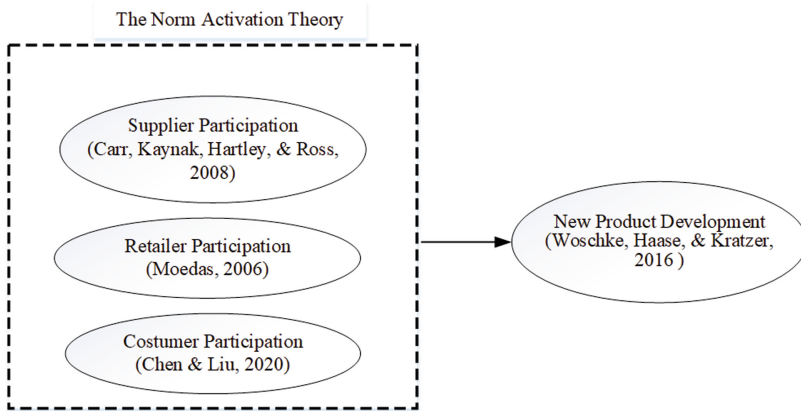


Fig. 1. Proposed Conceptual Model

3 Methods

To construct a model, this study constructed a framework through the use of content analysis that was derived from a variety of articles and previous research. The topic being discussed here is supported by a variety of articles, which may be found in the references section.

4 Conclusion

This investigation was undertaken to bridge the knowledge gap about the procedure of external participation within the new product development process batakness handwoven ulos. In this study, we analyze how participants' engagement in the perspective of the norm activation theory may be affected by external participation in new product development batakness handwoven ulos. At the end of the day, the results of this research will provide light on how we may better comprehend the external engagement that goes into the production of new products using batakness handwoven ulos. The results of this examination of external participation might be helpful to academics, businesses, and other types of researchers.

This research explicitly studied the literature on the norm activation theory determinants inherent in external involvement. These determinants include customers, retailers, and suppliers, and their relationships with and influences on new product development will also be investigated. In addition, particular theories from the fields of marketing and psychology that are relevant to the fluid and intricate interactions that are inherent in product development will be discussed at length.

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Islamic Fintech in Indonesia: Opportunities and Challenges for Growth and Innovation

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Abstract. The article analyzes the Islamic FinTech industry in Indonesia and its current position in the global Shariah-compliant FinTech competition, along with the opportunities and challenges faced by the industry. With over 230 million Muslims in Indonesia, the demand for digital financial services that comply with Islamic principles is high, and the integration of technology into these services is creating new opportunities for growth and innovation. Indonesia's Islamic FinTech industry has been rapidly growing, with a large number of companies and a potential market, but it faces several obstacles. The lack of digital infrastructure, unclear regulatory guidelines, limited access to equity, and a shortage of specialized professionals are significant challenges that need to be addressed to ensure the industry's growth. Despite the hurdles, the Islamic FinTech industry in Indonesia has a promising future, with the potential to provide Shariah-compliant financial services to a growing global market and become a major player in the global Islamic finance industry.

Keywords: Economics · Finance · International Financial Markets · Payment systems

1 Introduction

The integration of FinTech is playing an increasingly significant role in shaping the rapid growth of the Islamic finance sector in the global financial industry. The demand for financial services that comply with Islamic principles is high, given the over 1.8 billion Muslims worldwide. The integration of technology into Islamic finance is opening up new prospects for expansion, and innovation, and reducing the dominance of banks as the sole providers of financial services [1]. The presence of FinTech has significantly changed the way in which consumers engage in financial transactions [2, 3]. FinTech companies are transforming the financial industry by utilizing technologies like artificial intelligence, cloud computing, P2P technologies, and big data analytics to offer innovative financial products and services [4, 5]. The utilization of this technology is facilitating the provision of financial services that are accessible, affordable, and promoting financial inclusion among underserved segments of the population [6–8]. Islamic FinTech differs from conventional FinTech by incorporating the principles of Shariah law in its

operations [9–11]. These principles guide the development of financial products and services that adhere to Islamic ethical and moral values, such as avoiding interest-based transactions and promoting social justice. This approach makes Islamic FinTech appealing to a segment of the population who prefer to engage in financial activities that align with their religious beliefs. In contrast, conventional FinTech operates on a profit-driven model that is not influenced by religious or ethical considerations.

Indonesia, with a population of over 270 million people, is the world's largest Muslim-majority country. Islamic FinTech in Indonesia is unique in its ability to cater to the needs of the country's diverse Muslim population, ranging from the more conservative to the more liberal. In recent years, the country has witnessed a growing interest in Islamic finance, and the adoption of FinTech in this sector is rapidly gaining momentum. While there are many articles discussing Islamic FinTech in Indonesia, it does not delve into the specific factors that have contributed to Indonesia achieving only the sixth-largest market value in 2021, despite having the highest Muslim population and a substantial number of Islamic FinTech companies globally. Understanding the underlying reasons for this gap in market value is crucial for policymakers, industry stakeholders, and researchers to develop targeted strategies that can enhance the performance and competitiveness of the Islamic FinTech sector in Indonesia, especially in relation to the global market. This article aims to fill this gap by presenting the challenges and opportunities of Islamic FinTech in Indonesia and its impact on the world market.

2 The Global Standing of Islamic Fintech Indonesia

2.1 Based on Number of Companies

The development of Islamic FinTech companies globally shows a significant increase. According to a report by Salaam Gateway in 2021, there were 375 Shariah FinTech companies globally [12]. This represents an increase from 241 companies in 2020. Indonesia is the countries with the most Islamic FinTech companies with 61 companies or about 16.3% of the total global Islamic FinTech companies, followed by the UK with 45 companies (12% of the total), and the United Arab Emirates with 42 companies (11.2% of the total). Saudi Arabia and Malaysia are in fourth and fifth place respectively with 38 companies each.

2.2 Based on Market Value

The global Islamic FinTech market has experienced a significant increase in value from 2020 to 2021. It is estimated that the value of the Islamic FinTech market in all OIC countries in 2021 reached US\$79 billion, which is a 60% increase from the value of the Islamic FinTech market in 2020, which was US\$49 billion [13]. Indonesia had the fifth-largest market value in 2020 with an estimated total market value of US\$2.9 billion, Indonesia had the fifth-largest market value in 2020 with an estimated total market value of US\$2.9 billion, but dropped to sixth place in 2021, although the value of the Islamic FinTech market increased to US\$4.2 billion.

The top ten countries with the largest Islamic FinTech market value in 2021 are Saudi Arabia with a market value of US\$26 billion, Iran (US\$19.1 billion), UAE (US\$4.8

billion), Malaysia (US\$4.8 billion), Turkey (US\$4.4 billion), Indonesia (US\$4.2 billion), Kuwait (US\$3.7 billion), Sudan (US\$2.1 billion), Pakistan (US\$1.9 billion), and Bangladesh (US\$1.4 billion) (Fig. 1). In total, these top ten countries contributed 91% of the Islamic FinTech market value of OIC member countries. This indicates the dominance of these countries in the Islamic FinTech market, especially Saudi Arabia and Iran, which each control 32.9% and 24.2% of the Islamic FinTech trade among OIC countries. Meanwhile, Indonesia only contributes 5.4% of the total global Islamic FinTech market value.

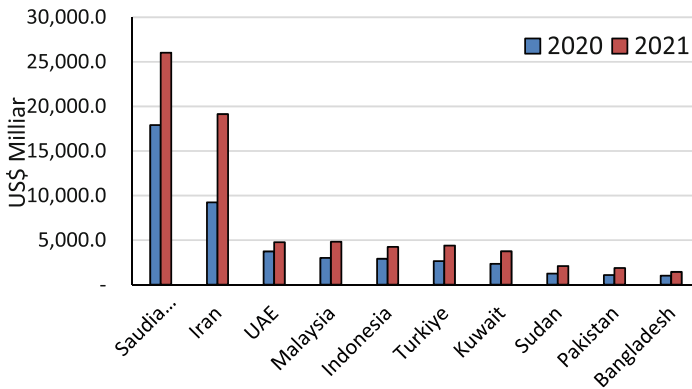


Fig. 1. The market value of Islamic FinTech from OIC member countries

2.3 Based on Level of Conducive Environment of Islamic FinTech

To measure the level of conducive environment for Islamic FinTech in each country, two consulting firms, namely DinarStandard (a company engaged in Islamic Economy Management Consultancy) and Elipses (a company engaged in Digital Finance Advisory and Investment firm), assessed all countries that have Islamic FinTech activities [13]. The assessment was conducted on 81 countries, consisting of 61 member countries of the OIC and 20 non-OIC member countries. The assessment was based on five categories, namely Islamic FinTech Market & Ecosystem, Talent, Regulation, Infrastructure, and Capital. The results of this assessment were reported in a report entitled The Global Islamic FinTech Report (GIFR). According to that report, for 2021, Malaysia ranked first as the country with the most conducive Islamic FinTech ecosystem with a total score of 81 and also succeeded in becoming one of the globally recognized FinTech Hubs. Followed by Saudi Arabia with a score of 80, Indonesia (65), UAE (60), and UK (50) as ranks 2, 3, 4, and 5. Malaysia and Saudi Arabia did not change their rankings compared to the results of last year's assessment. Meanwhile, Indonesia successfully moved up one rank compared to 2020, replacing the UAE's position. Indonesia's success in improving its ranking in the report indicates that the development of the Islamic FinTech business ecosystem in Indonesia is moving in the right direction.

3 Key Challenges of Islamic Fintech in Indonesia

3.1 Digital Infrastructure

Indonesia, with a population of over 270 million people, is the fourth most populous country in the world. With 73.70% of its population already connected to the internet, Indonesia has a large and growing online user base. In fact, almost 70% of the population are active on social media platforms. However, Indonesia's internet infrastructure still lags behind other countries such as the United Arab Emirates, Malaysia, or Saudi Arabia, which are leading players in the Islamic FinTech space. This is apparent from the country's average mobile internet connection speed, which is a relatively low 15.83 Mbps, and the uneven distribution of internet access across the country. The limited availability of reliable and affordable digital connectivity, such as broadband access, poses a significant challenge to FinTech inclusion for both individuals and businesses [14]. Without access to high-quality digital infrastructure, many individuals and firms may struggle to take advantage of the innovative financial products and services offered by the FinTech industry. These factors present a challenge for Indonesian FinTech companies to grow their business and reach their target audience effectively.

3.2 Regulatory Challenges

One of the biggest challenges facing Islamic FinTech in Indonesia is regulatory hurdles. Regulations from the government or authorized institutions play a significant role in enhancing the efficiency of Fintech and innovative Islamic financial services [15]. FinTech products and services in Indonesia are generally regulated by two institutions, namely The Bank of Indonesia (BI) and the Financial Services Authority (OJK). BI is responsible for and focuses on the payment systems of FinTech, while the OJK is more focused on financial services of the FinTech sector, such as lending services, digital banking, investment, and insurance. In addition to regulating FinTech, the OJK also has the authority to monitor and supervise FinTech-based companies. The OJK and BI have issued several regulations governing and overseeing the FinTech industry.

However, all of the above regulations do not specifically regulate Sharia-based FinTech. Unlike traditional finance, there is no global authority or standardization body that governs Islamic finance. Islamic finance is known for its complex and comprehensive framework that encompasses various contractual relationships and binding standards [16]. The lack of regulatory framework for Islamic FinTech and absence of a dedicated authority to monitor the movements of Islamic FinTech are major obstacles to the growth of this industry [17].

3.3 Islamic Finance Literacy and Inclusion

In 2022, OJK conducted a survey that covered all provinces in Indonesia to assess the level of financial literacy and inclusion. The findings revealed that financial literacy had increased from 35.03% in 2019 to 49.68% [18]. Additionally, the inclusion finance index had also risen from 76.19% in 2019 to 85.10%. Although financial literacy and inclusion are at high levels in Indonesia, the level of literacy and inclusion in Sharia finance remains

low. According to the survey, the level of Islamic finance literacy was only 9.14% in 2022, a slight increase from 8.93% in 2019. In addition, the inclusion of Islamic finance was 12.12% in 2022, up from 9.10% in 2019. Overall, there is a significant disparity between the literacy and inclusion of conventional finance and Islamic finance.

3.4 Access to for a Capital

Access to financing is a critical factor that promotes the formation and growth of the FinTech industry [19, 20]. While the FinTech industry as a whole has seen a surge in funding in recent years, Islamic FinTech companies in Indonesia often struggle to secure financing due to the perceived risk associated with Shariah-compliant finance. This situation hindering the development of Islamic FinTech companies. Furthermore, the lack of an understanding of Islamic finance law can create additional hurdles for Islamic FinTech companies seeking financing. Conventional Investors may be hesitant to invest in Islamic FinTech companies due to the lack of clear guidelines and regulations, leading to a shortage of funding for these companies.

3.5 Human Resources Qualification

Finally, a lack of qualified human resources is another challenge facing Islamic FinTech in Indonesia [5, 21]. The human resource competencies, such as creating, adapting, initiating action, and interpreting analysis, positively affect the adoption of FinTech and at the simultaneously impact the business growth [22]. Thus, it is considered one of the most important features contributing to the success of the Islamic finance industry. The human resources working in the Islamic finance sector in Indonesia are largely not suitable for the industry's needs, with 90% of them not coming from graduates of Islamic economics and Sharia finance programs [23].

4 Opportunities of Islamic Fintech in Indonesia

Despite these challenges, Shariah compliance also presents opportunities for Islamic FinTech companies in Indonesia.

4.1 The Global Trend and Projection

In 2026, the total growth of the Islamic FinTech market for member countries of the OIC is estimated to reach US\$179 billion [13]. This is based on the projected value of the CAGR (Compound Annual Growth Rate) for the Islamic FinTech market, which is estimated to be 17.9%. The CAGR value for the Islamic FinTech market is expected to be higher compared to the expected growth rate of the global conventional FinTech market, which is 13.5% for the same year. Meanwhile, Projected CAGR values suggest that the Islamic FinTech market in Indonesia will see a 21.6% increase by 2026, resulting in an estimated value of 11.26 billion USD. These figures indicate a significant growth opportunity for Islamic FinTech in Indonesia, driven by the high demand for financial services that adhere to Islamic principles.

4.2 The Lack of Financial Access in Rural Area

Indonesia is an archipelagic country with a vast geographical area comprising thousands of islands, and a significant portion of the Indonesian population resides in rural areas. However, many rural areas have limited access to traditional financial services, such as banks and ATMs, which hinders their participation in the formal economy. With over half of the Indonesian population still unbanked [24], there is a pressing need to develop Islamic FinTech that caters to the rural population. Nevertheless, this presents an opportunity for FinTech to address this issue and improve financial inclusion for those living in rural areas [25, 26]. By utilizing technology, Islamic FinTech can provide affordable and accessible financial services to these underserved communities. For instance, digital payment solutions and mobile banking can enable people in remote areas to access financial services and make transactions without the need for a physical bank branch. This can be especially advantageous in areas where there are no banks or the nearest bank is far away [27, 28]. Overall, Islamic FinTech has the potential to bridge the gap in financial inclusion and promote economic development in rural Indonesia.

4.3 Millennial Generation

Millennials, who are born between 1981 and 1996, are often tech-savvy and prefer to do things digitally, which has led to an increase in the awareness of FinTech products and services [29, 30]. In Indonesia, the Millennial Generation makes up 25.87% of the country's total population, with 69.38 million individuals recorded in the 2020 Population Census (Fig. 2). This population is second only to Generation Z. The millennial generation's preference for digital solutions and their interest in financial management have helped to drive the growth of FinTech. This presents a significant opportunity for Islamic FinTech businesses. FinTech companies need to respond to this demand by developing innovative products and services that meet the needs of this tech-savvy generation. Millennials trust technology and are less likely to seek face-to-face meetings with bankers at conventional branches thus the use of mobile banking and payment apps is favorite among them. These apps have made it easier and more convenient for millennials to manage their finances and make payments, without the need to visit a physical bank or carry cash. As a result, more millennials are adopting FinTech services to manage their finances.

4.4 Small and Medium Enterprises (SMEs)

Small and Medium Enterprises (SMEs) play a significant role in Indonesia's economy, as they contribute to job creation, poverty reduction, and economic growth. The Ministry of Cooperatives and SMEs of Indonesia data shows that the number of SME business sectors in Indonesia in 2021 reached 64.19 million with a participation in the gross domestic product (GDP) of 61.97%, equivalent to IDR 8.6 trillion [31]. Despite their importance to the economy, SMEs in Indonesia often face significant challenges when seeking to access debt financing [32]. This is in line with the fact that around 74% of SMEs have not yet obtained financing access, making it difficult for them to increase their production scale.

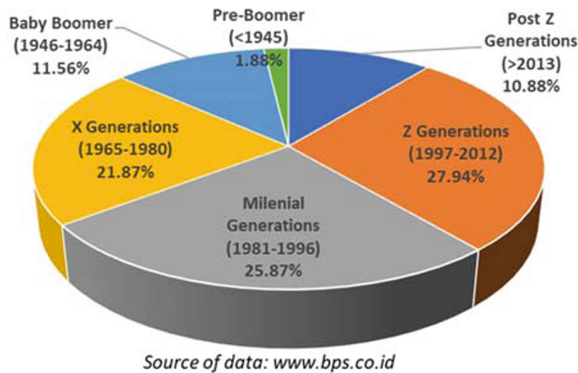


Fig. 2. The Indonesia population based on generation

To address this challenge, small businesses may need to explore alternative sources of financing. FinTech firms can play a vital role in here with access to capital, financial management tools, and other resources to help SME's. Also, by leveraging digital technology, FinTech can help SMEs to streamline their processes, expand their customer base, and gain a competitive edge in the marketplace.

5 Conclusion

The state of Indonesia's Islamic FinTech industry clearly a significant player in the market, with a total market value of USD 4.2 billion in 2021, a significant increase from USD 2.9 billion. This growth is attributed to Indonesia's status as the country with the largest Muslim population in the world. However, compared to Saudi Arabia, a country with a smaller Muslim population, Indonesia lags behind.

In order to improve the growth of the Islamic FinTech industry, several challenges must be addressed. The country's digital infrastructure, a crucial factor in this industry, is not performing optimally to support FinTech. Clearer and more specific regulatory guidelines are needed for Islamic FinTech to avoid regulatory ambiguity. The level of literacy and inclusion in Sharia finance remains lower than that of conventional finance, indicating a lack of awareness among the Indonesian population about the benefits of Islamic FinTech. Collaboration between Islamic FinTech and Islamic finance institutions, such as banks, needs to be increased to benefit both industries. Finally, there is a need to upgrade the quantity and quality of human resources working in the Islamic finance sector.

However, the Indonesia markets also present big opportunity for Islamic FinTech industry. The high population of millennial generation, the lack of conventional facility in rural area and the difficulty of small business and entrepreneurs to find a capital could help to boost the market of Islamic FinTech. Overall, the opportunity for Islamic FinTech in Indonesia lies in its potential by providing digital financial services compliant shariah finance law and at the same time improve digital financial inclusion.






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Conceptualizing User Interface Satisfaction in the Touch 'n Go E-Wallet Mobile Application

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Abstract. In the digital age, User Interface Satisfaction (UIS) has emerged as a pivotal component in enhancing user experience, especially within e-wallet applications. This article provides an in-depth analysis of the UIS within the Touch 'n Go e-wallet, a leading digital payment platform in Malaysia. Key facets of the user interface, including design elements like home screens, navigational menus, transaction flows, and security features, are meticulously examined. The study also delves into the application's design principles, including layout decisions, color schemes, typography choices, and content organization, all pointing to the e-wallet's commitment to user-centric design. Despite its advantages, the e-wallet grapples with challenges such as adapting to Malaysia's diverse demographics, navigating evolving UI standards, and balancing a multitude of features without overwhelming users. As the landscape of digital payments evolves, innovations such as Voice User Interfaces, Augmented Reality integrations, and personalized user experiences are poised to redefine UIS. This article underscores the significance of UIS in shaping the trajectory of digital payment platforms, with the Touch 'n Go e-wallet serving as a prime example.

Keywords: Touch 'n Go · e-wallet · mobile application · user interface · user experience

1 Introduction

In today's digital domain, User Interface Satisfaction (UIS) is paramount in dictating user experience with digital platforms. UIS, which encompasses usability, design clarity, intuitiveness, and aesthetic value, greatly influences user interactions with software applications (Lee et al., 2022; Fang et al., 2016). As technology integrates further into our lives, UIS becomes a determining factor for user engagement, adoption, and overall application success. Particularly, e-wallet applications, like Malaysia's Touch 'n Go, spotlight the vital role of UIS. Such satisfying interfaces can enhance transactions, limit user errors, and foster a positive application perception (Budiarani et al., 2021; Lee et al., 2022; Esawe, 2022).

E-wallets globally have witnessed surging popularity due to their convenience and security (Daragmeh et al., 2022; Ahmad & Latif, 2022). Malaysia's incline towards e-wallet adoption, facilitated by urbanization, smartphone penetration, and governmental pushes, emphasizes this trend (Lee, 2022). The Touch 'n Go e-wallet, a leading Malaysian e-wallet with a vast user base, offers an array of services from merchant payments to transportation. This article will delve into UIS within Touch 'n Go, dissecting its design, challenges, and overall impact on the user experience. This study seeks to enlighten e-wallet developers, researchers, and users on the pivotal role of UIS in shaping digital payment applications' future trajectory.

2 The Importance of User Interface Satisfaction

In an era defined by digital interactions, User Interface Satisfaction (UIS) emerges as an indispensable facet with far-reaching implications for user experiences, engagement, and the wide-scale adoption of digital platforms. At the heart of digital interactions lies the user experience (UX), a holistic concept encapsulating user perceptions, emotions, and overall effectiveness when engaging with an application or system (Sarsam & Al-Samarraie, 2018). Within this intricate web of experiences, the user interface (UI) serves as the pivotal connector, bridging users to the digital realm. UIS, in this context, emerges as the linchpin of UX quality. A satisfying UI design elevates the entire user experience by facilitating intuitive interactions, alleviating cognitive burdens, and optimizing overall usability. Conversely, a haphazardly designed UI can instigate user frustration, catalyze errors, and ultimately drive users away. Thus, underscoring the critical role of UIS in enhancing the UX serves as a testament to its paramount importance in the development of digital applications.

User engagement, a key metric mirroring the depth and quality of user interactions within a digital platform (Ng et al., 2023), dances inextricably with UIS. The interface plays a pivotal role in shaping the level of engagement users experience. A UI that seamlessly marries aesthetics, user-friendliness, and efficiency acts as a siren's call, encouraging sustained engagement and repeated interactions (Mallas et al., 2022). High UIS bestows upon users a sense of ease and delight, impelling them to delve deeper into an application's offerings. Engaged users are more inclined to invest their time, attention, and resources in a digital platform, culminating in heightened loyalty and fervent advocacy (Alomari et al., 2020). Consequently, any discourse revolving around UI Satisfaction must unflinchingly encompass its instrumental role in nurturing user engagement—an element that underpins the vitality of digital applications.

User adoption, the veritable lynchpin of digital platform acceptance, signifies the initial embrace and seamless integration of a digital platform into a user's daily routine. The ease with which users can navigate and accomplish tasks within an application assumes paramount importance in this context. This is where UI Satisfaction steps into the spotlight, offering its guiding hand in the process of adoption. An interface that unfurls a seamless and enjoyable experience acts as the proverbial red carpet, effectively lowering barriers to entry and hastening the assimilation of new users (Rohn et al., 2021). On the flip side, a UI plagued by frustration or confusion can serve as a deterrent, causing potential users to bounce off and shunning the platform, leading to high bounce rates

and lamentably low adoption rates. Therefore, the role played by UIS in facilitating user adoption of digital platforms stands as pivotal—a gateway to the growth and prosperity of these platforms.

3 User Interface Elements in Touch 'n Go E-Wallet

In this section, we embark on an in-depth analysis of the user interface (UI) elements within the Touch 'n Go E-Wallet, aiming to gain a comprehensive understanding of how the application's design and features contribute to user satisfaction and usability.

3.1 Key UI Elements in the Application

In our pursuit of unraveling the intricacies of the Touch 'n Go E-Wallet's user interface, we embark on a meticulous journey to not only identify but deeply describe its key UI elements. These elements, akin to the foundational building blocks of a digital realm, wield profound influence over how users navigate, interact, and ultimately, experience the application. Within the sprawling landscape of the Touch 'n Go E-Wallet, a multitude of key UI components stand out, each playing a pivotal role in shaping the user experience (Fig. 1).

Home Screen: The Nexus of Interaction. The home screen, as the inaugural point of interaction, is the proverbial gateway to the user's financial world within the application. Here, users are greeted with an immediate and concise overview of their account balances, recent transactions, and swift access to core features (Amin, 2016). The home screen serves a dual role: it must strike a harmonious balance between providing informative insights and facilitating intuitive navigation. In the Touch 'n Go E-Wallet, this balance is meticulously achieved through the prominent display of the user's account balance, recent transaction summaries, and quick-access icons that beckon users to engage in essential functions such as making payments, topping up their wallet, and reviewing transaction history (Fig. 1).

Navigation Menus: Paving the Path of Exploration. Navigational menus, akin to guiding beacons within the Touch 'n Go E-Wallet, empower users to traverse the expansive landscape of its multifaceted functionalities. These menus act not merely as signposts but as enablers of user autonomy, allowing individuals to chart their unique financial course within the application (Yeoh, 2022). A well-structured and intuitive navigation system empowers users to explore sections such as payments, top-up options, transaction history, and more with ease. The application employs a clear navigation menu, which simplifies user journeys by providing clear and straightforward menu items such as current balance, view profile, "Transaction History", "Reload", "Scan", "Pay," "Transfer," and "TnG Card" (Fig. 1 (Navigation Menu)). These menu items act as digital signposts, guiding users to their intended destinations within the application's expansive ecosystem.

Transaction Flows: Choreographing Seamless Experiences. Transaction flows within the Touch 'n Go E-Wallet represent the intricate choreography of user journeys when initiating payments, executing fund transfers, or undertaking other monetary transactions (Izaidin, 2022). These meticulously designed sequences of screens and

inputs mimic a choreographed dance, where each user action is meticulously defined and directed. The success of a seamless and intuitive transaction flow is pivotal, ensuring that users can effortlessly execute financial operations and, in turn, contributing significantly to their satisfaction. When making a payment using the Touch 'n Go E-Wallet, users are gracefully guided through a streamlined transaction flow. For instance, when making a payment at a physical store, users need only to tap the “Pay” option on the home screen, scan the merchant’s QR code, and promptly confirm the payment, rendering the process not only efficient but also a delight for users (Fig. 2).

Visual Elements: The Language of User Interaction. Visual elements, including icons, buttons, and graphics, form a universal language that transcends linguistic boundaries (Lee, 2022). These elements serve not merely as aesthetic embellishments but as functional aids that enhance usability and guide users on their digital journey. The application demonstrates a careful selection of visual elements, their strategic placement, and unwavering adherence to design principles. This meticulous attention significantly influences how users perceive and engage with the application. Icons and buttons within the Touch 'n Go E-Wallet are thoughtfully designed, adhering to modern UI conventions codes (Fig. 1 (Visual Elements)). For example, a prominently displayed “Scan” button adorned with a QR code icon simplifies the process of making payments by scanning QR codes (Fig. 1 (Navigation Menu)). These visual cues contribute to a user-friendly experience and a heightened sense of confidence in navigating the application.

Security Features: Fortifying User Trust. Security features serve as the unyielding fortress of the Touch 'n Go E-Wallet, assiduously safeguarding user data and financial assets. These elements encompass a diverse spectrum of user authentication and authorization facets, including biometric login options, transaction verification, and robust encryption (Loke, 2022). While these features often operate discreetly in the background, their omnipresence instills unwavering user confidence, assuring them of the application’s unwavering commitment to preserving their digital lives. The Touch 'n Go E-Wallet places an unyielding emphasis on security, incorporating robust features such as biometric authentication (fingerprint or facial recognition) for user login and transaction verification (Fig. 3). These stringent security measures ensure the sanctity of user data and financial information, fostering a profound sense of trust and security within the user community.

The analysis above forms an indomitable cornerstone for comprehending how the application pioneer’s user satisfaction, efficient interactions, and adoption, thereby contributing significantly to the ever-evolving landscape of digital finance.

3.2 Analyzing the Design of Screens: Crafting User-Centric Experiences

The design of individual screens within the Touch 'n Go E-Wallet transcends mere aesthetics; it constitutes the very essence of the user experience. In this comprehensive exploration, we delve deeply into the visual and functional aspects of these screens, recognizing their profound impact on user perception, usability, and overall satisfaction.

Layout: Orchestrating User Interaction. The arrangement of elements on each screen wields immense influence over the user's ability to navigate and interact effectively. An effective layout ensures that users can swiftly identify and engage with key features and information without unnecessary cognitive load (Kee, 2022). Within the Touch 'n Go E-Wallet, screens are meticulously designed to prioritize essential information and actions, ensuring that user interactions are both intuitive and efficient (Fig. 1 (Navigation Menu)). For instance, consider the payment confirmation screen: it prominently displays the recipient's details, payment amount, and a conspicuous confirmation button (Fig. 2 (Details)). This strategic layout minimizes friction in the payment process, enhancing user satisfaction and transaction accuracy.

Color Schemes: Crafting Aesthetic and Accessible Experiences. Color choices extend far beyond aesthetics, profoundly influencing the overall user experience. Within the Touch 'n Go E-Wallet, we evaluate the use of colors through the lens of readability, visual hierarchy, and alignment with the brand's identity. A cohesive and harmonious blue and white color scheme, aligned with the brand's identity, permeates the application's interface. These colors are not merely visually pleasing but serve a strategic purpose: they enhance readability and reinforce visual hierarchy. For instance, important elements such as buttons and transaction statuses are judiciously highlighted in contrasting colors, serving as visual cues that draw the user's attention. This deliberate use of colors contributes to enhanced user engagement and reinforces the application's visual identity.

Typography: Fostering Clarity and Comprehension. Typography, often an overlooked aspect of design, carries immense weight in user interactions. The selection of fonts and text styles within the Touch 'n Go E-Wallet undergoes a meticulous evaluation, encompassing considerations of font size, style, and the strategic use of headings and subheadings (Kee, 2022). The application employs legible fonts with appropriately sized text, ensuring that users can effortlessly engage with the content. Moreover, essential information is presented in a clear and easy-to-read manner, eliminating ambiguity and fostering rapid comprehension. This commitment to typographic excellence ensures that users can readily grasp transaction details and navigate through the application with confidence.

Content Organization: Crafting Logical and Intuitive Journeys. Effective content organization is the cornerstone of user-centric design, ensuring that information is presented logically and intuitively. This crucial aspect involves the thoughtful grouping of related elements, the use of clear headings, and the strategic deployment of labels (Kee, 2022). Within the Touch 'n Go E-Wallet, screens are meticulously organized to align with user expectations and behaviors. Consider the "Transaction History" screen as an exemplar: transactions are thoughtfully arranged chronologically, supported by clear headings and labels for each transaction category (e.g., "Payment," "Top-up"). This logical structure empowers users to swiftly locate and comprehend transaction history, thus enhancing the usability and overall satisfaction of the application.

3.3 Examining Terminology, System Information, and Unique Features: Nurturing User Understanding and Satisfaction

Effective communication is the bedrock upon which user interface design is built. Within this sub-section, we embark on a meticulous journey to dissect the terminology and system information embedded within the Touch 'n Go E-Wallet. The profound significance of clear and concise language, along with informative system messages, cannot be overstated, as they serve as guiding beacons that lead users through the application's functionalities with ease and precision (Tian et al., 2023).

Terminology: The Language of User-Friendly Interaction. Our evaluation begins with an examination of the terminology and labels employed within the application. Clear and familiar language is the cornerstone of user understanding, reducing cognitive load and minimizing ambiguity. Conversely, inconsistencies or the use of jargon can hinder comprehension and disrupt the user experience (Kee, 2022). The Touch 'n Go E-Wallet excels in this regard, adhering to straightforward and commonly understood terminology. For instance, the term “Top-up” is utilized for adding funds to the wallet, ensuring that users can effortlessly comprehend and execute actions without a second thought. This meticulous attention to terminology empowers users to navigate the application confidently and engage in financial transactions with a sense of ease and familiarity.

System Information: The Art of Informative Guidance. The evaluation extends to encompass system messages and notifications, a critical aspect of user guidance within the Touch 'n Go E-Wallet. These messages, when executed effectively, are both informative and concise, contributing significantly to user confidence and clarity (Kee, 2022). Ensuring that these messages are contextually relevant is paramount, as they guide users through various interactions with precision and transparency. The Touch 'n Go E-Wallet emerges as a frontrunner in this domain, as system messages and notifications are not only informative but also meticulously tailored to the context at hand (Fig. 4). For instance, when a payment is successfully executed, users receive a notification that meticulously outlines the transaction's details. This enhances transparency and fosters trust, as users remain well-informed throughout their financial journey, minimizing uncertainties and elevating the overall user experience.

Unique Features: Elevating User Engagement. The exploration culminates in the discovery of unique features that contribute to user satisfaction within the Touch 'n Go E-Wallet. These distinctive elements transcend the ordinary, encompassing innovative transaction tracking, personalized offers, and seamless integration with other services (Oad, et. al., 2021). Identifying and harnessing these unique features illuminate what distinguishes the application from its competitors and the profound ways in which it enriches the user experience.

One such unique feature of the Touch 'n Go E-Wallet is its seamless integration with an array of services beyond payments. Users are not confined to the narrow boundaries of financial transactions; they can effortlessly access a spectrum of services, from purchasing digital vouchers to paying tolls and even booking movie tickets directly within the app. These features not only differentiate the application within the e-wallet landscape but also elevate user engagement by offering an all-encompassing digital ecosystem that aligns with the diverse needs and desires of modern users. This holistic approach to user satisfaction permeates the Touch 'n Go E-Wallet, reaffirming its commitment to crafting a digital realm that transcends conventional boundaries and offers an unparalleled user experience.

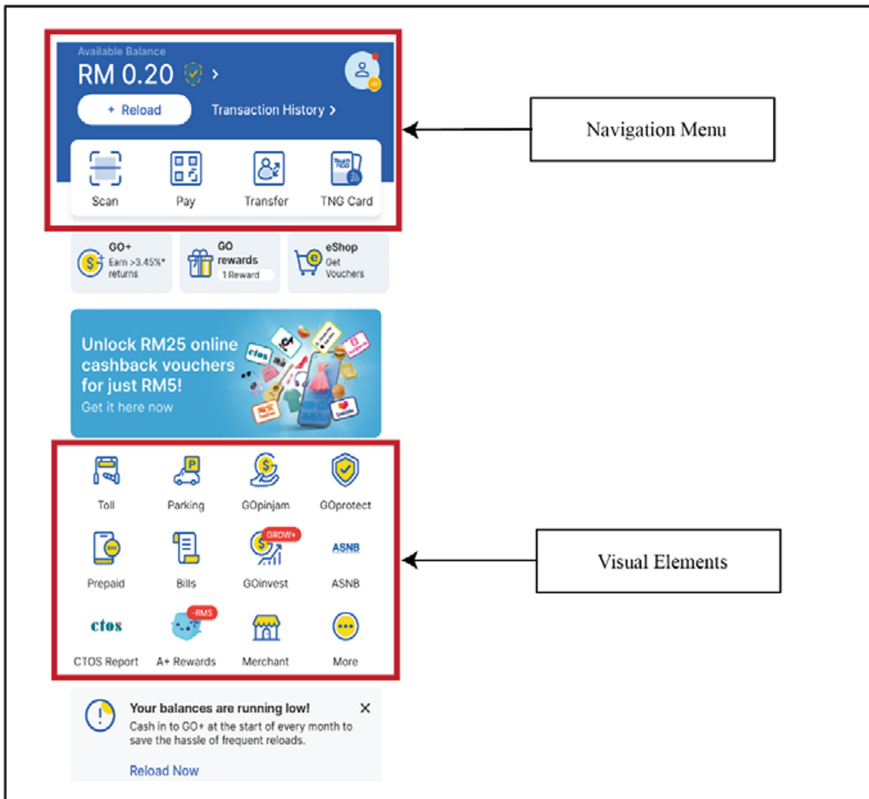


Fig. 1. Home screen of Touch 'n Go E-Wallet Application

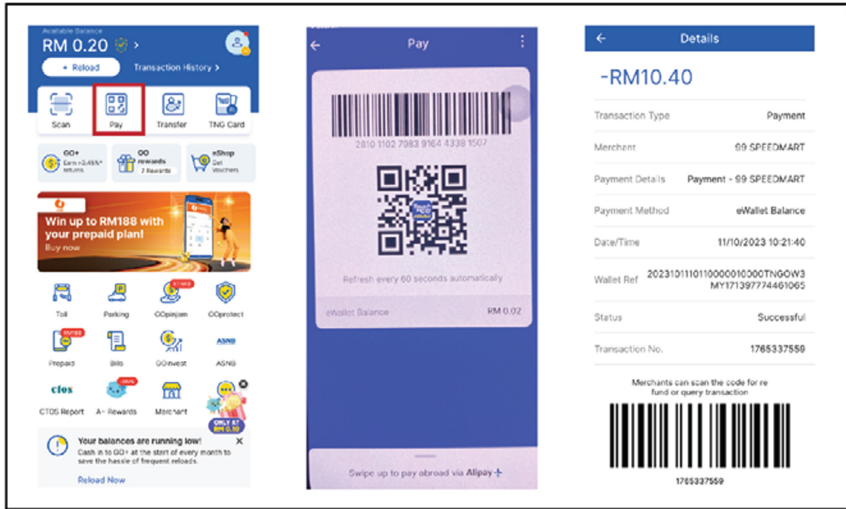


Fig. 2. Transaction flow

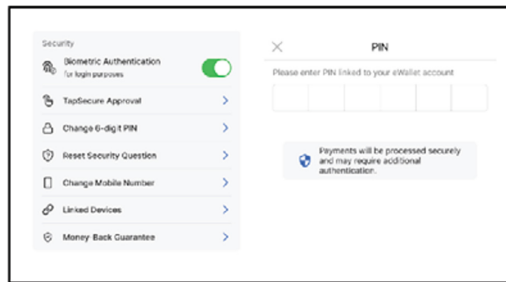


Fig. 3. Security features

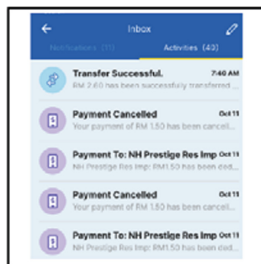


Fig. 4. System message and notifications

4 Challenges and Criticisms of UIS in Touch 'n Go E-Wallet

While the Touch 'n Go e-wallet has made significant strides in enhancing user experience and adopting good design practices, like all digital platforms, it isn't devoid of challenges and criticisms.

1. **Adaptability to Varied Demographics:** With the diverse demographic makeup of Malaysia, ranging from tech-savvy millennials to the older generation less acquainted with digital technologies, ensuring a universally intuitive UI poses a challenge. Some users, especially the older generation, have reported issues with comprehending certain features and navigating the app smoothly (Lee, 2022).
2. **Constant Evolution of UI Standards:** As UI/UX design principles continually evolve, staying updated and ensuring the app's interface aligns with the latest design standards is a challenge. For instance, some critics argue that certain icons or layouts in the app might seem outdated compared to global standards (Fan et al., 2020).
3. **Overwhelming Features:** The versatility of the e-wallet, offering services from payments to movie bookings, can sometimes be overwhelming for new users. The challenge lies in presenting a multitude of features without overwhelming users or cluttering the interface (Loke, 2022).

5 Conclusion and Future Implications

The Touch 'n Go E-Wallet, as delineated through our detailed exploration, stands out as a premier digital financial tool, exemplifying the seamless integration of advanced design, user-focused functionality, and a philosophical commitment to the end-user. From its core UI elements to the detailed screen designs, it underscores the essence of user-centricity, reinforcing user trust and clarifying their digital journey. More than just an instrument for financial transactions, it has metamorphosed into a comprehensive digital environment, adeptly catering to the varied needs and experiences of users, thus setting a new standard in the contemporary e-wallet domain.

Nevertheless, the journey towards digital financial supremacy comes with its own set of hurdles. Adapting to a wide demographic spectrum and the perpetual evolution of UI paradigms are undeniable challenges. Peering into the future, we foresee Voice User Interfaces and Augmented Reality as potential game-changers in e-wallet platforms. Imagine making payments using voice commands or pointing a phone camera at products for instant payment options. Additionally, the surge towards personalization would see e-wallet interfaces dynamically adapting to individual user behaviors. Coupled with these technological advancements, an emphasis on ethical design principles will be paramount, addressing rising concerns over digital well-being and privacy. As the Touch 'n Go E-Wallet steers through these evolving landscapes, its innovative spirit and adaptability will be pivotal in determining its sustained prominence. In essence, this e-wallet's narrative highlights the pivotal role of placing users at the heart of design and innovation, paving the way for the future trajectory of digital financial solutions.

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A BiGRU-Based Model Augmented with Attention for Arabic Aspect-Based Sentiment Analysis

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Abstract. Individuals in today’s digital world have the ability to share their opinions widely owing to the internet and social media platforms. Aspect-Based Sentiment Analysis (ABSA) is an effective technique helps in comprehending these opinions. Accordingly, this study proposes an Arabic aspect sentiment classification model that incorporates the state-of-the-art natural language processing (NLP) techniques. The model was constructed using three layers: an embedding layer that used an Arabic transformer-based pre-trained language model. Subsequently, bidirectional gated recurrent unit (Bi-GRU) layer was added for capturing contextual information in the given sentence. On top of the Bi-GRU, a soft attention layer was used to draw the model’s attention to the important words. The benchmark Arabic hotel reviews dataset was used for evaluating the proposed model. The evaluation finding demonstrate that the proposed model showed a 14.41% enhancement in accuracy over the baseline model, and exceeded state-of-the-art models by 1.3%, attaining an accuracy of 90.81%.

Keywords: Aspect-based sentiment analysis · Deep learning · Transformer · Attention mechanisms · Arabic language

1 Introduction

Today, individuals are sharing their thoughts and opinions on social media and online platforms, more than ever before, and generating by that an enormous volume of data. Thousands of reviews are posted everyday about products, services, places, brands, and even about persons. These data are valuable for both customers and business owners. Customers can make better decisions based on other customers’ reviews. Business owners can utilize these data to monitor the customer’s feedback, hence, they will tailor their products according to that feedback. Sentiment analysis (SA) is considered as one of the NLP approaches. It is generally used to analyse and process the data and subsequently determine the emotional tone expressed in that data as positive, negative, or neutral. SA can help businesses in measuring the success of their marketing campaigns, the recommendation systems to generate better recommendations, and its benefits can cover many other domains such as health care and politics [1].

Aspect-based sentiment analysis (ABSA) is relatively a challenging SA task, which determines the accurate sentiment polarity regarding each distinct aspect mentioned in the review sentence. There are three levels of SA1, the first level is the document level, which consists of multiple sentences, the SA determines the whole document as having positive or negative sentiment. It gives an overall sentiment about one aspect among the entire document. At the second level, the sentences level, the sentence as a whole is categorised as having positive, negative, or neutral sentiment if no opinion is conveyed. The third level is the aspect level, which classifies the expressed sentiment towards each distinct aspect in the given sentence. The sentence may contain multiple aspects such as “very attractive user interface, but the app has slow response”, in this sentence the opinion is positive with respect to the aspect “user interface”, whereas the polarity of the opinion is negative with respect to the “response time”.

Lately, ABSA has attracted much attention. It typically involves four main tasks [2], the first task is Aspect Extraction (AE) that identifies and extracts the specific aspects or features of a service, product, or entity that are being addressed in the review. Once the aspects have been extracted, the second task, Sentiment Classification (SC), is applied, which involves analysing the text to categorise the sentiment expressed regards each aspect to be positive, negative, or neutral. The third task is Category Extraction (CE). After determining the sentiment for each aspect, this task involves identifying the broader categories or topics to which the aspects belong. It helps in organizing and grouping the aspects based on their related topics or themes. For example, in a product review, the categories could be performance, design, usability, and pricing. Aspect Category Polarity (ACP), the fourth task, gives the sentiment polarity related to each aspect category. It helps to measure sentiment polarity at a higher level of abstraction by providing an overview of the overall sentiment distribution across different topic areas.

Traditional machine learning techniques were adopted to achieve the goal of ABSA in the earlier works, such as Support vector machine (SVM) in [3] and [4]. Deep learning (DL) techniques, which are consider as subset of machine learning (ML), have recently been extensively applied for ABSA, and they achieved a remarkable performance due to their ability to learn the semantic relationships between the aspect and the context words. Deep neural networks that are built by DL algorithms are seek to simulate the way that the biological brain operates. It composed of numerous hidden layers surrounded by an input and output layer; each layer is made up of several connected neurons [5–7].

DL models are sometimes coupled with an attention mechanism, which is crucial in improving the performance of the ABSA models [8]. As neural networks cannot deal with the raw text, word embedding techniques are used to convert the word representation. Different word embeddings are widely used for SA tasks [5]. Lately, BERT [9] which is a language representation model, achieved a competitive performance in the ABSA task [8]. Despite the importance of ABSA and the rich Arabic content, the Arabic ABSA works are falling behind, especially in utilizing the recent techniques effectively.

This study presents a key contribution to the field of ABSA with regard to Arabic language. It demonstrates the effect of combining the pre-trained language model AraBERT, Bi-GRU networks, and soft attention mechanism in one model. Our approach leverages the strengths of each component to effectively capture and analyse the sentiment expressed regarding to each distinct aspect in the Arabic review text. This is

the first study of its kind, to our knowledge, that explore this particular combination of techniques for classifying the aspect sentiment polarity in Arabic reviews. The proposed model surpasses the baseline model [3] with a 14.41% improvement in accuracy and outperformed the state-of-the-art models by 1.3%. This contribution exhibits the efficacy of the proposed model and highlight its potential impact in advancing ABSA for Arabic text.

The rest of the paper is organized in the following manner: the next section presents a summary of previous Arabic ABSA DL-based studies, Sect. 3 demonstrates the proposed model architecture, and Sect. 4 outlines the used dataset, experiment settings, and the obtained outcomes. Lastly, Sect. 5 summarises the paper's conclusion as well as highlights future work.

2 Related Works

The Arabic Hotels dataset [3] is one of the commonly used datasets in the field of Arabic ABSA. An SVM-based model trained with n-gram features was provided with the Hotel dataset. The accuracy for the aspect sentiment classification (ASC) task is 76.4%. As the main interest of this study is the ASC for Arabic reviews, this section presents the related Arabic DL-based works for the ASC task.

Authors in [4] implemented two models for ABSA, the first one is a traditional machine learning model using the SVM classifier, and a DL model using vanilla RNN and Word2Vec word embedding for the second model. They evaluated their models using the Hotels reviews dataset. The results of the aspect sentiment polarity identification task reveal that the SVM model excels over the vanilla RNN, achieving an accuracy equal to 95.4%, while the RNN accuracy was 87%. However, in terms of execution time, SVM takes a longer execution time comparing to RNN in their experiment.

The model proposed in [10] was based on CNN. The aspect vector, as well as the sentence's word embeddings, are inputted into the CNN layers producing the feature map. To obtain the most significant feature, maximum pooling is used, and then fed them into the SoftMax to get the sentiment identification. The accuracy of the experiment using Arabic Hotels reviews dataset was equal to 82.7%.

To enhance the model's ability to extract contextual information in both directions of the sentence, hierarchical bidirectional LSTMs were employed in [11]. Word2Vec was used for word embedding followed by stacked bidirectional LSTMs layers. The forward and backward LSTMs' hidden states were combined and transmitted to the SoftMax classification layer to represent the probability distribution of sentiment classes for each sentence. The accuracy for the Arabic Hotel reviews dataset was equal to 82.9%.

The authors of [12] presented two models based on the LSTM, to tackle two tasks of ABSA. The proposed model generates aspect and text embeddings for the task of identifying the aspect sentiment polarity, using Word2Vec, and feed it as inputs to the LSTMs, followed by soft attention. The attention weight vector is then passed to the SoftMax to identify the aspects sentiment polarity. For evaluation, the Hotels reviews dataset was used. The proposed model achieved an accuracy equal to 82.6%.

Attention mechanism is also adopted in the model proposed in [13]. It is a memory-based recurrent attention (MBRA) model with a position-weighted memory module.

The memory networks combine the RNN model with an external memory, to overcome the inability of RNN to store long data sequences. The main three parts of this model are: (1) Memory building module that takes the word embedding vectors generated by the fastText as input and building the memory with useful sentence representations that are captured by Bi-IndyLSTM networks. (2) Position-weighted memory module. It gives weights to the words based on their position. Since words nearer to the aspect have a greater impact on its sentiment, these words will be assigned higher weights. (3) Recurrent attention module, as sometimes distant words have a major effect on the aspect sentiment, multiple soft attention layers are utilised to capture important words, multiple soft attention layers are used to capture important words. The final feature set is fed into the SoftMax layer for sentiment classification. Using the Hotels dataset for the evaluation, their model achieved an accuracy equal to 87.31%.

In [14], another model that made use of the attention mechanism was proposed. The model works by getting the aspect and context embedding vectors using Word2vec. Then, bi-directional GRU was applied to obtain the hidden states of the aspect and the context on both directions of the sentence separately and apply the average pooling for both separately. Passing the resulted representation into the attention layers to calculate the attention vectors. Finally, the aspect and context attention vectors are added together and sent into the SoftMax function for the final classification. They used the Hotel dataset for evaluation and attained an accuracy equals to 83.98%.

Authors of [15] examined the ability of BERT to accept a pair of sentences, the model inputs are two sentences. The first sentence is the review sentence, and the second one is the aspect words entered as an auxiliary sentence. Then, a simple linear layer is fed with the output of BERT, which represents the full contextualized word representation, and transforms that into features in a linear manner. Finally, for the sentiment classification, the SoftMax function was used. The authors used a pre-trained model called Arabic BERT [16] that was trained on approximately 8.2 billion Arabic words including both MSA and dialectal words. The experiments were conducted using Arabic hotel reviews dataset. The accuracy result was equal to 89.51%.

3 Proposed Model

The proposed model was implemented for tackling the aspect sentiment polarity identification task in Arabic reviews. The model's primary layers are: (1) AraBERT, the pre-trained language model, as an embedding layer, (2) Bi-GRU as encoder layer, and (3) Soft attention layer. Figure 1 shows the architecture of the proposed model.

3.1 Embedding Layer

Humans as language speakers were acquired massive amount of information about the language they speak, which enable them to understand the language, formulate words and sentences, and use them to communicate. On the other hand, neural networks are not able to understand the language which make it hard to feed them with text data directly. To solve this issue, text data would be converted to numerical values that represent the texts by utilizing word embedding models.

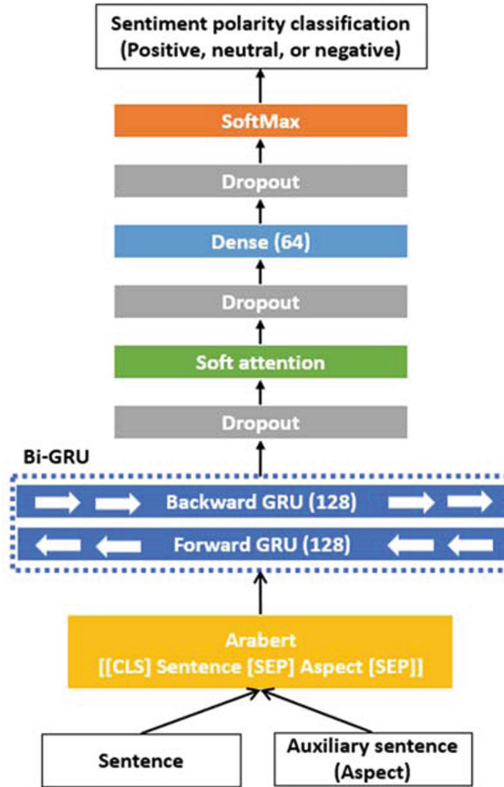


Fig. 1. Architecture of the proposed model

In this model, we applied the transfer learning by using AraBERT [17]. One of the well-known Arabic pre-trained language representation models is AraBERT, that introduced in 2018. AraBERT was trained on 77 GB of Arabic language content from several sources, including Arabic Wikipedia, Arabic corpus, and Arabic news articles [18]. BERT is developed to expect not only a single sentence as an input, as it can also accept a pair of sentences. We utilized this property via passing the whole review text as the first sentence and constructing the auxiliary sentence for the aspect terms. AraBERT would then presents their semantic meaning in a numerical form.

The model input sequence is generated as: $\text{input} = ([\text{CLS}], s_1, \dots, s_j, [\text{SEP}], a_1, \dots, a_n, [\text{SEP}])$, where s_1, \dots, s_j denotes the whole review sentence with j tokens, and a_1, \dots, a_n represents the review aspects with n tokens as an auxiliary sentence. The first token in the sequence is a classification token [CLS], while [SEP] token is used to separate the sentences.

3.2 Bi-GRU Encoder Layer

The recurrent neural network (RNN) processes the entered data sequentially and recursively applies a set of mathematical operations to every word of an input sentence at

a time, along with the hidden state from the previous time step to compute the current state. It has an internal memory to store learned information. RNN can be used to capture long-term dependencies in sequential data. However, simple RNN suffers from the vanishing gradient problem. To address this issue, two RNN variations are commonly utilised: long short-term memory (LSTM) and gated recurrent unit (GRU) [7].

GRU is considered a highly effective LSTM version. It consists of two types of gates named update and reset gates. These gates are sets of sigmoid activation functions that regulate the information flow across the GRU layer [7]. The LSTM's input gate and forget gate are combined into an update gate in the GRU, where the state is being updated using the input gate, and the decision to keep the information or not is made by the forget gate [5, 7]. The reset gate determines the past information that the network will forget. Compared to LSTM, GRU is simpler and therefore it becomes widely used for NLP tasks [5].

Due to the feed-forward model's limited ability to fully capture the reviews contextual information, Bi-GRU is needed to obtain a better contextual information on the sentence's two directions. Hence, in this proposed model the word embeddings are passed through a Bi-GRU layer, which consists of two GRU layers with a dimension of 128 neurons for each layer. The first layer would process the review sentence in the forward way, while the second would process it in the reverse way, allowing the model to capture the context and long-term dependencies between review words in both directions.

3.3 Soft Attention Layer

A simple soft attention layer [19] is adopted on top of the Bi-GRU layer to highlight the most relative words that highly affect the sentiment polarity at the sentence level, which helps to enhance the accuracy of the sentiment analysis by focusing on the most important words.

In this layer, the context vector " c_i " is generated by first computing the attention scores " e_{ij} " as the dot product of the input hidden states " h_j " and the weight matrix " w_j " and following that with a non-linear transformation (\tanh). The mathematical representation of attention score " e " is presented in the following equation:

$$e_{ij} = \tanh(h_j w_j)$$

Then, SoftMax function is utilized to obtain the normalized attention weights " a ":

$$a_{ij} = \frac{\exp(e_{ij})}{\sum_{k=1}^{T_x} \exp(e_{ik})}$$

Lastly, the context vector " c_i " is computed as the weighted sum of the dot product of SoftMax outputs and the hidden states:

$$c_i = \sum_{j=1}^{T_x} a_{ij} h_j$$

The soft attention layer's output is subsequently fed into a dense layer with a ReLU activation function that further refined and transforms the learned features. Finally, a

SoftMax function is employed within another dense layer, to indicate the sentiment of the mentioned aspects as positive, neutral, or negative.

4 Experimentation and Results

To execute the implemented Python code, Google Collaboratory [20] tool is used, it provides a cloud platform, due to the computational limitations on the local machine. For loading the word embedding models and their tokenizers, Hugging Face's Transformers library [21] was utilized. The neural networks were built using TensorFlow library [22].

4.1 Dataset Description

The proposed model was tested using the Arabic hotel dataset [3]. The dataset was constructed as a part of SemEval-2016 multilingual ABSA task that cover customers' reviews from seven distinct domains and eight different languages. The dataset is a benchmark dataset for Arabic ABSA, it consists of 24,028 annotated ABSA tuples that are split into 19,226 for training and 4,802 for testing. Furthermore, the dataset was annotated on a sentence-level (6,029 annotated sentences) as well as a text-level (2,291 reviews' texts). The focus of this study is only on the sentence-level tasks. Figure 2 shows an example of a hotel review from the dataset. Table 1 describes the dataset's size and distribution.

```
- <sentence id="937:2">
  <text>وهو موقع جيد لذي تستمتع باطلاة شاملة على مدرج الطائرات والاستماع بالخدمة شهيلا الجيدة</text>
  - <Opinions>
    <Opinion to="8" from="4" polarity="positive" category="LOCATION#GENERAL" target="موقع"/>
    <Opinion to="31" from="25" polarity="positive" category="LOCATION#GENERAL" target="الطائرة"/>
    <Opinion to="73" from="68" polarity="positive" category="FOOD_DRINKS#MISCELLANEOUS" target="الخدمة"/>
  </Opinions>
</sentence>
```

Fig. 2. Example of Arabic Hotel reviews Dataset Schema

Table 1. Arabic hotels reviews dataset size and distribution [11]

Task	Train			Test		
	Text	Sentences	Tuples	Text	Sentences	Tuples
T1: Sentence-level	1839	4802	10509	452	1227	2604
T2: Text-level	1839	4802	8757	452	1227	2158

4.2 Evaluation Metric

The model's performance was evaluated using the accuracy metric. It was chosen as the primary evaluation metric in order to ensure consistency and comparability with existing

studies and baseline model. By dividing the number of correct predictions by the entire dataset predictions, the accuracy of the model can be identified. The accuracy (Acc) calculation method is as follows:

$$Acc = \frac{(TP + TN)}{(TP + FP + TN + FN)}$$

In the equation, TP, TN, FP, and FN denote true positive, true negative, false positive, and false negative, respectively.

4.3 Experimental Settings

The pre-trained language model AraBERT “version 0.2-base” was used for word embedding, which is pre-trained over a dataset of a size equal to 77 GB, and it consists of 200M sentences [18]. For the optimizer, Adam was used with a learning rate of $1e-5$. The dropout rate was set to 0.1, and the total of 15 epochs were used, with a batch size of 24.

Model training took up 70% of the hotel dataset, model validation 10%, and model testing 20%. For text preprocessing, punctuation marks, symbols, diacritics, non-Arabic letters, digits, and extra white spaces are removed, and the variations of Arabic letters are normalized into a standardized form. The associated AraBERTv0.2-base tokenizer is used to ensure that the input sentence tokenization is compatible with the model’s pre-training dataset tokenization, and to reduce the out-of-vocabulary words. For padding, the longest review is measured, and its length is defined as the maximum length. To handle the overfitting problem, an early stopping technique is applied; training is stopped when the performance on the validation set stops improving. Dropout layers, that randomly drops out some of the neurons, are used during training which can help to prevent overfitting. The proposed model is compared with the baseline model [3], as well as the state-of-the-art models described in the related work section [4, 10–15]. The baseline model was published along with the Hotels dataset [3], it is based on a SVM classifier that was trained using n-gram features.

4.4 Results and Discussion

As shown in Table 2, the proposed model outperforms the baseline model and all Arabic DL models evaluated on the same dataset and for the same task (Aspect Sentiment Classification) for Arabic reviews, as it showed a 14.41% enhancement in accuracy over the baseline model, and surpassed the state-of-the-art models by 1.3%, with an accuracy equals to 90.81%.

The result has proved the effectiveness of the incorporation of the state-of-the-art NLP techniques. It also indicates that the proposed model was successful in capturing the complex relationships between aspects and their corresponding sentiment polarities in hotel datasets reviews.

We conducted further experiments on our model, one in which we obtained the aspect embedding and the review embedding separately, and another in which we removed the attention layer, for assessing the efficacy of utilising BERT auxiliary sentence and

Table 2. Comparison of the proposed model with the baseline and state-of-the-art models

Approach	Accuracy
Baseline [3]	76.42%
Bi-LSTM, Soft attention [12]	82.6%
CNN [10]	82.7%
Hierarchical bi-LSTMs [11]	82.9%
Bi-GRU, IAN [14]	83.98%
RNN [4]	87%
Bi-IndyLSTMs, recurrent attention [13]	87.31%
BERT-linear-pair [15]	89.51%
Proposed model without auxiliary sentence	87.98%
Proposed model without attention	88.62%
Proposed model	90.81%

the use of the soft attention. The experimental results revealed that utilizing the auxiliary sentence of AraBERT for word embedding leads to a 2.83% improvement compared to obtaining the embedding of the review and the aspect separately. Although, a sentence-level attention is used within the aspect-level task, the attention shows 2.19% improvement for the proposed model. An example of the attention scores is presented in Fig. 3.

Text: الغرف جيدة لكن الخدمة والاستقبال سيء جدا
Aspect: الغرف
Actual polarity: positive
Predicted polarity: positive
1/1 [=====] - 7s 7s/step
Text: الغرف جيدة لكن الخدمة والاستقبال سيء جدا
Aspect: الخدمة والاستقبال
Actual polarity: negative
Predicted polarity: negative

Fig. 3. Example of the Attention scores of the following review “The rooms are good, but the service and hospitality are very bad” toward the aspect’s “rooms” and “service and hospitality”

In comparison to the other classes, we found that the proposed model performed relatively poor in predicting the neutral class. This is likely due to class imbalance, which can cause the model to be biased towards the majority classes.

Mislabelled data is another issue that can seriously degrade the performance of the sentiment classification models. Since labels are incorrect, classification model will learn from incorrect examples and may struggle to accurately classify sentiments. After conducting a thorough examination of the misclassified aspects' sentiments, we have found that the used dataset contains mislabelling data, which influence the accuracy of the proposed model. The issue is not limited to the test set; it extends to the training set, leading to a confusion that can impact the learning process of the proposed model.

Additionally, we have observed an inconsistency in labelling sentiments of aspects that are associated with the word “جيد” (meaning “good” in English). These aspects are sometimes labelled as having positive sentiments and at other times as neutral. This inconsistency further adds to the model's confusion and results in mixed predictions of both positive and neutral classifications when that word is mentioned.

5 Conclusion

State-of-the-art NLP techniques have been incorporated into the proposed model in the present research. By constructing AraBERT auxiliary sentence that is composed of aspect terms along with passing the whole review text as the main sentence, the contextual word embeddings were obtained. Following that, Bi-GRU networks with soft attention are used to obtain better text representation. Results of the experiments reveal that the proposed model significantly outperformed the baseline model. Moreover, it surpasses the state-of-the-art models that have considered the Arabic Hotel dataset in their evaluation. The proposed model's results for predicting neutral reviews were less accurate than those for positive and negative reviews. This indicates that the model had difficulty in correctly predicting the neutral class, most likely due to the inadequate number of neutral reviews and the mislabelling issue in the used dataset.

For the future work, we seek to extend the proposed model into an Aspect Sentiment Triplet Extraction (ASTE) model, where three different tasks will be covered instead of a single task. ASTE aims to capture three key elements in a given review: the aspect, its associated sentiment, and the opinion that clarify the motive of that sentiment [23]. By considering these three elements simultaneously, ASTE will give a deeper understanding of the opinions expressed towards specific aspects, enabling comprehensive insights into user sentiments and preferences. Additionally, we intend to apply the attention mechanism at the aspect-level, which may result in predicting more accurately.

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Mitigating Out-of-Stock (OOS) Risk in the Polymer Packaging Industry: A Practical Approach

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Abstract. The packaging industry's pivotal role in safeguarding and transporting goods underscores the need for effective inventory management, particularly concerning critical raw materials like polymers. Managing inventory levels efficiently is crucial for seamless production and cost reduction. This paper presents an insightful approach to inventory management and risk mitigation, focusing on the looming challenge of running out of stock (OOS) of polymers within the packaging sector. Employing qualitative research methods, we conducted in-depth interviews with four key managerial personnel from a prominent packaging company. Our study unravels the intricate landscape of inventory management practices employed by industry players, shedding light on innovative strategies to preempt OOS scenarios. We propose a pragmatic inventory management approach that encompasses the implementation of tailored inventory policies, a thorough examination of cycle service levels, the profound impact of demand forecasting, and the intricacies of suppliers' lead-times on inventory policy. This research significantly contributes to the existing body of knowledge on inventory management within the manufacturing sphere by directing attention to the packaging industry's unique challenges in polymer inventory management. Our findings deliver actionable insights that practitioners in the packaging sector can leverage to elevate their inventory management practices and, concurrently, reduce the ominous spectra of OOS occurrences. Furthermore, this study paves the way for future exploration into the domain of inventory management and OOS risk assessment, specifically within the packaging industry's dynamic landscape.

Keywords: inventory management · packaging industry · polymers supply chain · out-of-stock · demand forecasting · sourcing strategy

1 Introduction

Inventory management is a critical aspect of manufacturing businesses, with a lot of focus on avoiding out-of-stock situations. Inventories are essential resources used to meet present and future needs, but they must be managed efficiently to prevent deterioration and excessive costs. Inadequate inventory levels lead to unmet customer demand, resulting in financial losses.

In today's rapidly changing business landscape, unforeseen disruptions, such as supply chain disruptions and sudden shifts in customer demand, can exacerbate the risk of running out of stock. Therefore, it becomes imperative for companies to adopt a proactive approach to inventory management, effective inventory management is becoming crucial for a company's survival. This includes not only optimizing inventory policies but also implementing robust demand forecasting and procurement strategies. Maintaining inventories of raw materials, work-in-progress, and finished products is essential to keep operations running smoothly; however, mismanagement of these inventories can lead to both understocking and overstocking, affecting a company's overall performance. Inventory management involves various approaches, such as continuous review and periodic review systems. The choice of approach depends on factors like industry type and product characteristics. For example, retail and e-commerce businesses often utilize continuous inventory review systems, while manufacturers of customized products may opt for periodic review systems. Careful consideration of inventory policies is vital to prevent the risk of stockouts [1].

This research delves specifically into the packaging industry, focusing on a prominent plastic bag manufacturer based in Malaysia. The primary objective is to investigate key factors contributing to polymer OOS in the packaging industry, analyzes past OOS events, the impact on their business and proposes mitigation strategies to avoid OOS events based on study from a large-scale plastic bag manufacturer located in Malaysia. By providing valuable insights into the company's inventory management practices, this study aims to enhance supply chain efficiency and effectiveness, ultimately benefiting the company's performance and competitiveness.

2 Literature Review

The literature review provides a comprehensive overview of inventory management within the manufacturing industry, with a specific focus on addressing OOS events and strategies for their mitigation. This study aims to investigate practical inventory management methods to reduce the risk of polymer OOS incidents in the packaging industry.

Given the limited literature on inventory management within the packaging sector, this study suggests the adaptation of inventory management principles from broader manufacturing contexts to the packaging industry, assuming similarities in manufacturing processes.

Efficient inventory management is vital in manufacturing, especially concerning crucial raw materials like polymers in the packaging industry, used in producing items such as bottles, bags, and films. Effective inventory control and risk mitigation for polymer OOS are essential for the packaging industry's seamless operation [2, 3].

OOS poses a common challenge for packaging firms, resulting from insufficient inventory to meet customer demand, significantly affecting performance and profitability. Research indicates that OOS can lead to reduced customer satisfaction, lost sales, and revenue [4]. Customers may turn to competitors when products are unavailable, potentially reducing market share. Moreover, OOS can increase the cost of goods sold, requiring rush orders or higher material costs to meet demand. OOS disruptions extend

to a company's supply chain, lengthening lead times, and raising costs due to expedited shipments. Production disruptions can also occur when raw materials are lacking [5].

Several strategies have been proposed to mitigate OOS impact. Effective inventory management systems aid demand forecasting and inventory adjustments. Sourcing strategies, like supplier diversification, reduce OOS risk. Lean inventory practices identify and eliminate waste, improving efficiency [6].

Advanced analytics and data-driven methods enable real-time inventory monitoring and informed decision-making [7, 8]. A study by Wang shown that machine learning algorithms enhance forecast accuracy and reduce inventory costs [9].

In summary, the literature underscores OOS as a prevalent challenge in manufacturing, impacting company performance. However, various strategies, including inventory management, sourcing diversification, lean practices, advanced analytics, and machine learning, help improve demand forecasting, inventory control, and OOS risk mitigation.

3 Research Methodology

3.1 Introduction

Due to the limited literature available on inventory practices in the packaging industry, an exploratory study was chosen to gain a better understanding of inventory management practices and the reasons for OOS events for polymers. To achieve this, an inductive case study approach was utilized to examine inventory management practices in the packaging industry [10, 11]. This approach is well-suited for investigating complex phenomena that cannot be illuminated by surveys alone since it allows the researcher to interact with the informant and to draw on multiple sources of information, leading to information-rich cases [12, 13].

3.2 Methodology Justification

To accurately describe, truly understand, and explain these complex subject areas, many researchers include more studies using a qualitative approach. By identifying the research process and related quality criteria, case study research is useful in supply chain management [14].

An exploratory study was conducted due to the scarcity of research on inventory management practices and challenges in the packaging industry. Given the limited knowledge in this area, a qualitative approach was chosen, specifically employing an inductive case study method [15, 16]. The study aimed to uncover inventory management practices in the Malaysian packaging industry, investigate the reasons for polymer OOS incidents, and propose strategies for mitigating these issues to improve the company's financial performance.

3.3 Data Collection and Analysis

Qualitative data collection in this study involved conducting semi-structured interviews with experienced managerial personnel (refer to Table 1) in the polymer packaging

industry. These interviews aimed to comprehensively explore the company’s current inventory management practices, reasons for OOS incidents, and strategies for OOS risk mitigation. To guide the interviews, a predetermined set of key themes and questions was developed, encompassing various aspects such as professional experiences, inventory categorization, supplier management, lead-time, service level, demand forecasting, out-of-stock situations, supply chain design, strategy, and inventory policies. The questions were designed to facilitate detailed responses.

Table 1. Details of the informants from the company

No.	Informants	Job title	Experience in industry
1	Mr. FA	Factory Manager	12 years
2	Mr. NZ	Purchasing Manager	8 years
3	Ms. AM	Blending Manager	11years
4	Mr. TT	Freelancer and consultant in plastics packaging manufacturing	35 years

This qualitative data analysis followed a thematic analysis approach, which involved identifying patterns and themes within the interview data. Thematic analysis allowed for a comprehensive exploration of inventory management practices, challenges, and mitigation strategies. The data were transcribed, coded, and categorized into themes and sub-themes, facilitating a deep understanding of the research objectives. To ensure credibility, member checking was employed for participant validation. Overall, this approach provided valuable insights into the company’s OOS challenges, strategies to mitigate the risk of OOS events and their relevance to the broader industry.

3.4 Limitations and Ethical Considerations

This study has several limitations, including the restricted generalizability of the case study approach to smaller packaging companies and the small number of participants. Additionally, the reliance on historical data and interviewees’ recall may affect the accuracy and timeliness of the findings. Participants’ potential gaps in supply chain knowledge could impact the quality of information. However, the research adhered to ethical principles, securing informed consent, ensuring confidentiality, and operating within available resources. Ethical considerations included mitigating participant influence, researcher bias, and potential negative impacts on the community. These factors were thoughtfully addressed throughout the research process.

4 Findings

Table 2 presents a comprehensive breakdown of codes, themes, and elements related to Out-of-Stock generated in this research. Under the parent code of “Out-of-Stock”, four key structural themes emerged.

Table 2. Code, Themes and Elements related to OOS

Parent code	Child Codes/Structural theme	Grandchild Codes
Out-of-stock	• Events of OOS	
	• Impact of OOS	<ul style="list-style-type: none"> • Loss of profit • Airfreighting • Cost implication • Reduced operation rate
	• Reasons of OOS	<ul style="list-style-type: none"> • Limited Supply • Pandemic • Supply Chain Disruptions • Shipment Delays
	• Methods to mitigate OOS	<ul style="list-style-type: none"> • Supply Assurance • Contingency Plan

4.1 Events of OOS

The company's approach to OOS situations is characterized by a profound concern for their potential impact on business operations, as revealed in interviews with key informants like Mr. FA, Ms. AM, and Mr. TT. According to the informants, instances of OOS have been relatively infrequent, well managed by the supply chain team, and mainly observed during the COVID-19 pandemic. Statements from Mr. FA and Ms. AM underscored that while OOS events have occurred occasionally, they are not a common issue. The supply chain team is held accountable through key performance indicators (KPIs) to prevent OOS events. Mr. TT emphasized the importance of avoiding OOS, as it can significantly disrupt production, and the company is committed to exploring alternative solutions to ensure continuous production. Overall, the data underscores the company's unwavering commitment to mitigating OOS and ensuring uninterrupted business operations, recognizing the crucial importance of material availability.

4.2 Impact of OOS

The polymer packaging company is deeply concerned about the potential consequences of OOS situations, recognizing the significant disruptions they can cause to their operations. Mr. TT underscores the criticality of avoiding OOS, given the production halts, and added costs associated with air freighting raw materials. This highlights the pivotal role of inventory management in maintaining smooth business operations. Mr. FA reinforces this concern, emphasizing OOS as a top-level issue and a key performance indicator for the supply chain team. The team is held responsible for preventing OOS at all costs and must have mitigation plans in place if one occurs. The far-reaching ramifications of OOS, including lost profits, increased costs, and operational disruptions, are acknowledged. To address these challenges, the company remains committed to maintaining a reliable supply of materials, even resorting to local suppliers at a premium cost, when

necessary, as indicated by Mr. NZ. Overall, OOS avoidance is paramount for the company, with vigilant top management oversight and a dedication to ensuring uninterrupted operations.

4.3 Reasons for OOS

Out-of-stock (OOS) situations can have detrimental effects on a company, potentially causing production disruptions and revenue loss. Insights from interviews with Ms. AM and Mr. FA shed light on the reasons behind OOS incidents within the company. Ms. AM points out that market shortages, resulting in the unavailability of alternative raw material grades, are a significant contributor to OOS. The company depended on two approved suppliers for specific material grades, and when these suppliers faced limited allocations, shipment delays, or shortages, OOS events occurred.

Mr. FA highlights late requisition submissions as another OOS trigger, where delayed material requests can leave suppliers with insufficient time to fulfill orders. Allocation constraints, wherein regular suppliers are unable to meet demand due to various factors, are also mentioned.

The recent COVID-19 pandemic further complicated supply chains, introducing longer lead-times, unpredictable shipping schedules, port closures, and higher freight costs. Furthermore, Mr. NZ pointed out that unplanned plant shutdowns, major disasters, geopolitical issues, or significant shipment delays could contribute to OOS scenarios, though shorter delays might not necessarily result in OOS.

Overall, various factors, including limited supply, pandemic, supply chain disruptions and delayed shipments, were identified as potential causes of OOS events within the company.

4.4 Methods to Mitigate OOS

The interviews with the informants underscore the importance of maintaining adequate stock levels, including raw materials and auxiliary resources, to prevent OOS situations. Mr. TT emphasizes the significance of holding three months' worth of inventory, including safety stock for ingredients like printing ink. He highlights that rapid action is essential when a supplier can no longer provide materials within their stock timeframe, as ordering from alternative sources takes time. Mr. NZ discusses changes made at the strategic level, introducing a new inventory policy (R,S) in 2019, which significantly reduced the frequency of OOS occurrences to 2–3 times per year. Ms. AM mentions plans to expand the material base to have up to five alternatives when materials go out of stock.

In response to OOS, the company has established guidelines, including customer communication, formulation changes, and assessment of profitability, with top management making the final decisions. Innovation plays a role in the company's strategy to prevent OOS incidents, involving the exploration of alternative materials and adjustments to product formulations to reduce reliance on single ingredients. Sometimes, they reduce production volume to extend the timeline.

Mr. FA emphasizes the importance of stability and reliability in the supply chain and having contingency plans in place. Contract agreements with suppliers guarantee fixed allocations, ensuring a steady supply. Mr. NZ highlights the company's strategy of flexibility, adaptability, and agility in navigating challenges such as the COVID-19 pandemic without encountering OOS situations, emphasizing the robustness of their supply chain.

Finally, communication with customers is essential in the event of an OOS situation. The company's customer relationship department works to keep customers informed of the situation and potential delivery dates and works to find solutions that are acceptable to both parties.

5 Discussion and Conclusion

OOS events can have significant consequences for businesses, including lost sales and damage to customer relationships. The absence of a particular item can frustrate customers seeking alternative products and suppliers. This not only leads to losses in business revenue but also has a negative impact on the company's reputation and long-term customer relationships. Additionally, OOS events can have an impact on production processes and supply chain operations. The absence of a critical raw material can disrupt the production flow, resulting in decreased efficiency and increased costs [4]. Moreover, the effort required to quickly source alternative materials and adjust the production processes can be significant, further exacerbating the impact of OOS events.

Four key factors which were mentioned repeatedly by the informants and summarized in Table 3.

Table 3. Key Factors for OOS in the company

No.	Key Factors	Description
1	Limited Supply	Suppliers are unable to meet the necessary demand due to either a shortage in the supply of upstream feedstock or an unexpected increase in demand within the packaging industry
2	Supply Chain Disruptions	Unexpected occurrences, such as a shutdown of a petrochemical plant due to maintenance, a major disaster, force majeure, or geopolitical issues, can disrupt the supply chain
3	Shipment Delays	Delays in shipment exceeding 30 days can result in Out-of-Stock (OOS) situations due to the limited safety stock in place, which is set for less than 4 weeks
4	Pandemic	Disease outbreaks and lockdowns in ports and cities can cause closure, leading to disruptions in material supply

Understanding the causes and consequences of OOS events is essential for businesses seeking to optimize their inventory management processes and achieve greater operational efficiency and financial success.

The company employs several strategies to mitigate OOS situations. One significant method is the use of a contingency plan, which involves senior management's proactive involvement in reviewing and constantly updating mitigation plans when OOS events occur. The guidelines for handling OOS situations include identifying potential issues, considering alternative sources and product formulations, effective communication with customers, and slowing down manufacturing instead of halting it completely to minimize disruptions.

In addition, the company emphasizes supply assurance by diversifying its supplier base to three to five sources, prioritizing local supply sources even if they come at a slightly higher cost, and establishing contractual agreements with critical suppliers for reliable allocation. Product development and innovation also play a role in reducing OOS by allowing the company to switch ingredients when critical polymers are in limited supply, increasing flexibility. These strategies, including the adoption of an effective inventory policy, have substantially reduced OOS occurrences and contribute to a practical approach in managing OOS situations in the polymer packaging industry.

6 Recommendation for Future Research

Measuring the precise impact of OOS events on a company's value can be challenging. It requires empirical data collected from various supply chain stages to gain a deeper understanding of this influence. Empirical knowledge, acquired through observation and experimentation, is crucial for accurately assessing how OOS incidents affect a company. This data can be obtained through methods like tracking sales, monitoring inventory levels and costs, and assessing financial health. By combining empirical knowledge with cost analysis across supply chain stages, it becomes possible to determine optimal inventory policies and comprehend the impact of OOS occurrences on a company's value.

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Strategic Development for the Tourism Industry Using the Penta Helix Model (A Case Study of Kuta Beach, Bali Tourist Attraction)

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Abstract. The tourism industry has become one of Indonesia's leading sectors, making a significant contribution to the national and regional economies. Badung Regency, especially Kuta, is an iconic tourism destination in Bali and a global center of gravity. In the midst of the pandemic, Badung Regency is working on a recovery plan to revitalize the tourism industry at Kuta Beach and rekindle the interest of both domestic and international tourists. Given the abundant tourism potential in Badung Regency, particularly at Kuta Beach, synergy among the elements of the Penta Helix model, which includes business, government, community, academics, and media (BGCAM), is crucial. This research employs a mixed-method approach with the Rapid Appraisal Method (RAM), combining rapid monitoring, participatory methods, and SWOT analysis. Based on the analysis, this study underscores the integral role played by the various elements of the Penta Helix model in advancing the development of Kuta Beach tourism in Bali, with each element contributing according to its strengths and authority. Academics serve as the foundation for policy formulation and the enhancement of tourism human resources, while industry pioneers drive innovation in tourism businesses. The government's role is pivotal in policy creation, regulation drafting, and implementation, and the community and media contribute significantly to providing a welcoming and secure environment, as well as promoting Kuta Beach as a tourist destination. The short-term, medium-term, and long-term strategies outlined offer a comprehensive roadmap for the sustainable growth and enhancement of Kuta Beach tourism.

Keywords: Tourism Industry · Sustainable Tourism · Community-based Tourism · Penta Helix model · Tourism Industry Development Strategy

1 Introduction

The tourism industry in Indonesia, particularly in Bali, plays a vital role in contributing to the country's economy. It fosters economic growth, helps preserve the environment and culture, and alleviates poverty (Yasir et al. 2021). Tourism development has a significant

impact on improving the well-being of communities and is a key player in achieving sustainable development (Yasir et al. 2021). The economic dimension of tourism aims to maximize crop yields, minimize costs, and boost the vitality of the tourism industry, thereby enhancing local economic growth (Cavalcante et al. 2021).

Tourism in Indonesia encompasses various activities related to tourists, including transportation, accommodation, attractions, services, and more (Budhi et al. 2022). It generates job opportunities, promotes local trade, and attracts financial investments to the Bali region (Kuzior et al. 2021). Consequently, there is a growing need to focus on sustainable tourism for its economic benefits and to improve the welfare of local communities.

Sustainable tourism refers to the development of tourism that meets tourists' needs while ensuring environmental sustainability and benefiting current and future generations (Abdou et al. 2020; Cavalcante et al. 2021). The principles of a green economy and sustainable development guide the impact of tourism on the economy, emphasizing low-carbon development and sustainable practices (Pang et al. 2023). To achieve sustainable tourism, community participation is essential.

Community-based tourism involves the active involvement of the community in tourism development, where they make decisions and share the benefits of tourism (Forero 2022). Such an approach has significant potential for rural development, environmental conservation, and socioeconomic progress (Thananusak and Suriyankietkaew 2023). Collaboration among the five key stakeholders, including government, businesses, academics, the community, and the media, as outlined in the Penta Helix model, is essential to realize the goals of tourism development effectively and sustainably (Baihaki et al. 2020).

In the context of Bali's Kuta Beach, where the tourism sector is of paramount importance, understanding the significance of the Penta Helix model in tourism development is crucial. Thus, the primary objectives of this study encompass two key aspects. First, it seeks to comprehend the significance of Penta Helix in the development of tourism at Kuta Beach, Bali. Second, the research aims to formulate a comprehensive strategy for the short, medium, and long-term development of the tourism industry at Kuta Beach, Bali. This strategy is intended to serve as a valuable reference point for informed strategic decision-making by governments.

2 Methodology

This research is an Action Research project conducted in the Kuta Beach Area, specifically in Kuta Village, South Kuta District, Badung Regency. The research methodology involved a mixed approach, combining the Rapid Appraisal Method (RAM) for quick data collection and analysis, community participation, and the utilization of a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis.

The RAM method is employed to efficiently gather insights from the target population and stakeholders about the geographical and socioeconomic conditions of the area. This approach consists of several stages, including interviews with key informants, conducting Focus Group Discussions (FGD), engaging in community group interviews, direct observation, and conducting mini surveys. The SWOT analysis is used to assess

the potential and challenges related to the development of the tourism industry in Kuta, Bali. In the initial phase, factors relevant to the tourism industry's growth were identified through a researcher's questionnaire. These factors were further refined in consultation with specialists and the local community, resulting in a comprehensive list of factors for the SWOT analysis.

3 Results and Discussion

3.1 Descriptive Analysis of the Tourism Potential in Kuta Beach, Bali

Based on the results of FGD and interviews with several respondents, some of the potentials possessed by Panti Kuta tourism objects such as those that can still be developed are:

a. Art Market Potential

The art market in Kuta Beach has the potential to be developed into a shopping center for art items for tourists. Tourists, preferring unique items at low prices to be used as souvenirs, which have a distinctive artistic value from the area will have added value for tourists shopping.

b. Night Tourism Potential

The potential of night tourism is a must with the aim of 24-hour economic turnover on Kuta beach. In addition to culture, as an attraction tourists come to Kuta Beach Bali with tourist attractions that invite tourists to visit at night. The merchants played an important role to shape the culture such as; Knowing detailed knowledge about the product, good product quality, trust, honesty, friendliness, and cleanliness are the main points.

c. Sustainable Entertainment and Cultural Potential:

Kuta Beach has a strong potential to be used as cultural tourism potential by highlighting cultural arts such as the potential for dances, such as the Legong Keraton Dance created by dance artists from the traditional village of Kuta Mr. Wayan Lotring, Cak Perempuan dance, ngaben/cremation ceremony processions from Hindus in Bali. as well as music and other cultural parades. And can also be developed tour around Kuta beach and visit historical places in Kuta area. The tour can be designed by riding a horse or Dokar which is a characteristic of equestrian transportation in Bali, especially in the city of Denpasar.

d. Water tourism potential: Kuta Beach is also very potential in the development of Water Tourism. On this beach there are many small boats known as *jukung*. Besides being used to catch fish, these *jukung* can also be used by tourists to do activities such as: fishing, diving, and surfing. This *jukung* rental activity is very influential on the survival of fishermen on Kuta beach. And the waves on Kuta beach are very supportive of water sports activities such as surfing. In addition, for beginner surfers who want to try surfing, there are also trainer services or Surf School that can be a guide for them. On Kuta beach, a skatepark area has also been built.

e. Potential tourists Hotel and Restaurant, Culinary.

Along the stretch of Kuta beach there are many star hotels that offer views of Kuta beach with white sand and enchanting sunsets. On Kuta beach there are also many restaurants and food stalls that sell seafood, as well as other Balinese specialties.

3.2 SWOT Identification of Kuta Beach Bali Attractions

Based on the results of the FGD, internal factors (in the form of strengths and weaknesses) and external factors (in the form of opportunities and threats) can be identified in Kuta beach attractions in the new normal era (Table 1).

Table 1. Internal and External Factors in Kuta Beach Bali

Factor		Description
Internal	Strengths	<ol style="list-style-type: none"> 1. White sand beach view and sunset at Kuta Beach 2. Branding is well known abroad 3. Various types of beach tourism such as surfing, Jetski, jogging track and cycling 4. There is an Art Market on Kuta beach 5. Unique cultures such as: female Cak dance, legong kraton dance and traditional Balinese gamelan music 6. There are open stage facilities for the performance of cultural arts, music, and dance as well as ngaben culture 7. There are educational tourist attractions for turtle/turtle breeding and egg laying places 8. Strategic location near I Gusti Ngurah Rai airport and good road access 9. Hotel facilities and facilities very nice restaurant 10. Tsunami Center Educational Tour 11. The existence of interesting sports photos
	Weaknesses	<ol style="list-style-type: none"> 1. The local government and tourism actors in Kuta beach had never previously prepared the concept of disaster mitigation in the tourism sector 2. There is no special institution that manages tourism in Kuta Beach 3. People on Kuta beach rely too much on tourism with high economic value 4. The lack of health facilities and public toilets is too far away 5. There is no information service officer and there is still a lack of balawista officers 6. The arrangement of the place where traders sell in Kuta Beach has not been well arranged 7. Limited vehicle parking space for visitors
External	Opportunities	<ol style="list-style-type: none"> 1. The market share of domestic and foreign tourists is still very large 2. Tourists visiting Kuta Beach in the post-pandemic period will have the chance to attract high-quality tourists focused on health and wellness 3. The existence of international class events in Bali so that it can bring many tourists to Bali

(continued)

Table 1. (continued)

Factor		Description
	Threats	<ol style="list-style-type: none"> 1. Mass tourism will decrease to the island of Bali will also affect tourist visits to Kuta Beach 2. Assuring tourists of a sense of security and comfort for the health and cleanliness of tourist products at Kuta Beach Bali 3. Intense competition with other tourist destinations, both local, domestic, and abroad 4. The threat of abrasion on Kuta beach

Based on the SWOT matrix, an S-O strategy can be prepared that maximizes strength to be able to take existing opportunities for the development of the Kuta beach tourism industry, the S-T strategy is by maximizing the strength factor to be able to overcome obstacles in the development of the Kuta Beach Tourism Industry. Furthermore, the W-O Strategy is a strategy to minimize weaknesses to be able to take existing opportunities, while the W-T Strategy aims to minimize weaknesses and at the same time avoid threats in the development of the Tourism Industry in Kuta Beach. The decision-making process by providing a flow chart consisting of the basic stages of identifying SWOT factors, establishing decision hierarchies, prioritizing SWOT factors and groups, and strategizing using the TOWS matrix (Grid 2019). Table 2 presents the compilation of the SWOT matrix.

Table 2. SWOT Matrix for Tourism at Kuta Beach, Bali

SWOT Matrix	Strengths – S	Weaknesses – W
Opportunities – O	<p>Strategi S-O: Optimizing promotion about Kuta beach tourism at home and abroad, unique culture, adding public facilities to provide a sense of travel security, which can bring domestic and foreign tourists</p>	<p>Strategi W-O: Preparing the concept of tourism mitigation and institutional strengthening of Tourism Management on Kuta beach to bring in quality domestic and foreign tourists</p>
Threats – T	<p>Strategi S-T: Optimizing the unique potential of tourist attractions and tourist attractions on Kuta beach so that it can compete with other tourist destinations both inside and outside Bali and provide a sense of security and comfort for tourists</p>	<p>Strategi W-T: Increase the number of information service officers and public facilities, increase parking areas for tourists to attract domestic and foreign tourists to visit Kuta Beach</p>

3.3 The Role of Penta Helix in Tourism Development in Kuta Beach Bali

Based on the results of literature review and FGD, Table 3 below presents the role of each element on the Penta Helix, in the development of tourism on Kuta beach Bali. Each element of the Penta Helix has its own role in the development of tourism on Kuta beach Bali which is adjusted to the authority and capability of each Penta Helix element. Community involvement in the Penta Helix scheme has an important role in addition to academics, business, and government, the community has the ability to participate directly in encouraging the development of the tourism industry (Sudiana et al. 2020). Overall, these dynamics can contribute to the development of sustainable and regenerative tourism that places high attention on community well-being, holistic development, and cultural vitality and sustainability (Duxbury et al., 2021).

Table 3. The role of Penta Helix in tourism development in Kuta Beach Bali

Penta Helix Element	Role in Tourism	Role in Tourism Development in Kuta Beach Bali
Government	<ol style="list-style-type: none"> 1. Tourism development through regulation, coaching, implementation, and supervision 	<ol style="list-style-type: none"> 1. Develop and implement standardization policies; CHSE certification of tourist attractions 2. Issue policies that support credit to MSME entrepreneurs in Kuta Beach 3. Helping tourism marketing in Kuta Beach by holding beach events/festivals featuring local Balinese products
Industrial/private	<ol style="list-style-type: none"> 1. Sources of business capital 2. Job opportunities 3. Recruitment of local human resources as tourism industry players 	<ol style="list-style-type: none"> 1. Breakthrough new types of business/new innovations in accordance with potential standards Development of Kuta beach Bali 2. Using Corporate Social Responsibility (CSR) Funds to assist small borrowers in improving their competence 3. Using a touch of technology in business

(continued)

Table 3. (continued)

Penta Helix Element	Role in Tourism	Role in Tourism Development in Kuta Beach Bali
Academy	<ol style="list-style-type: none"> 1. Implementing training and development of tourism human resources 2. Implement scientific studies 3. Implementing socialization and mentoring of community groups in producing innovative tourism products and services 	<ol style="list-style-type: none"> 1. Provide policy input to the government based on studies conducted 2. Provide data and input related to needs in tourism development on Kuta beach Bali
Local Community/Balinese Residents	<ol style="list-style-type: none"> 1. Acting as a business actor who moves directly/indirectly in the tourism industry on Kuta beach Bali 2. Looking for new ideas or breakthroughs in the tourism industry 3. Monitor the cultural and social impact of tourism 	<ol style="list-style-type: none"> 1. Discipline in implementing health protocols, especially in tourist attractions 2. Support government policies 3. Serving tourists kindly 4. Providing a sense of security for tourists visiting Kuta beach Bali
Media	<ol style="list-style-type: none"> 1. Promotional instruments, information distribution and improvement of tourist image 	<ol style="list-style-type: none"> 1. As a tourism promotion media in Kuta Beach Bali 2. Creating comfort for the public and tourists with constructive news 3. Reporting on efforts that can be made for the development of Tourism in Kuta Beach so that it is easily accessible to all parties

3.4 Tourism Industry Development Strategy in Kuta Beach Bali

The strategies for developing tourism in Bali are categorized into short-term, medium-term, and long-term plans. The formulation of these strategies was informed by the results of the FGD conducted in collaboration with the Penta Helix model. Table 4 outlines the development strategy for the tourism industry in Kuta Beach, Bali, based on this collaborative effort.

These strategies are designed to be implemented in three stages: short-term, medium-term, and long-term. This phased approach ensures that the strategies can be realized gradually and sustainably, promoting the steady growth of the tourism industry.

Table 4. Formulation of Bali Tourism Industry Development Strategy in Kuta Beach

Classification	Description	Code
Short-term	1) Arranging the Kuta Beach area well and adding tourist facilities needed for the comfort of tourists	S1
	2) Provision of subsidized interest and credit restructuring (loans and multi-finance) to Micro, Small and Medium Enterprises (MSMEs) in banks or other financing institutions, to help MSMEs in Kuta beach	S2
	3) Providing the required training and certification and placement of workers through the expansion of training for MSME players in the Tourism industry in Kuta Beach	S3
	4) Facilitation of Local Governments to continue the development of 3A (accessibility, amenities, and attractions) affected by the termination of the Special Allocation Fund for physical tourism, with special attention to hygiene facilitation	S4
	5) Acceleration of infrastructure development in priority destinations in Kuta Beach	S5
	6) Promotions, exhibitions, and tourism events gradually began to be activated such as the procurement of the German Beach festival in Kuta	S6
	7) Increasing incentives for tourism businesses, airlines, travel agents, and promotions in the form of flight ticket discounts and jet fuel discounts at several priority tourism destination airports, providing incentives for group incentive trips/famtrips held in Bali	S7
Medium Term	1) Optimizing tourism Education about turtle / turtle breeding and education about tsunamis in Kuta Beach	M1
	2) Marketing to countries that are near and that have already recovered	M2
	3) Increased incentives for tourism businesses, airlines, travel agents, and promotions in the form of flight ticket discounts, providing incentives for group incentive trips/famtrips held in Bali, promotions through influencers and digital marketing	M3
	4) Cooperate with airlines to promote Kuta beach tourist destinations	M4
	5) Organizing international <i>events</i> such as beach sports, art and MICE (Meeting, Incentive, Convention, and Exhibition), including the success of organizing international events, to promote Kuta beach tourism to the international world	M5
	6) Improvement of 3A infrastructure (amenities, accessibility, and attractions) in Kuta beach tourism destinations through the State Budget, Transfer Funds, Regional Budget, SOEs, and the private sector	M6
	7) Establishment and Institutional Strengthening of Kuta Beach Tourism Management Agency	M7

(continued)

Table 4. (continued)

Classification	Description	Code
	8) Training and mentoring cooperation for MSME actors in Kuta Beach includes technical guidance on improving health, hygiene, and safety standards for tourists	M8
	9) Increased bidding for international MICE at Star Hotels in the stretch of Kuta Beach Bali	M9
	10) Escorting the realization of large-scale tourism investment	M10
	11) Increased access to financing for tourism and creative actors both to banks and non-banks	M11
Long Term	1) It is necessary to establish a work-ready tourism school curriculum from the beginning of the semester. Various facilities to support the economy need to be immediately executed for the tourism sector such as tax holidays in the context of investment in the tourism sector, export credit facilities for tourism actors (related to service exports), and electricity (energy) tariffs specifically when outside peak load times for tourism business actors) especially in Badung Regency and in Prov, Bali generally	L1
	2) Strengthening Attractions - Can be done through diversity of tourism types such as cultural tourism, education, sports, health, history, and others. Diversification of tourist attractions also needs to be done in Kuta Beach	L2
	3) Strengthening Access - What needs to be done is: 1) Improving connectivity between transportation modes to compensate for physical infrastructure development; 2) Optimization of the use of information technology in the context of harmonization of tourism agenda information throughout the region; and 3) Better synergize the travel calendar)	L3
	4) Strengthening demand side - preferably done through optimizing the potential of domestic tourists, tourist cards for students and elderly citizens and tourism discount cards for the public)	L4
	5) Shifting the focus of tourism in Kuta, Bali towards high-quality tourism, encompassing medical, maritime, MICE (Meetings, Incentives, Conferences, Exhibitions), and nomadic tourism	L5
	6) Conducting green tourism recovery in Kuta Bali (through the preparation of standards, implementation, and arrangement of tourist attractions and other tourism potentials)	L6

Sustainable tourism development requires active participation from various stakeholders, with a particular emphasis on engaging local communities. This community involvement is essential for tourism development, and research has shown that it is strongly linked to perceived benefits and support for tourism initiatives (Duxbury et al. 2021). Sustainability is a fundamental concern within the tourism sector, as it aims to balance economic impacts with social and environmental considerations, ensuring that

the industry meets the needs of various stakeholders and respects the limits of growth (León-Gómez et al. 2021).

4 Conclusion

Based on the results of data analysis and discussion, as well as the research objectives as described earlier, it can be concluded that each element of the Penta Helix plays a very important role in the Development of Kuta beach tourism, Bali. The role is tailored to its capabilities and authority. Academics play a role in making studies as a basis for policy making and honing the competence of tourism Human Resources (HR), then the Business / industry pioneers innovative tourism businesses, the Government plays a role in making policies, drafting regulations and their implementation, then the role of the Society is also very important in serving tourists kindly provides a sense of security for tourists visiting Kuta beach Bali, and the role of the Media is Creating public and tourist comfort with news that builds and promotes Kuta beach tourist destinations.

Kuta Beach Tourism Development Strategy in the short term is arranging the Kuta Beach area well and adding tourist facilities needed for the convenience of tourists, promotions, exhibitions, and tourism events gradually began to be activated such as the procurement of German Beach festivals on Kuta beach.

While the medium-term strategy is Establishment and institutional strengthening of the Kuta Beach Tourism Management Agency so that it can manage tourism activities well as training and mentoring cooperation for MSME actors in Kuta Beach including technical guidance on improving health, hygiene, and safety standards for tourists. Furthermore, for the Long-Term Strategy is to carry out green recovery of tourism in Kuta Bali (through the preparation of standards, implementation, and arrangement of tourist attractions and other tourism potential) and strengthening demand side (preferably done through optimizing the potential of domestic tourists, tourist cards for students and elderly citizens and tourism discount cards for the public).

5 Recommendations

Several recommendations can be made as a follow-up to the results of this study:

- a) The government needs to facilitate the establishment of the Kuta beach Tourism Management Agency, as a forum to manage tourism on Kuta beach, Bali.
- b) The role of academics should be to provide policy input to the government based on studies conducted so that the policies made by the government are in accordance with the development of tourism on Kuta beach.
- c) Each element of the Penta Helix needs to participate and optimize its role in the development of the Kuta Beach Bali tourism industry, considering that Bali's economy (macro and micro) is still very dependent on tourism.
- d) Kuta beach community empowerment strategy is very necessary for the development of the Tourism Industry on Kuta beach.

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How Does TikTok Helps SMEs in Business?

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Abstract. The emergence of the digital age is shown in human activities such as accessibility and feasibility of obtaining information that supports human needs. Social media marketing exists and is found to be one of the easiest strategies for businesses to reach out to more customers. A giant company named TikTok is one of the social media platforms with the fastest user growth since 2016. TikTok is one of the applications that relies on creating content related to the products or services that the business offers. One of the strategies is content marketing to attract new potential customers with the aim of recognizing the business to reach wider markets. This research aims to gain information on how TikTok helps SMEs to increase their sales and profitability. Using a qualitative approach, 7 business owners from different business backgrounds were interviewed. The results of this paper show TikTok can create a significant effect on business sales, as customers come from a wider range of backgrounds. The business creates creative and captivating content to attract customers. Collaboration with social media celebrities creates a huge number of followers that help SMEs increase their sales and profits.

Keywords: Social Media Marketing · Content Marketing · TikTok and SMEs

1 Introduction

E-Commerce is a process of products that are exchanged or distributed electronically by individuals, groups, or companies with computers as intermediaries for business transactions [1]. In this era of modernization, the company relies on Information Communications and Technology (ICT) based on the Internet and World Wide Web. There are 2 types of e-commerce, that are Business-to-Business commerce (B2B) and Business-to-consumers (B2C). This paper focuses on describing about Business-to-consumer (B2C) relations, especially among consumers who consume products and services from Small and Medium Enterprises (SMEs) [2].

SMEs are the leading sector in the country's economic development. The SME sector can make an important contribution to the transition to a market economy by creating jobs, generating income, driving technological progress, and promoting other aspects of social development [3]. In the current era, it is expected and required to utilize technology in all business activities to compete and survive. The implementation of this e-business

for SMEs is expected to facilitate them in developing and improving their business. Today, e-businesses are developed by only an application, which is easier for consumers to connect [4].

A giant company named TikTok is one of the social media platforms with the fastest user growth since 2016. Based on information from Byte Dance, TikTok has more than 1 billion active users every month. Indonesia has the second-highest number of TikTok users after America. According to Statistics data in July 2021, there are 22.2 million active users of TikTok every month in Indonesia. While America has 65.9 million active users every month. TikTok is a different application by creating a simple algorithm. By recording the users' interest content and displaying similar content. This exposes users to new experiences that stage their emotions or needs that are not only limited to entertainment.

TikTok has introduced an e-commerce platform called TikTok Shop, serving as a means for entrepreneurs to connect with potential customers. This new feature, developed by TikTok, facilitates direct buying and selling transactions within the TikTok application. According to Hootsuite's 2022 survey, 24% of marketers now find TikTok to be an effective tool for reaching their business objectives, marking a substantial increase of 700% compared to the previous year when the figure was just 3%.

Engagement levels are high on TikTok for those looking to sell. TikTok has made it creative yet easy for people to share the process in terms of making a product or delivering a service [5]. According to Populix. 2023 survey, 86% of respondents' Most Used Platform had shopped on social commerce. The most used platform is the TikTok Shop (45%), followed by WhatsApp (21%), Facebook Shop (10%), and Instagram Shop (10%). TikTok ads reach 476% of the population aged 18+ in Indonesia. This means that TikTok reaches 884.9 million people or 15.9% of the world's population over 18. Top Purchase Categories years according to Byte Dance Advertising Resources. TikTok reaches Generation Z users up to 25% of female users aged 18–24 years and 17.9% of male users aged 18–24 years [6].

The easy algorithm applied by TikTok caught much attention to the SMEs, not only by showing the products through the official accounts of the SMEs. The customers also can take part in promoting the products by creating content marketing based on their testimony. With only 'one click', another customer could buy the products and the SMEs will receive the profit [7].

This paper focuses on how SMEs succeed in gaining customers through TikTok. TikTok is the newest social e-commerce app compared to other apps that exist. What is the benefit for SMEs by using TikTok as their promotion platform?

2 Research Methodology

This study uses a qualitative approach. The initial stage in the research is to conduct a literature review, by seeking as much information regarding SMEs that use TikTok. Compilation of documentation, and sourcing supporting data on social media, such as Instagram, Facebook, Google, and other social media were carried out. Furthermore, the researcher conducted interviews, namely in-depth interviews directly with the owner of SMEs in Denpasar City who had met the researcher's criteria, that is the owner of SMEs that uses TikTok as their medium to promote products or services.

So based on the requirements of qualitative research, the data collection process can be halted if it is felt that the researcher has found answers to the research objectives [8]. In conducting the analysis, the researcher consolidated the data by summarizing and removing interview results that were not significant or that did not support research results. Researchers focused on business owners, especially SMEs who use content as promotional media on TikTok. Research information was obtained by in-depth interviews and supported by documentation for the findings obtained in the field. The interviews were conducted with 7 informants from various shops that use TikTok content as a media promotion tool and these businesses are in the city of Denpasar, Bali Province as shown in Table 1.

Table 1. Respondent Characteristics

No	Informant	Business's Name	Address
1	Dian Jayanti	Arj88_Store	Bedugul Sidakarya Denpasar Selatan
2	Rita Agustina	Oriana eyewear	Tukad Barito Timur Denpasar Selatan
3	Anastasia Cindy	Heels by Peony	Tukad Barito No. 101 Denpasar Selatan
4	Gita Cahyani	Georgioswomen	Tukad Barito Timur No. 101 Denpasar Selatan
5	Indah Pratiwi	Orlenalycious	Bedugul Sidakarya Denpasar Selatan
6	Dayu Shinta	Nanas.Id	Tukad Barito No. 17 Denpasar
7	Ita Kirana	Kimorajewelry.official	Tukad Barito No. 21B Panjer

Interviews were conducted offline by visiting the Store which was used as the research objective using sound recordings and documentation in the form of photographs to strengthen the results of the interviews that had been conducted. Researchers use qualitative methods to dig deeper information related to the title raised in this study. The qualitative method produces data in the form of descriptions, which are written words based on the results of interviews with informants.

Question 1: The Main Reason SMEs using TikTok to be the Media Promotion

Based on the results of interviews with 7 informants, there were 2 informants who stated that TikTok apps were booming.

Interviewee 4 stated:

“Umm, because nowadays, TikTok is booming, so there are a lot of young people who are almost 12/7 on TikTok... hm, what’s more, if on TikTok, we can do live content while selling, we offer lots of discounts, so that many consumers are interested in our products, that’s all I think.”

It was stated that apart from the fact that the TikTok application was booming, the informants also acknowledged that there were live features that could be useful in increasing sales which was also in line with 2 informants about using social media TikTok could reach a wider market.

As explained by Interviewee 6:

“Because umm TikTok has a wider reach, automatically many people know more about Nanas.id’s products, so there is an opportunity for consumers to be interested to buy or use our products, especially if there is a live feature which really helps in the sales and promotion process for Nanas. id itself.”

However, it is different from the 5 informants who prefer to use the TikTok application to focus on creating content about products.

In accordance with the above Interviewee 5 stated:

“The reason we chose the TikTok application for our promotional media is because consumers can see the manufacturing process in making cakes which makes consumers more interested in trying this product from Orlena Cake, that’s all.”

The newest way to promote the product is by creating ‘how to do’ content, so, the customers could gain another experience through the video.

Question 2: The Effect of TikTok Content on Sales

In this case, the researchers focused on the effect of TikTok content on sales. By relying on content marketing theory. According to [9], content marketing is a marketing technique for creating and distributing relevant and valuable content to attract, acquire, and engage a clear and understandable target audience to drive profitable customer action. Based on the results of interviews with 7 research informants, there were 5 informants who felt a huge impact as they saw an increase in sales.

Interviewee 5 stated that:

“In my opinion, the influence is very impactful. First, for TikTok content, in my opinion, one of the marketing strategies that can be done in this store is by expanding the marketing coverage because TikTok can be reached by lots of people. So it’s not just in Bali, other customers from other cities can also buy the products from our store as a result of our TikTok content.”

This is supported by a statement from interviewee 7 which stated:

“Okay, for the effect, all digital content must always bring positive change as long as it’s right on target. And so do we”

However, it was different from interviewee 2 who stated that they did not feel significant effect because they were not too focused on creating content, as they stated:

“Eee, usually, for example, from TikTok content, we do have sales, but not that significant. So for us content marketing has little effect on our business.”

Question 3: Sales Experience for SMEs by using TikTok

Regarding the differences in sales experienced by each store before and after using TikTok content as media promotion. Researchers obtained information based on the results of interviews with 7 informants. There were 5 informants who said that they felt a huge difference, such as profits which had increased after using TikTok content as a media promotion.

Interviewee 5 stated:

“Okay, the difference in sales before using TikTok content and after using TikTok content, in my opinion, is different, right? From the first time I became a content creator, I felt the difference. If we upload content on TikTok, more people are reached out, so more people know Orlena and more people come from Orlena and even 90% of people who come here usually know us from TikTok. We could say it’s increased from umm... Since we uploaded content on TikTok. Umm, let’s say it increases about 85–90%”

It was stated that the sales they experienced after using TikTok content were quite different when consumers came to their store as a result of the content that they watched on TikTok and this resulted in an increase in sales of 85%–90%.

The same thing was experienced by interviewee 6 who stated:

“Eh, the influence of using TikTok content has a big impact. Why, because our income increased. Because if we don’t use the TikTok content, our customers only come from Bali. As we know, our product Nanas.id is only a local product, so, the word of mouth marketing is necessary. Things changed after we started using TikTok, we reached lots of customers from other regions. we do our marketing, especially using the TikTok digital platform, so we felt that the digital marketing platform is wider, ee again, so the existence of TikTok content, really affects the sales, especially in terms of profits. For example, maybe this month increased by 20% of last month, on the other side, the following month’s sales will increase again by another 10%. It depends on the events also; we create content depending on the event that is held by the people. So, for example, for the Galungan event, at the end of the year, the content will be more elaborate. And of course, our profit increased too, the sales can be said increased by an average of 15–25% in a month.”

But it was different from informant 7 who said that it didn’t matter because he had been using digital platforms for a long time. And they don’t observe a significant increase in their sales.

Informant 7 stated:

“Okay, the difference is not significant because we have always been in the digital world and have never been without content creation. What is certain is that as the digital world develops, it will increase.”

This is almost the same as experienced by informant 4 who did not feel the effect on sales.

Informant 2 stated:

“Yes, the difference is there for sales, but there isn’t too much of a significant increase to us.”

Question 4: Content Marketing of SMEs on TikTok

Based on the information that was obtained by researchers by interviewing 7 informants, it was found that sellers recognize the content that is most liked and that attracts consumers’ interest. There were 4 informants who stated that content related to product reviews was something that attracted consumers’ interest which affected sales of their business.

As said by Informant 5 with stated:

“Okay, for the content that most consumers are interested in, it’s usually about our product reviews content, so we’re usually making content that reviews each of our products, for example, we explain about the types of brownies, how to make it, ingredients”, “the ones that are most liked by the customers are usually about reviews and cake making. People are curious about how it’s made”

In addition to product review content, 2 informants stated that content usually attracts consumers by providing tips and tricks besides product information.

In accordance with what was conveyed by informant 2 that comes from eyewear business type stated that:

“Eeee, usually reviews and tips & tricks for frames, especially from eee, choosing a frame, setting up the frame, and how to use the frame, maybe now it’s more important to the customer, on knowing what they need and we suggest to them what to wear, what kind of frame based on the type of customer’s face”

However, there is a slight difference, according to informant 6 that behind-the-scenes content and collaborating with celebrities are said to attract consumer interest as well.

Informant 6 that involved in the footwear business stated that:

“Kinds of content that usually attracts consumers’ buying interest, are such as tips & tricks, info, behind the scenes content. Besides that, the consumer’s interest increased through an applicator in the TikTok shop. So with an applicator, a celebrity, or a TikTok influencer promoting the products we sell on TikTok, greatly increases sales by only one click on the boxes.”

This is also the case with what was conveyed by 2 informants who stated that content that attracts consumer interest is by collaborating with TikTok or Instagram celebrities.

3 Results and Discussion

The rapid development of the era also caused rapid changes in human life. The changes in the way of human thinking, different points of view, and lifestyle [10]. The impact of the emergence of the digital age is shown in human activities such as accessibility and the

feasibility of obtaining information that supports human needs [11]. The convenience that is currently felt is inseparable from technological developments that have made almost all people accustomed to existing technological advances and cannot be separated.

Social media marketing exists and is one of the easiest strategies for businesses to reach out to more customers. The existence of the development of technology help business to increase their sales. Such developments affect the way marketers operate and affect marketing practices at strategic and tactical levels presenting marketers with difficult choices and challenges [12]. Marketers become open to the idea of product offerings that can be tailored to the end based on consumer interest. They are also often open to the idea of creating conditions that allow collaboration with customers in developing and testing new products.

TikTok is one of the applications that rely on creating content related to the product or services that the business offer. According to [13], content marketing is a marketing strategy to plan, distribute, and create content that can attract users or audiences and encourage them to become customers. The purpose of content marketing is to attract new potential customers with the aim of recognizing the business. Thus, when the customer already recognizes the business, the next objective of content marketing is to encourage or attract potential audiences to become loyal customers [14].

According to the research, the main reason SMEs use TikTok is because this application is one of the hottest and most booming applications to use in this era. Another point that makes TikTok as one of the greatest applications for SMEs, is the development of its features. Especially, the existence of the Live feature that could increase sales. Another business owner revealed that by using TikTok social media, one can reach a wider market. As stated by [15] the benefits of social media marketing are to reach people across boundaries, to gain profits, and to create brand awareness of the products. TikTok application is used as a promotional medium by creating content and this content marketing is the focus strategy for SMEs to promote. One of the objectives is to create trending or viral content to increase consumers' appeal.

The business owners who were interviewed agreed that the power of content marketing could help them increase their sales. Before TikTok existed, the store's market didn't reach out to far and wide customers. Therefore, after creating TikTok content, it greatly affected their sales performance. Right now these shops have a wider market coverage, not only in Bali but also outside the region. The business owners agreed that their income increased. However, one business owner in the scope of women's clothes, stated that using TikTok content did not have a significant effect on sales. Other data from the documentation that has been done can be seen in the picture below.

Based on Fig. 1(a), the business has a lot of viewers, and their content received a lot of 'likes' and comments meanwhile in Fig. 1(b), the TikTok page on that business does not have a large number of viewers. In other terms, in TikTok, the content marketing could be viral and get into exploration feed mode or they call it the 'for you page'. This means that content marketing reaches a wider scope based on customer's interests.

With the development of the internet era, the process of marketing brands and products is in terms of content. The form of content currently is increasingly diverse and creative. This diverse content is often used for commercial purposes, such as introducing products or offering services. However, even though content has long been known

in the marketing world, not many brands realize that they need to create content consistently. Instead of consistently creating content, many brands don't understand that marketing requires content even in the Internet era [16].

Slight differences are felt by some business owners before and after creating content and using TikTok as their media for promotion. 5 informants agreed that by using TikTok, their business experienced an increase in sales. From another point of view, 2 informants who focused on selling women's clothes and jewelry stated that there were not too many significant changes in sales after using TikTok content. It can be concluded that not all TikTok content can affect the increase in in-store sales. If a store experiences an increase in sales when using TikTok content, it depends on how the store creates content that can attract buyers. Creating review content and the process of making the store's products could be the alternatives.

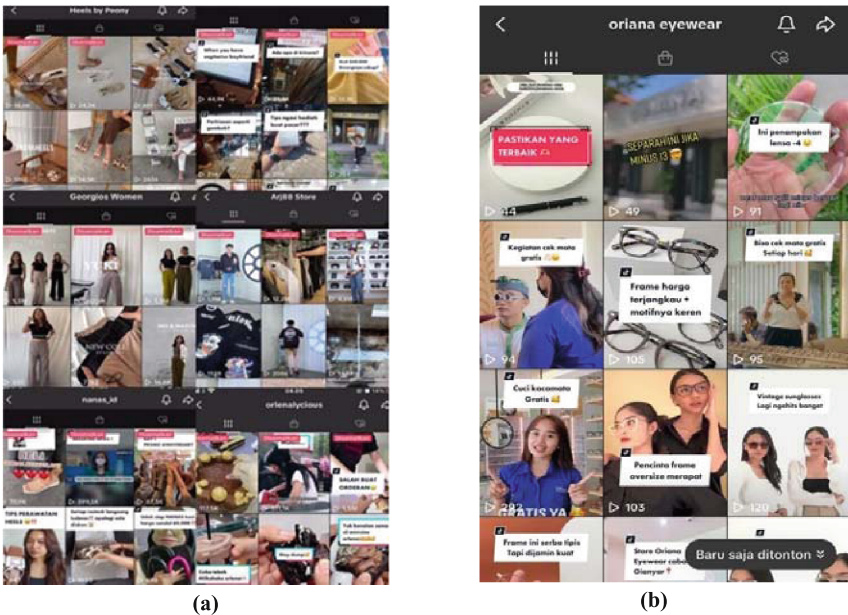


Fig. 1. Compilation of content marketing from the SMEs (a) successful content (b) unsuccessful content

In general, the TikTok system suggests content improvements after considering account user preferences that are expressed through interactions via the app, such as posting comments or following accounts. These signals help to recommend the system to measure the content customers' interest and the content they need to skip [17]. Tips and tricks, and sharing information are essential as stated by informants 1, 2, 4, and 5 and there is also content that displays the behind-the-scenes of making the main content that is attractive to consumers as expressed by informant 6. Additional information is that there are also content ideas by collaborating with TikTok celebrities to help gain customers based on their fans and to get people interested in the uploaded content. From

the results of the information collected, it can be concluded that all content ideas can be interesting based on the target market where every business has its own characteristics in creating content based on what they offer.

On TikTok, it has the concept of user-generated content (UGC), where only short videos can generate a lot of information. So that if you compete with more brands, they are still considered relevant and more easily stored in the minds of consumers [18]. The concept of user-generated content (UGC) on TikTok is influencer-centric, with a focus on independent creators. Users can follow any content creator they find interesting. TikTok opens new avenues for businesses to collaborate with celebrities or influencers that reach brands' target audience.

The additional data obtained from searches on social media in accordance with Fig. 2 and Fig. 3 that it is true what was conveyed by informant 5 that product review content and how to make it will be preferred by consumers compared to one of the contents that is also uploaded on the TikTok page which with different kind type of content which only explain about their products. As can be seen, customers are preferring to gain experience while watching the content. The likes and comments showed the different responds content which only explain about their products.

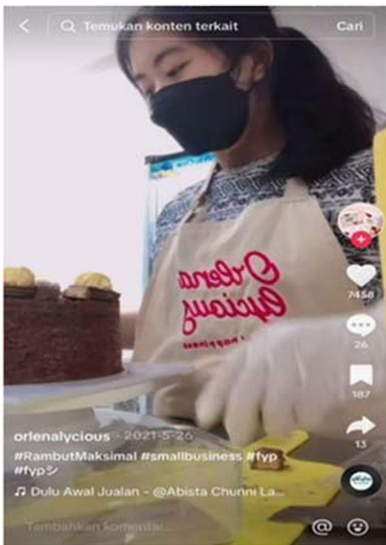


Fig. 2. One business that not affected by creating TikTok content

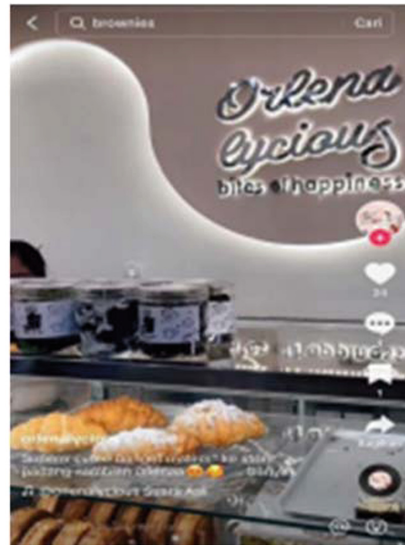


Fig. 3. Products promotion content

4 Conclusion

The objectives of the research are gaining information how the power of content marketing to attract people to buy a product or service on social media. This research found that Tiktok gave huge impact to business especially for Small and Medium Entreprises. Tiktok create a simple and easiest way for sellers and buyers to use it. Also has a great

opportunity to catch a wider customer. The beneficial of content marketing affected business to gain sales and profit. Creating a creative content based on what business offers can be an element for customers interest. The consumers in this modernization era curious and search for another experience of content. The collaboration between the business and Tiktok celebrities also helps SMEs increased their sales.

The findings focusing on gaining information based on phenomenon of the business targets, not for generalizing information. It means, the future research that will use another method to gain more information could have another finding with a greater scope, and greater sample. It will be more interesting for gaining the experience on the customers sides.

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The Role of E-Wallet Use and Financial Literacy on Consumptive Behavior in Indonesia

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Abstract. The Fourth Industrial Revolution, which is caused by rapid technical breakthroughs has disrupted nearly every industry and resulted in the widespread use of the Internet, social networks, and digital devices. Since the introduction of e-commerce, digital payment mechanisms have evolved into digital wallets or e-wallets. The popularity of digital payments is growing due to a variety of causes, including high smartphone penetration, a rising number of merchants turning digital, more dependable payment system regulation, and a strong ecosystem of service providers. The advent and ease of use of e-wallets as a payment system do not exclude the likelihood of having an impact on one's purchasing habits. The gradual increase and emergence of e-commerce in Indonesia leads to the increased use of e-wallets and may cause consumptive behavior. Furthermore, the low levels of financial literacy among citizens in Indonesia lead individuals to make poor choices and spend money on unnecessary things. The object of this study will be e-wallet users that recite in Indonesia. The research was conducted in Indonesia with a considerable increase in digitalization despite inadequate financial literacy. The research method was quantitative, utilizing questionnaires and the data collected is analyzed with Structural Equation Modelling (SEM). The results of the investigation depict that both the use of e-wallets and financial literacy has a significant and positive impact on consumptive behavior. The implications and recommendations are also included in this paper. This research is beneficial for business owners and future research to gain insights and for the use of their future undertakings.

1 Introduction

With today's rapid technical breakthroughs, the Fourth Industrial Revolution has disrupted nearly every industry and resulted in the widespread use of the Internet, social networks, digital devices, and so on [1]. As Internet availability and accessibility have grown, more individuals are able to make use of most online services, including e-commerce [2]. E-commerce then has led traditional payment methods to digital payment where consumers can pay for their goods and services via the internet without the use

of cash [3]. Payments in digital transactions are referred as e-payments, digital money as e-money, and digital wallets as e-wallets [4, 5]. The popularity of digital payments is growing due to a variety of causes, including high smartphone penetration, a rising number of merchants turning digital, more dependable payment system regulation, and a strong ecosystem of service providers [6]. E-wallet is a type of digital payments which does not require a media card and can be used with a smartphone, which is almost universal in today's culture, therefore e-wallets may be used for a variety of transactions [7, 8].

However, to make optimum use of e-wallets with the advancement of technology, it is crucial to acquire the knowledge of managing finances which is also known as financial literacy. Financial literacy is defined as the awareness, information, skill, attitude, and behavior required to make wise financial decisions and attain individual financial well-being [9]. Financial literacy will be highly beneficial in offering an in-depth grasp of the rules of the game for managing smart funds and the possibility of achieving financial independence will be increased [10, 11]. According to the Financial Services Authority's (OJK) 2022 National Survey of Financial Literacy and Inclusion (SNLIK), Indonesia's financial literacy index in 2022 was 49.68%. This figure demonstrates that only around 50 out of every 100 Indonesians are well-educated and Indonesia's financial literacy level is at relatively average level [12]. Previous studies that examined the effect of financial literacy on consumer behavior found that financial literacy had a negative and substantial effect on students' consumption behavior [13, 14]. In contrast, studies by Zahra & Anoraga [15] and Fauzia & Nurdin [16] found that there is a significant positive influence of financial literacy on consumptive behavior.

On the other side, consumption behavior of an individual is the act of spending one's money among various products and services to optimize one's welfare [17]. According to Sari et al., [18] positive consumer behavior is defined as spending activity that is still within normal limitations, implying that consumption activities are truly serving a purpose. Consumptive behavior that emerges because of the advancement of digital technology can be motivated by a variety of factors ranging from the type of service transaction to the goods offered, one of which is the lifestyle and fashion taste which is becoming increasingly popular among Millennials [19]. This is because despite the advent and ease of use of e-wallets as a payment system, it does not exclude the likelihood of having an impact on one's purchasing habits [18].

According to Enrico et al., [20], fulfilling desire is another factor contributing to consumptive behaviour as individuals always have a never-ending wants and desire of consumption leading to excessive spending of products or service. People with high social status also tend to want to show their prestige, hence social status is another factor that contribute to individuals consuming excessively for the sake of maintaining their social status [18]. Furthermore, promotions and discounts given by e-money producers might lead to consumptive behavior, if consumers do not exercise appropriate control over the usage of e-money [5]. Research by Tompodung et al., [21] and Nuratika et al., [14] suggested that if the use of digital wallets is increased then consumptive behavior will increase indicating a significant positive relationship.

The results from previous research that imply the positive effect of e-wallets use on consumptive behavior are contributed with the gradual emergence of e-commerce such

as Shopee, and Tiktok Shop in Indonesia which leads to the increased use of e-wallets and it may lead to consumptive behavior. Furthermore, the average level of financial literacy among citizens in Indonesia might cause individuals to make poor choices and spend money on unnecessary things [15]. Hence, this creates the urgency for this research to be conducted aside from understanding that it is crucial for future researchers and business owners to gain insights as it enables one to understand the key changes in consumptive behavior. Previous research had investigated the influence of the use of e-wallets and the financial literacy of students on consumptive behavior in DKI Jakarta [14]. However, no research has been found investigating on the influence of both the use of e-wallet and financial literacy on consumptive behavior among e-wallet users which are the general population of Indonesia with different levels of income, background and educational level that is not restricted to a niche population of students. The novelty of this research lies in the broad sample of e-wallet users in Indonesia from a wide range of age groups and in-depth investigation of the “use of e-wallet” factor using several specified elements adopted from the constructs of TAM namely, perceived usefulness and perceived ease of use. The investigation on the impact of e-wallets on consumptive behavior is important as the rise of the internet and e-commerce made buying and selling in an online setting, also with the rise of contactless payment since the pandemic.

This study uses two independent variables which are the Use of E-Wallet and Financial Literacy. As for the dependent variable, this study uses the variable Consumptive Behavior. Thus, Fig. 1 shows the framework of this research which is The Role Of E-Wallet Use and Financial Literacy on Consumptive Behavior in Indonesia. The observed hypotheses are outlined below:

H1: The use of e-wallet has a positive effect on consumptive behavior.

H2: The financial literacy of e-wallet users has a negative effect on consumptive behavior.

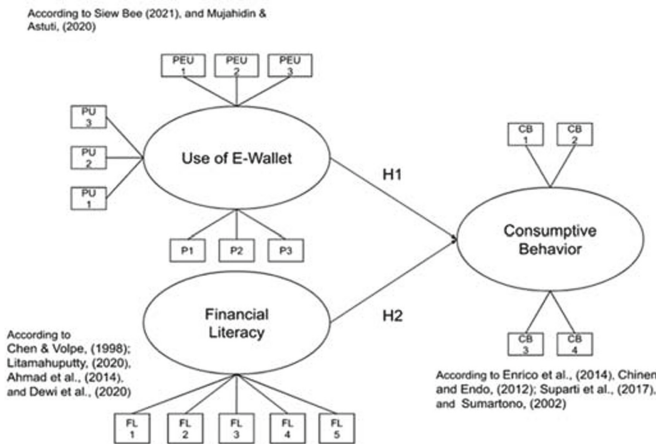


Fig. 1. Research Framework

2 Methodology

The research was undertaken in Indonesia as according to the findings of a survey conducted by the Association of Indonesian Internet Service Providers (APJII), the country would have 210.03 million internet users in the year 2021–2022. This figure climbed by 6.78% over the preceding period, when it stood at 196.7 million individuals [22]. Besides, based on the results of a survey by the Ministry of Communication and Informatics (Kominfo) with the Katadata Insight Center (KIC) entitled “Digital Literacy Status in Indonesia 2021”, as many as 65.4 percent of respondents use digital wallets the most [23]. The population for this study was the general population of Indonesia while for sample, this research adopted purposive sampling as there were certain criteria that were needed to be fulfilled to gather more accurate data in accordance with the non-probability sampling. The criteria needed are the sample had to utilize any e-wallet application for their transaction or consumption activities and currently residing in Indonesia.

Data was acquired using the quantitative research method, which entails administering surveys or questionnaires to a large number of respondents and employing formal standard questions and predefined response options [24]. A questionnaire was used as the survey research tool in this research. The data source was from primary sources which questions were created in the form of a Google Form and distributed quickly using only a link. In addition, the online survey was distributed via several social media platforms such as WhatsApp, LINE, and Telegram. Google Forms’ online data collection approach allows users to react to a series of questions by selecting “Strongly Agree” or “Strongly Disagree.” Total 95 respondents were asked to use a scale with numerous answer alternatives to score their level of agreement or disagreement with a series of statements regarding the stimulus items. To eliminate neutral responses from respondents, this research implemented a four-point Likert scale.

The Partial Least Squares, or PLS, data analysis approach was used in this study to interpret the collected data which is also a statistical approach that extends multiple regression and assists in assessing if variables are legitimately linked [24]. The PLS path model incorporates two testing strategies which are Outer Model Measurement and Inner Model Analysis. Outer Model Measurement employs precise measurement to determine the validity and reliability of a concept while Inner Model Analysis used to examine the structural model’s findings. The relevance of the path coefficients (T-values for each path), R-square values, F-square values, and T-Statistic are the primary assessing factors for the structural model in PLS-SEM for this study.

3 Results and Discussion

3.1 Data Analysis

Respondent Characteristics. According to 112 of the samples from the general population of Indonesia, 50.9% of the total respondents (57 out of 112) are female. Males account for 55 of the total responses, or 49.1%. For the variable of age, the great majority of respondents are between the ages of 16 and 25, accounting for 83.9% of all respondents. This age group also includes generation Z, the generation born during the digitalization period, which makes them knowledgeable of technology, particularly

financial technology (e-wallet). Meanwhile, according to the respondent’s location, the majority of respondents live in Bali, accounting for 89.3% of the total respondents due to researcher residing in Bali.

Model Analysis. To assess the research model utilized in this work, the SmartPLS 3.3.3 computer tool and the PLS (Partial Least Squares) technique are used. The two primary model assessments in this test are the outer model analysis and the inner model analysis which the structural equation model for this research is portrayed in Fig. 2.

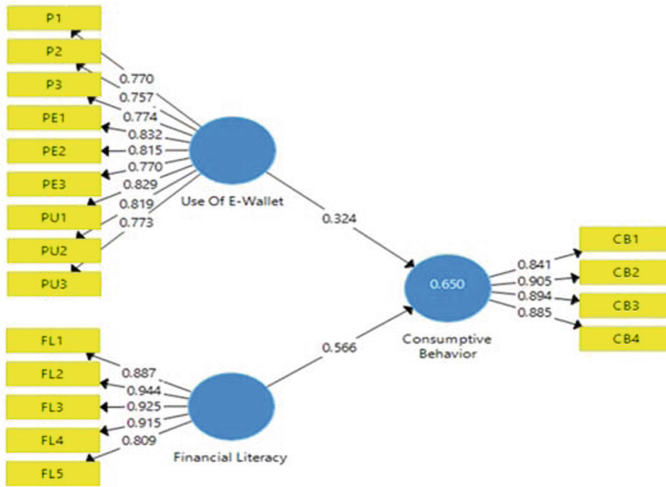


Fig. 2. Structural Equation Model

Outer model analysis

1. Validity Test

The validity value indicates how closely the obtained data aligns with the description of the relevant variable.

a. Convergent Validity

Convergent validity is revealed by the link between the indicator and variable scores. If the correlation value of an indicator is more than 0.70, it is deemed reliable. However, at the scale development stage of the research, a loading of 0.50 to 0.60 is still acceptable [24]. The output findings shown in Table 1 indicate convergent validity since the loading factor is more than 0.70.

b. Discriminant Validity Using Cross Loading

If the cross-loading value of each indicator for the variable in question is greater than the cross-loading value of other variables, the indicator is considered legitimate. The results of the cross-loading calculations showed the strongest indicator is the indicator

Table 1. Average Variance Extracted (AVE) Results

	Original Sample (O)	T Statistics (IO/STDEV)	P Values
CB1 <– Consumptive Behavior	0.841	23.084	0.000
CB2 <– Consumptive Behavior	0.905	46.655	0.000
CB3 <– Consumptive Behavior	0.894	39.178	0.000
CB4 <– Consumptive Behavior	0.885	38.172	0.000
FL1 <– Financial Literacy	0.887	44.843	0.000
FL2 <– Financial Literacy	0.944	74.912	0.000
FL3 <– Financial Literacy	0.925	62.414	0.000
FL4 <– Financial Literacy	0.915	53.796	0.000
FL5 <– Financial Literacy	0.809	18.473	0.000
P1 <– Use Of E-Wallet	0.770	17.517	0.000
P2 <– Use Of E-Wallet	0.757	20.238	0.000
P3 <– Use Of E-Wallet	0.774	14.039	0.000
PE1 <– Use Of E-Wallet	0.832	21.958	0.000
PE2 <– Use Of E-Wallet	0.815	16.606	0.000
PE3 <– Use Of E-Wallet	0.770	14.234	0.000
PU1 <– Use Of E-Wallet	0.829	22.920	0.000
PU2 <– Use Of E-Wallet	0.819	22.231	0.000
PU3 <– Use Of E-Wallet	0.773	17.395	0.000

PE1 (Understandable) from the element of perceived ease of use, which amounted to 0.832. This indicates that the user's comprehension of the utilization of E-wallets is significant in affecting their consumption.

The strongest indicator of the financial literacy variable according to the outer loading and cross-loading results valued at 0.944 is the indicator FL2 which is discipline. The indicator is explained as the discipline of e-wallet users in monitoring their finances which allows them to identify their spending and savings. While the weakest indicator is valued at 0.809 the FL5 indicator which is purchase decision. Purchase decision in this context is being able to prioritize needs over wants and being the weakest indicator shows that purchase decision contributes the least to promoting consumptive behavior.

c. Discriminant Validity Using Average Variance Extracted (AVE)

Another method for determining discriminant validity is to compare the average variance extracted for each variable to the correlation between the variables and other variables in the model. The model has acceptable discriminant validity if the AVE value for each variable is greater than the correlation between the other variables in the model, as shown in Table 2.

Table 2. Average Variance Extracted (AVE) Results

Research Variable	AVE
Use Of E-Wallet	0.939
Financial Literacy Of E-Wallet Users	0.954
Consumptive Behavior	0.933

2. Reliability Test

In addition to the validity test, a variable reliability test was performed, and it was assessed using two criteria composite reliability and Cronbach’s alpha from the indicator that assesses variables. The composite reliability and Cronbach’s alpha output scores for all variables are greater than 0.70 which means the variables are reliable and consistent (Table 3).

Table 3. Composite Reliability and Cronbach’s Alpha Results

Variable	Composite Reliability	Cronbach’s Alpha	Description
Use Of E-Wallet	0.939	0.927	Reliable
Financial Literacy Of E-Wallet Users	0.954	0.939	Reliable
Consumptive Behavior	0.933	0.904	Reliable

Inner Model Analysis

1. R-Square (R2) (Coefficient of Determination)

The goal of R-Square analysis is to measure how much the changes in the independent variable impact the dependent variable. The R-Square (R2) value demonstrates the strength of the research model and varies between 0 and 1 which findings for this research is 0.650. The value of 0.650 suggests that the change or variations of consumer attitude is 65% affected by the independent variables of Use of E-wallet and Financial Literacy and the other 35% is explained by other factors outside the research. Other factors influencing consumptive behavior might be self-control, lifestyle, consumer attitude, price level, hedonic browsing and benefit perceptions.

2. Hypothesis Testing

P-statistics are used to test hypotheses (p-value). If the test findings on the inner model are significant which the p-value is more than 0.05, it may be concluded that the latent variable has a substantial impact on other latent variables. It depicts the direction and effect of each independent variable on the dependent variable based on the findings of the PLS analysis. These outcomes can be summarized in Table 4.

Table 4. Hypothesis Testing Results

Hypothesis	Correlation coefficient	<i>t statistic</i>	<i>p values</i>
Use Of E-Wallet → Consumptive Behavior	0.324	3.178	0.002
Financial Literacy Of E-Wallet Users → Consumptive Behavior	0.566	5.080	0.000

3.2 Discussion

The Influence of the Use of E-Wallet on Consumptive Behavior. In accordance with the hypothesis testing using the bootstrapping method, the H1 is accepted as the t-statistic value and the p-value has fulfilled the requirements. The t-statistic value had reached above 1.96 (a reference value for the level of significance of the data) which is 3.178 which indicates that the relationship between the variables of the use of E-wallets and consumptive behavior is significant. Moreover, the p-value did not exceed 0.005 and amounted to 0.002 which also emphasizes the significance of this relationship. Furthermore, the coefficient value of the latent variable advertising content value based on the path coefficient results is 0.324 which indicates that the use of e-wallets has a 32.4% influence on the change in the consumptive behavior of e-wallet users. Hence, from the hypothesis testing results, it can be concluded that the use of E-wallets has a positive and significant effect on the consumptive behavior of E-wallet Users in Indonesia which is in line with the findings of Nuratika et al., [14] Nasution et al., [25] and Suarningsih et al., [26]. This means that the more intensive the use of e-wallets is, the more consumptive the e-wallet users in Indonesia will be.

The Influence of Financial Literacy on Consumptive Behavior. According to the results of the hypothesis testing on the impact of financial literacy on consumptive behavior, financial literacy significantly and positively affects the consumptive behavior of E-Wallets Users in Indonesia. This is concluded as the t-statistics value is above 1.96 which is 5.080 indicating the relationship between financial literacy and consumptive behavior is strong. Additionally, the p-value is valued at 0.002, not exceeding 0.05 making the hypothesis significant. Furthermore, the coefficient value of the latent variable of financial literacy value based on the path coefficient is 0.566 indicating that financial literacy has a 56.6% influence on the change in consumptive behavior of generation Z e-wallet users. This convinces that a higher financial literacy will lead to a higher chance

of having consumptive behavior. Based on this, the hypothesis is rejected being financial literacy has a negative effect on the consumptive behavior of Indonesians. The result of the study is in accordance with Zahra & Anoraga [15] and Fauzia & Nurdin [16] which founds that there is a significant positive influence of financial literacy on consumptive behavior.

4 Conclusion

Based on the findings from this study, it is proven that the use of an E-Wallet and has significant positive effect on the consumptive Behavior of E-wallet users in Indonesia. Users' perceived ease of use, perceived usefulness, and promotion of the E-wallet application have led them to be consumptive. Perceived ease of use and usefulness may lead them to consumptive behavior as it is very easy to make transactions that support irrational decisions than following their personal desires and ignoring all other aspects. Furthermore, the promotion aspect of the E-wallet will lead individuals to ignore the product's functionality due to the low cost of transactions as it makes the products cheaper. With these, users are prone to utilize their purchasing power and ignore their financial situation for the future making them behave consumptively.

Besides, this research had concluded that financial literacy has a significant positive impact on e-wallet users in Indonesia. This depicts that having positive qualities of high financial literacy with sufficient financial knowledge, awareness, and discipline do not guarantee healthy financial practices if not implemented correctly or efficiently. In order to increase those practices, there should be motivation and urgency for them to start implementing it. It is crucial for the government to further increase awareness of healthy financial practices and showcase successful individuals based on their financial planning behavior through financial government campaigns. In terms of the convenience of e-wallets which promotes consumptive behavior, the government can reduce the impact by restricting the age that is allowed to own e-wallets and the e-wallet firm can incorporate by providing a "limit" feature to remind users about their spending. Thus, Indonesian citizens will be able to understand the importance of healthy financial practices for their financial well-being in the future and weigh their choice of products based on their needs. Hence, they will put themselves at lower financial risks and avoid future financial stress.

5 Recommendations

The study offered insights into how financial practices are not being efficiently and effectively implemented which results in the rejection of the second hypothesis. In the future, research can be conducted in another research setting to widen the investigation of the factors affecting consumptive behavior. Furthermore, future research may investigate specific e-wallet providers such as Go-Pay, Ovo, Dana, LinkAja and etc. This may provide niche insights on specific platforms and their potential to cause consumptive behavior. Future studies can also build on the current research's approach by including more personal finance-related variables such as financial capabilities, financial concerns, and financial well-being.

In addition, future research should investigate how to increase the financial practice of Indonesians in order to reduce consumptive behavior among the population. This will broaden the scope of consumptive behavior and find new insights to not only increase financial literacy in the paper but also show it through the prosperity of the population. As this study also finds that the easy-to-use features as well as the cheap transaction fee of e-wallets are what drives individuals to use them more and be consumptive, future studies can incorporate these aspects into their research in order to further identify the cause of consumptive behavior in e-wallets. This will simultaneously provide innovation to the citizens as well as reduce consumptive behavior.

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The Privacy Paradox on Social Media: Balancing Privacy Concerns, Perceived Value, and Purchase Intentions with Habit Moderation

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Abstract. Collecting data from social media platforms has become increasingly streamlined, while privacy policies are being actively promoted. Social media users enjoy various features free of charge, but it's important to recognize that their data serves as the currency for these services. Often, social media users willingly grant access to their location, which proves highly beneficial for both the social media platforms and marketers. However, this exchange of information comes at the cost of users' privacy. Hence, the primary objective of this study is to delve into the privacy paradox within the realm of social media. This involves understanding how privacy concerns, perceived value, and purchase intentions are interlinked, with social media habits acting as a moderating factor. The findings reveal that privacy concerns alone do not significantly impact purchase intentions. Instead, perceived value emerges as a crucial mediating variable between privacy concerns and purchase intentions. Furthermore, social media habits play a pivotal role in strengthening the connection between perceived value and purchase intentions.

Keywords: Privacy paradox · Privacy concern · Perceived Value · Social media Habit and Purchase intention

1 Introduction

In the digital era, the internet is quite influential in today's life. Along with the times, now humans no longer need to bother looking for information with printed media such as newspapers and magazines (<https://kompasiana.com/>). According to data obtained from the Indonesian Internet Service Providers Association (APJII), the penetration of Internet users in Indonesia increased from 73.7% of the total population in 2019 to an unspecified figure in 2020, which is an increase of 8.9% from 2018, and in Bali Province, there was an increase in internet penetration of 0.2%, which in 2018 was 1.5% and in 2019 was 1.7%, this is also supported by an increase in internet users in Bali, in 2018 as much as 59% and in 2019 as much as 78.2% and as many as 51.5% of internet users use the internet for social media (Indonesia Internet Service Provider Association 2022).

Social media has evolved into a platform where people can socialize and access information, transforming the dynamics of our interactions with friends and various institutions, both private and public. These platforms provide a unique arena where individuals, organizations, and even governments can engage in a wide range of interactions, including commercial, social, political, and educational exchanges of information, ideas, products, and services (Rathore et al. 2016; Zeng and Gerritsen 2014; Zhu and Chen 2014). The growing number of social media users has led many businesses to promote their products and services on these platforms. In 2020, total spending on digital advertising in Indonesia amounted to \$1.45 billion, with spending on social media advertising reaching \$439.2 billion, marking a 14.4% increase from the previous year (Data Reportal 2022). The increasing user base on social media platforms has made them a promising channel for advertising, as it has the potential to boost the purchase intentions of social media users (Hartawan et al. 2021; Pandey et al. 2018).

Purchase intention from social media users is what marketers expect. Schivinski et al. (2021) observed that purchasing intent can be influenced by the captivating and attention-grabbing nature of advertising content and messages. Advertising on social media platforms employs various tactics, including eye-catching images, endorsements from celebrities, and customer reviews, as highlighted by Naeem (2021). Wang et al. (2021a) further elucidate that the frequency of ad exposure can have a more pronounced impact on purchase intent. However, ads that appear excessively and lack a clear message may potentially irritate consumers due to their repetition. Consequently, marketing efforts on social media platforms are anticipated to influence purchase intent (Sharma et al. 2021). A significant uptick in purchase intent can subsequently lead to increased sales, as noted by Hong and Kim (2020). An increase in sales through social media is certainly what marketers expect.

Apple requires users to give explicit permission for applications to collect permissions, before the update about 70% of iPhone users shared their Identifier for Advertisers (IDFA) with the application this allowed the application to identify their personalization and serve ads according to the user, but after the reforms made, globally, only about 13% of iPhone users shared their IDFA (Roirevolution 2023). Apple does this because it considers that users deserve the opportunity to choose whether or not their data will be collected and shared on apps and other websites (Magneti 2023). Google announced that it was adopting new privacy restrictions that would cut tracking of user activity across all apps, this is similar to the features Apple created, which forced some companies to change their advertising practices where these changes affected large companies that relied on tracking users across apps (Dewi 2022), such as the parent Facebook Meta or better known as Facebook Advertising. The impacts experienced by Facebook Advertising are Ad Retargeting and Ad Measurement & Reporting. Ad Retargeting impacts users who do not use IDFA will not be reached. Ad Measurement & Reporting has an impact on the mismatch of prospects on what is targeted and limits Facebook's ability to serve ads to social media users (Magneti 2023). The privacy paradox refers to the gap between an individual's desire to safeguard their privacy and their actual online behavior. It reflects the disparity between an individual's willingness to share personal information and the way they behave, which often diverges significantly.

Advertising on social media platforms is a dynamic landscape, continually evolving, and subject to various factors, with one key driver being the privacy concerns specific to each social media platform. Based on data from the Indonesian Internet Service Providers Association (APJII), 57.8% of Indonesians express confidence in the security of their personal data when using the internet (Indonesia Internet Service Provider Association 2022). The level of security for users' personal data on social media platforms is a result of the privacy policies established by each platform and the perceived value that users associate with them (Chandra 2013). These concerns can diminish the perceived value users derive from using social media (Muhammad et al. 2018). Privacy concerns have gained greater prominence as individuals grow more apprehensive about data breaches and the extent to which their personal information is exposed on social media platforms.

When consumers perceive a high value in a service, they are more inclined to share their data. This willingness is often driven by a sense of reciprocity and an appreciation for the value provided by free service providers, such as those in the realm of social media (Schumann et al. 2013). Consequently, users are more likely to share their data when they receive a perceived value in return. Customer value is frequently assessed by the intensity of usage of free services, which can include the display of advertisements to users of these services (Bolton and Lemon 1999).

This perspective is substantiated by several previous studies. For instance, Li (2014) found no significant relationship between individual privacy concerns and purchasing activities in online stores. In contrast, Schwaig et al. (2013) discovered a negative relationship between user privacy concerns and the intention to engage in online transactions. Liao et al. (2011) similarly identified a negative and significant relationship between privacy concerns and the intention to conduct transactions in an online environment. Pujianto (2016) suggested that privacy has a positive but insignificant impact on the intention to engage in online transactions, while Sanjaya and Ekowati (2022) found that privacy has a positive and significant effect on the intention to conduct online transactions. Balakrishnan et al. (2014) uncovered that online advertising has a positive and significant impact on purchase intention. However, Dong et al. (2021) found that social media advertising has no significant effect on purchase intention.

Given the background information and the gaps identified in prior research, the primary objective of this study is to investigate the influence of the privacy paradox on social media habits, perceived value, and privacy concerns in relation to purchase intention on social media. The conceptual framework for this study is presented in Fig. 1, and it is followed by the research hypotheses.

Research hypotheses:

- H1: Privacy concern has a convinced and meaning effect on perceived value
- H2: Privacy concern has a convinced and meaning effect on purchase intention
- H3: Perceived value has a convinced and meaning effect on purchase intention
- H4: Perceived value mediates the effect of privacy concern on purchase intention
- H5: Social media habit strengthens the influence of perceived value on purchase intention

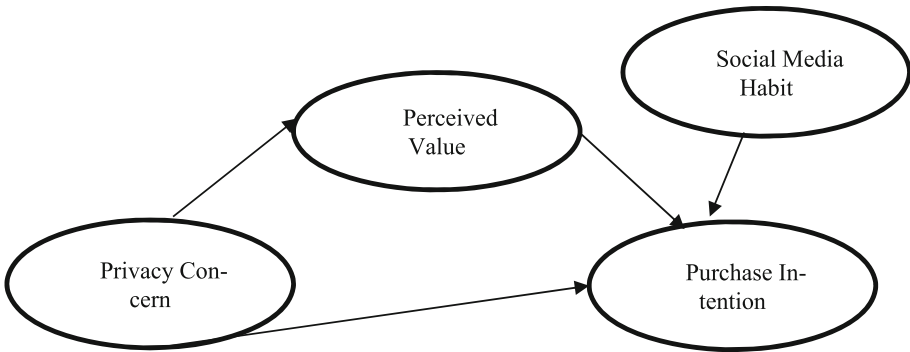


Fig. 1. Conceptual Framework

2 Research Methods

The research is a quantitative study that employs associative analysis. The study was carried out in Bali. The target population for this research consists of individuals in Bali who are over 17 years old and use social media. The reason for selecting individuals over 17 years of age is that they are considered capable of comprehending the questionnaire's content effectively. Because the number of social media users aged 17 years is infinite, the sample determination in this study uses the multiplication of the number of indicators. The indicators in this study are 16 so $16 \text{ indicators} \times 10 = 160$ respondents. This research uses SEM-PLS which is analyzed with Warp PLS.

3 Results and Discussion

Based on the distributed questionnaires, it is evident that most of the respondents belong to the millennial generation, specifically in the age range of 27 to 35 years, accounting for 55% of the total respondents. And generation z aged 18–26 years as much as 43% and the rest are respondents from generation X which is 2% of the total respondents. Female respondents dominate with 53% compared to male respondents at 47%. Most respondents are aware of the request for access to personal data on social media, namely 87%, but 70% of respondents do not mind their data being accessed by social media. 93% of respondents stated that they often get posts suggested by social media for them, and according to their activities on social media. Based on the Warp-PLS output, the results for APC (Average Path Coefficient), ARS (Average R-Square), and AVIF (Average Variance Inflation Factor) are presented in Table 1.

Considering the indicators derived from the three-fit pattern, as depicted in Fig. 2, it preserves be inferred the findings of this findings are satisfactory, meeting the criteria for a good fit. Two tests were performed, with the first test specifically evaluating the direct impact, excluding the mediating variable, which is privacy concern on purchase intention (Table 2).

Furthermore, testing by entering the mediating variable perceived value and the moderating variable social media habit into the model (see Fig. 3), the following results will be obtained.

Table 1. Goodness of Fit

Model fit	Index	p-value	Criteria	Information
Average path coefficient (APC)	0.288	P < 0.001	P < 0.050	Accepted
Average R-Squared (ARS)	0.254	P < 0.001	P < 0.050	Accepted
Average Block Variance Inflation Factor (AVIF)	1.670		< 5	Accepted

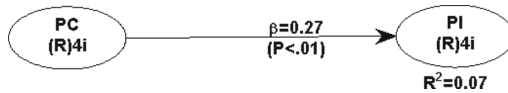


Fig. 2. Fit model

Table 2. Relationship Coefficients between Variables

	Path coefficients	P values
Privacy concern → Purchase intention	0.274	<0,001

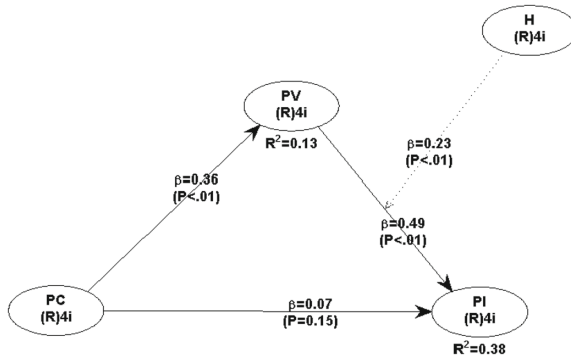


Fig.3. Model Summary

As the analysis outcomes presented in Table 3, the impact of privacy concerns on perceived value is 0.361 with a p-value of < 0.001. This indicates that privacy concerns have a convinced effect on perceived value. In other words, when social media users have more privacy worries, they tend to perceive more value in using social media. This finding aligns with previous research, such as Korzaan and Boswell (2008) and Stewart and Segars (2002), who also found that concerns about information privacy positively and significantly affect behavioral intentions. People who are concerned about the privacy of their personal information are more likely to take measures to protect their identity during online transactions. Sanjaya and Ekowati (2022) similarly found that privacy has a positive and significant impact on online transaction intentions.

In this study, the effect of privacy concerns on purchase intention is positive but insignificant, with a value of 0.071 and a p-value of 0.146. This suggests that while privacy concerns may have a positive influence on purchase intention in the context of social media, this influence is not significant. Other factors appear to have a more substantial impact on purchase intention, and privacy concerns do not play a major role. This aligns with findings from Acquisti and Grossklags (2005), who observed that, even when privacy can be compromised, only a small proportion of individuals change their privacy preferences.

The impact of perceived value on purchase intention is both positive and significant, with a value of 0.493 and a p-value of < 0.001. This suggests that when social media users perceive a higher value in their use of social media, it has a positive influence on their intention to make purchases. This finding is in line with the research conducted by Wang et al. (2021b), which highlights the positive effect of perceived value on users' emotional attachment to social media platforms. In the context of advertising, perceived value is typically defined as the assessment of benefits compared to costs when shopping online. Therefore, the perceived value of an online transaction reflects the net benefits that users perceive. As a result, consumers tend to prefer shopping with vendors or platforms that offer them the maximum perceived value. This underscores the importance of creating a positive and valuable user experience, especially in the context of e-commerce and online advertising. The moderating relationship between habit and the effect of perceived value on purchase intention is positive and significant, with a value of 0.227 and a significance level of < 0.001. This indicates that habit can strengthen the impact of perceived value on purchase intention, which is considered a quasi-moderation. This aligns with research by Tawakal and Widodo (2021), who found that habit can act as a moderating variable for the effect of trust on purchase intention. Other studies, such as Amoroso and Lim (2017), Ali et al. (2016), and Baptista and Oliveira (2015), have also shown that habit has a positive and significant effect on various intentions and behaviors.

Table 3. Relationship Coefficients between Variables

	Path coefficients	P values
Privacy concern → <i>Perceived Value</i>	0.361	<0.001*
Privacy concern → <i>Purchase Intention</i>	0.071	0.146 ^{ns}
<i>Perceived Value</i> → <i>Purchase Intention</i>	0.493	<0.001*
<i>Habit*Perceived Value</i> → <i>Purchase Intention</i>	0.227	<0.001*

Significance level *0.05; ns = not significant

The data in Table 4 reveals that the R-squared value for the perceived value construct is 0.130, indicating that approximately 13% of the variance in perceived value can be explained by the variance in privacy concerns. The R-squared value for the purchase intention construct is 0.377, suggesting that around 37.7% of the variance in purchase intention can be explained by the variances in both privacy concerns and perceived value. Additionally, the Q-squared values, which are used to test the predictive validity of the model, must be greater than zero to demonstrate that the model is effective in predicting

the outcomes. In this case, the model estimation results exhibit good predictive validity with values of 0.135 and 0.383, both of which are above zero. This indicates that the model can effectively predict the relationships between the variables in the study.

Table 4. Output Latent Variable Coefficients Result

	PC	PV	PI	H
R-squared coefficients		0.130	0.377	
Q-squared coefficients		0.135	0.383	

The results in Table 5, concerning the indirect impact of privacy concerns on purchase intention via perceived value, show a value of 0.178 with a p-value of < 0.001 . Interestingly, it is evident that the direct influence of privacy concerns on purchase intention is not significant. This implies that perceived value serves as a full mediator in the connection between privacy concerns and purchase intention. To put it more plainly, privacy concerns can shape purchase intentions on social media primarily through the lens of perceived value.

This finding is in line with research conducted by Yin and Qiu (2021), who categorized perceived utility value and hedonic value under the broader concept of perceived value. Their research revealed that perceived utility value and hedonic value effectively mediate the connection between AI technology experience and consumer purchase intention on online shopping platforms. In essence, the more value consumers perceive in the products or services offered on a specific platform, the more likely they are to intend to make purchases on that platform.

Table 5. Indirect Effect of 2 Segments

Indirect effects for paths with 2 segments	Coefficient	P Value
Privacy Concern \rightarrow Perceived Value \rightarrow Purchase intention	0,178	$< 0,001$

4 Conclusion and Recommendations

To address and balance the privacy concerns experienced by social media users, it is essential to emphasize the perceived value that users gain from their social media interactions. When users perceive a valuable experience in using social media for free, it can serve as a buffer against the impact of privacy concerns on their purchase intentions. This means that users may become less apprehensive about the use of their data by social media platforms for serving advertisements or other content that aligns with their individual privacy preferences. Social media habit is a fundamental aspect that social media platforms can utilize to gather data from users. This data includes information on

when users are most active on social media and the type of content they engage with. Understanding these user habits enables social media platforms to better tailor their content and advertising strategies.

Suggestions that can be given to social media users, it will be well to pay attention to the privacy policy of each social media and filter more access permissions from personal data and be more careful in sharing information to social media such as location, photos, and others. Suggestions that can be given to marketers are to do more targeting when running advertisements on social media, because by doing the right targeting according to the habits and demographics of users it will be easier to reach potential consumers on social media despite the strict privacy policies of social media and the operating system of each device.

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The Role of *Tri Kaya Parisudha* as a Moderator in Whistleblowing Systems and the Effectiveness of Internal Controls for Fraud Prevention

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Abstract. Microfinance institutions play a significant role in the economy, serving as a credible tool for poverty alleviation and promoting financial inclusion in developing countries. This research explores the impact of both whistleblowing systems and the effectiveness of internal controls on fraud prevention. Additionally, it investigates the moderating role of *Tri Kaya Parisudha*'s cultural influence. The study was conducted at the Village Rural Institution in Denpasar City, involving an analysis of 392 individuals. A non-probability sampling method was employed, utilizing a saturated sampling technique. Hypotheses were tested at a 5 percent significance level using Partial Least Square (PLS) analysis. The findings indicate that both the whistleblowing system and the effectiveness of internal control have a positive influence on fraud prevention. Moreover, the *Tri Kaya Parisudha* culture enhances the impact of the whistleblowing system on fraud prevention. However, *Tri Kaya Parisudha*'s culture does not act as a moderator for the effect of internal control effectiveness on fraud prevention.

Keywords: Whistleblowing · Fraud Prevention · Effectiveness

1 Introduction

Microfinance institutions have gained global recognition as effective tools for poverty reduction and financial inclusion in developing countries (Kayembe et al. 2021). In Indonesia, the government has enacted Law number 1 of 2013 to support the development of these institutions, which offer financial services, including various financing and savings schemes, to empower micro-entrepreneurs (Badina and Rosiana 2022). Indonesia, like many other developing countries, has witnessed rapid growth in microfinance services, with a specific focus on supporting the local economy (Cahyawan and Machdum 2019; Dewi and Rahajeng 2021). Additionally, there are unique village economic institutions in Indonesia, such as the Village Rural Institution in Bali and Lumbung Pitih Nagari in West Sumatra, which are not subject to Law Number 1 of 2013 (Mertayasa and Masdiantini 2022).

However, despite their importance, some Village Rural Institutions have faced challenges, including cases of fraud due to weak internal and external oversight (Adnyani and Hutnaleontina 2022). Notable instances of fraud, such as fictitious loans, have occurred in various Village Rural Institutions, tarnishing their reputation (Suryani and Putra 2023). To address these issues, the concept of whistleblowing has emerged as a means to report fraudulent activities, which can serve as an early warning system for fraud (Adnyani and Hutnaleontina 2022). Whistleblowing is the act of revealing law-violating actions within an organization and can be a critical element in fraud prevention (Yuniasih et al. 2022).

Preventing fraud is crucial for organizations, as it is an intentional act involving deception to gain unfair or unlawful advantages (IAPI 2021). It can take various forms, including misappropriation of assets, financial statement fraud, corruption, false statements, and computer-related fraud (Dewi and Atmadja 2021). Prevention is preferable to dealing with the aftermath of fraud since waiting for it to occur leads to losses that benefit certain individuals (Dewi et al. 2022).

The effectiveness of fraud prevention is influenced by a combination of factors, including the presence of a whistleblowing system and the quality of internal controls. Internal controls play a vital role in reducing the occurrence of fraud, but their effectiveness can vary (Yanti et al. 2023). The results of research on the relationship between internal controls and fraud prevention have been mixed, with some studies showing a positive effect and others not finding a significant impact (Mersa et al. 2021; Suandewi 2021).

Incorporating the concept of *Tri Kaya Parisudha*, which emphasizes ethical behavior and good thoughts, speech, and actions, can further strengthen an organization's ability to prevent fraud (Dewi and Atmadja 2021; Suryandari et al. 2021). This cultural framework promotes ethical behavior and can help reduce the potential for fraud.

Based on the description that has been presented, the formulation of the problem in this study is whether the whistleblowing system influences fraud prevention and whether the effectiveness of internal controls influences fraud prevention. In addition, it also examines whether *Tri Kaya Parisudha*'s culture strengthens the influence of the whistleblowing system on fraud prevention and whether *Tri Kaya Parisudha*'s culture strengthens the effect of internal control effectiveness on fraud prevention. Accordingly, the following hypotheses are formulated in this study:

H₁: Whistleblowing system has a positive effect on fraud prevention.

H₂: The effectiveness of internal control has a positive effect on fraud prevention.

H₃: *Tri Kaya Parisudha* can strengthen the influence of the whistleblowing system on fraud prevention.

H₄: *Tri Kaya Parisudha* can strengthen the effect of internal control effectiveness on fraud prevention.

2 Research Methodology

This study focuses on fraud prevention within the context of the Village Rural Institution in Denpasar City, involving a population of 556 employees. The research employed a non-probability sampling technique, specifically the saturated sampling method, with

405 returned and analyzed questionnaires out of the 556 distributed. Notably, the study encompassed employees from various positions within the Village Rural Institution. Data collection through questionnaires was conducted over the course of one month, concluding on August 4, 2023.

The study identifies fraud prevention as the dependent variable, with specific indicators including fraud awareness, the presence of sanctions for fraud, a positive work environment, fostering honesty, and transparency. On the other hand, the whistleblowing system is considered an independent variable, with indicators related to the effectiveness of its implementation, methods for reporting violations, and the benefits it offers. Additionally, the effectiveness of internal controls serves as another independent variable, encompassing indicators such as control environment, risk assessment, control activities, information and communication, and supervision and rule enforcement.

The study also introduces the moderating variable of *Tri Kaya Parisudha*, which reflects the respondents' attitudes toward specific statements and is measured on an interval scale with responses ranging from "Strongly Disagree" to "Strongly Agree."

To evaluate the research hypotheses, the study utilized Partial Least Square (PLS) with a significance level of 5 percent, employing the SmartPLS 4.0 application. This choice of methodology is due to the research's limited theoretical foundation, especially concerning the connection between *Tri Kaya Parisudha* and fraud prevention. The study ultimately presents its findings through a path diagram, which summarizes the results of the inner and outer models.

3 Results and Discussion

Table 1 provides valuable insights into various key aspects. Firstly, it reveals that fraud prevention within Village Rural Institutions in Denpasar City has a range from a minimum value of 12.00 to a maximum value of 14.00, with an average score of 13.403. This average score suggests that fraud prevention is generally at a high level within these institutions, as it exceeds the mid-point. The standard deviation of 0.873 indicates that there are variations in the levels of fraud prevention studied, deviating by an average of 0.873 from the mean score.

Moving on to the whistleblowing system, the data indicates that the system's performance ranges from a minimum value of 21.00 to a maximum value of 29.00, with an average score of 26.735. This average implies that, overall, the whistleblowing system in Village Rural Institutions in Denpasar City is functioning effectively. A standard deviation of 3.417 highlights variations in the scores, differing by an average of 3.417 from the mean.

In the case of internal control effectiveness, the minimum value is 39.00, while the maximum is 45.00, and the average score stands at 43.069. This suggests that, on average, internal control mechanisms within these institutions are operating efficiently. Similar to the whistleblowing system, a standard deviation of 3.417 indicates that there are deviations from the average score, with an average difference of 3.417.

Lastly, the data regarding *Tri Kaya Parisudha*, the cultural values embraced by Village Rural Institution employees, shows a range from a minimum value of 21.00 to a maximum value of 27.00, with an average score of 25.760. This indicates that employees

generally have a good understanding and appreciation of *Tri Kaya Parisudha*. The standard deviation of 1.783 reflects variations in the cultural values, differing by an average of 1.783 from the mean score.

Table 1. Descriptive statistics

Indicator	Number of Samples	Minimum Value	Maximum Value	Average value	Standard Deviation
Fraud Prevention	392	12,000	14,000	13,403	0,873
Whistleblowing System	392	21,000	29,000	26,735	3,417
The Effectiveness of Internal Control	392	39,000	45,000	43,069	2,200
<i>Tri Kaya Parisudha</i>	392	21,000	27,000	25,760	1,783

Table 2, which displays the SmartPLS output for loading factors, reveals that each indicator in the study has a loading factor exceeding 0.6. These loading factors surpass the recommended threshold of 0.6, indicating that the indicators employed in the research are valid and demonstrate convergent validity.

Table 3 presents crucial findings regarding the validity and reliability of the study's variables. The Average Variance Extracted (AVE) values for the whistleblowing system, the effectiveness of internal control, *Tri Kaya Parisudha*, and fraud prevention all exceed the expected threshold of 0.5. This signifies that the indicators used in the research are valid and have successfully demonstrated convergent validity.

Moreover, Table 3 also displays the Composite Reliability values for these variables, including the whistleblowing system, the effectiveness of internal control, *Tri Kaya Parisudha*, and fraud prevention. These Composite Reliability values surpass 0.7, indicating a high level of reliability for these variables, signifying that the data collected is dependable and robust.

Additionally, the Cronbach alpha values for each variable in the study are also above 0.7. This suggests that the consistency and internal reliability of the answers tested in the research are quite good, reinforcing the validity and integrity of the data.

The R-square (R²) result is 0.988. The influence model of the whistleblowing system, the effectiveness of internal control, *Tri Kaya Parisudha*, and fraud prevention gives an R-square value of 0.988 which can be interpreted that the variability of the fraud prevention construct is 98.8%, while 1.2% is explained by other variables outside researched. The R-square value of 0.988 also indicates that the model is classified as good.

Furthermore, significance is determined by looking at the parameter coefficient values and the statistical significance value of t to determine the effect between variables through the bootstrapping procedure. Figure 1 shows the results of bootstrapping.

The first hypothesis in this study suggests that the whistleblowing system positively impacts fraud prevention. Table 4 displays a correlation of 0.642 between the whistleblowing system and fraud prevention, with a significance value of 0.000, which is less

Table 2. Loading Factor Value of Each Indicator

Indicators	Loading Factor Value
Effectiveness of Whistleblowing System Implementation ($X_{1.1}$)	0,986
Violation Reporting Method ($X_{1.2}$)	0,988
Benefits of the Whistleblowing System ($X_{1.3}$)	0,959
Control Environment ($X_{2.1}$)	0,857
Risk Assessment ($X_{2.2}$)	0,832
Control Activity ($X_{2.3}$)	0,910
Information And Communication ($X_{2.4}$)	0,859
Oversight And Rule Enforcement ($X_{2.5}$)	0,892
Manacika ($X_{3.1}$)	0,986
Wacika ($X_{3.2}$)	0,968
Kayika ($X_{3.3}$)	0,981
Sanctions in Case of Fraud ($Y_{1.1}$)	0,988
Fraud Awareness ($Y_{1.2}$)	0,950
Good Working Environment ($Y_{1.3}$)	0,988
Creating Honesty ($Y_{1.4}$)	0,789
Transparency ($Y_{1.5}$)	0,988

Table 3. Results Of AVE, Composite Reliability and Cronbach Alpha Analysis

Construct	Average Variance Extracted (AVE)	Composite Reliability	Cronbach Alpha
Whistleblowing system	0,956	0,977	0,968
The Effectiveness of Internal Control	0,758	0,939	0,977
<i>Tri Kaya Parisudha</i>	0,957	0,978	0,921
Fraud Prevention	0,890	0,977	0,968

than $\alpha = 0.05$. This indicates that the whistleblowing system has a direct and positive influence on fraud prevention. As a result, the first hypothesis is supported, indicating that the more effective the implementation of the whistleblowing system, the better the fraud prevention at Village Rural Institutions in Denpasar City.

The relationship between the whistleblowing system and fraud prevention is closely tied to the Fraud Triangle Theory, particularly the concept of opportunity. In a work environment where opportunities for fraudulent actions exist, a whistleblowing system acts as a means of both reporting and surveillance. Such a system not only serves as a channel for reporting fraud but also instills fear in employees, acting as a deterrent

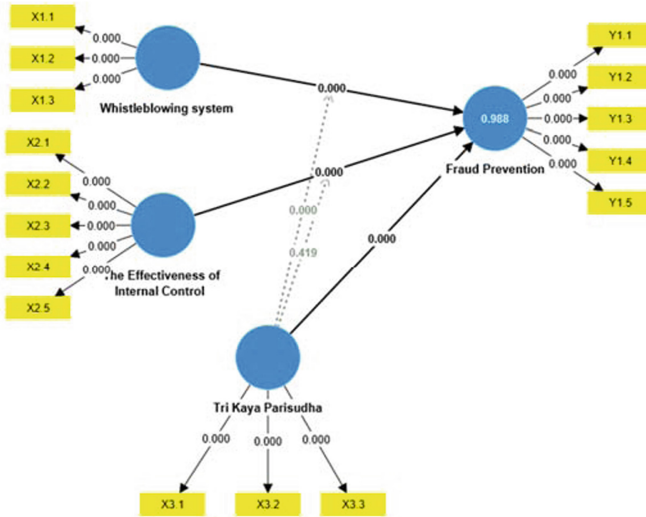


Fig. 1. Bootstrapping results

to fraudulent behavior. Furthermore, it serves as an early warning system for detecting fraud, which can help minimize fraudulent activities.

The findings of this study align with previous research (Utama and Astawa (2021); Suputra (2021); Anandya and Werastuti (2020); Romadaniati et al. (2020); Jayanti and Suardana (2019)), indicating a positive link between whistleblowing and fraud prevention. A strong understanding of how the whistleblowing mechanism operates and the protection provided to whistleblowers motivates employees to report fraud to the relevant authorities. The variable loading factor analysis reveals that the method of reporting violations within the whistleblowing system, particularly when managed by an independent special officer, encourages employees at Village Precredit Institutions in Denpasar City to report violations and feel protected when reporting instances of fraud.

The second hypothesis posits that the effectiveness of internal control has a positive influence on fraud prevention. As indicated in Table 4, the analysis reveals a relationship coefficient of 0.078, with a significance value of 0.000, which is less than the predefined threshold ($\alpha = 0.05$). This outcome indicates that the effectiveness of internal control indeed has a positive impact on fraud prevention. Therefore, the second hypothesis is substantiated. These results underscore the notion that more effective implementation of internal control leads to improved fraud prevention within the Village Rural Institution in Denpasar City.

This relationship can be understood through the Fraud Triangle Theory, which asserts that the presence of opportunities can contribute to fraudulent actions when internal control is insufficient. These opportunities arise due to a lack of oversight or the exploitation of one's position for personal gain. Effective internal controls play a pivotal role in minimizing such opportunities for fraud (Utama and Astawa 2021). Implementing robust

internal controls can reduce the likelihood of fraudulent incidents and enhance the efficiency of operational activities. Therefore, the more effective the internal control mechanisms, the more successful fraud prevention efforts become (Armelia and Wahyuni 2020), which aligns with the findings of Utama and Astawa (2021) and Armelia and Wahyuni (2020).

Unethical and fraudulent behaviors can also be influenced by the presence of an internal control system and supervisory monitoring (Lestari and Supadmi 2017). Control activities, such as segregation of duties, are instrumental in ensuring that management directives are adhered to. Notably, the control activity with the highest loading factor value pertains to statements like “In the LPD where I work, every assignment is always authorized by an authorized employee,” highlighting the effective implementation of control activities, particularly the segregation of duties, in preventing fraud within the Village Rural Institution in Denpasar City.

The third hypothesis examines the role of *Tri Kaya Parisudha* in strengthening the impact of the whistleblowing system on fraud prevention. Table 4 presents compelling evidence that *Tri Kaya Parisudha* does indeed enhance the influence of the whistleblowing system on fraud prevention, as indicated by the highly significant p-value of 0.000 (≤ 0.05). The original sample estimate value of 0.094 further supports the idea that *Tri Kaya Parisudha* plays a reinforcing role in the relationship between the whistleblowing system and fraud prevention. Consequently, the third hypothesis, which postulates that *Tri Kaya Parisudha* strengthens the connection between the whistleblowing system and fraud prevention, is validated.

The relationship between the *Tri Kaya Parisudha* variable and the dependent variable is confirmed by a p-value of 0.000, which is less than 0.05. Moreover, the interaction between the *Tri Kaya Parisudha* variable and the independent variables is evidenced by the significant p-value in the interaction between the whistleblowing system and the *Tri Kaya Parisudha* variable, also at 0.000 and below 0.05. Based on these observations, the *Tri Kaya Parisudha* variable can be considered a quasi-moderator in the study.

Tri Kaya Parisudha, a cultural concept rooted in society, embodies three fundamental behaviors that guide human life towards purity. These behaviors encompass Manacika, which encourages pure thoughts and ethical thinking; Wacika, which promotes speaking in a kind and honest manner, including fulfilling promises; and Kayika, which emphasizes virtuous actions, such as refraining from fraudulent activities (Dewi and Atmadja 2021). Among the elements of *Tri Kaya Parisudha*, Manacika holds the highest loading factor value. Manacika is considered the foundational element in *Tri Kaya Parisudha*, as it underpins all three behaviors (Partha et al. 2022). Statements within the Manacika indicator, such as “I always think about the impact or consequences that can be caused when I carry out my duties or work,” reveal that employees at the Village Rural Institution in Denpasar City tend to focus on positive thoughts, particularly concerning the impact of their work. Such positive thoughts, in turn, translate into virtuous words and actions, acting as a deterrent against fraudulent activities. Furthermore, this mindset fosters awareness of the law of karma, instilling a sense of fear that encourages employees to use the whistleblowing system to report any fraudulent incidents within the organization.

The fourth hypothesis postulates that *Tri Kaya Parisudha* can strengthen the influence of internal control effectiveness on fraud prevention. However, the analysis presented

in Table 4 indicates that *Tri Kaya Parisudha* fails to moderate the impact of internal control effectiveness on fraud prevention. This is evident from the p-value, which stands at 0.419, exceeding the predetermined significance level ($\alpha > 0.05$). The original sample estimate value of 0.016 confirms that *Tri Kaya Parisudha* does not enhance the effect of internal control effectiveness on fraud prevention. Consequently, the fourth hypothesis, which suggests that *Tri Kaya Parisudha* could strengthen the connection between internal control effectiveness and fraud prevention, is not supported by the findings of this study.

In terms of the relationship between the *Tri Kaya Parisudha* variable and the dependent variable, the p-value of 0.000 falls below the 0.05 threshold, indicating a significant connection. However, when considering the interaction between the *Tri Kaya Parisudha* variable and the independent variables, the p-value for the interaction between the effectiveness of internal control and the *Tri Kaya Parisudha* variable is 0.419, which is greater than 0.05. Consequently, the *Tri Kaya Parisudha* variable is categorized as an intervening, exogenous, antecedent, predictor type rather than a moderator in the study.

The results of the research highlight that the culture of *Tri Kaya Parisudha* does not moderate the impact of internal control effectiveness on fraud prevention. This finding contradicts the statement made by Sari and Karyada (2023), which posited that internal control is influenced by the principles of *Tri Kaya Parisudha* to minimize the potential for accounting fraud. In the *Tri Kaya Parisudha* concept, it is expected that individuals will exercise self-control and believe in the law of karma, where the consequences of their actions will be realized (Yanti et al. 2020).

The effectiveness of internal control is well-suited for preventing fraud, particularly due to the robustness of control activities. These activities significantly reduce opportunities for fraud at the Village Rural Institution in Denpasar City, as evidenced by the high loading factor value of 0.988 on the transparency indicator within the fraud prevention variable. An example statement within this indicator is “I publish fund management activities to the general public.” The high level of transparency enhances the overall effectiveness of internal control, rendering the *Tri Kaya Parisudha* culture incapable of moderating the relationship between internal control effectiveness and fraud prevention.

Table 4. Hypothesis Test Results

Construct	Original sample estimate Value	Significance
Whistleblowing system	0,642	0,000
The Effectiveness of Internal Control	0,078	0,000
<i>Tri Kaya Parisudha</i>	0,400	0,000
<i>Tri Kaya Parisudha</i> x Whistleblowing system	0,094	0,000
<i>Tri Kaya Parisudha</i> x The Effectiveness of Internal Control	0,016	0,419

4 Conclusion

Based on the results and discussion, it can be concluded that the whistleblowing system has a positive effect on fraud prevention. This shows that the better the implementation of the whistleblowing system, the more fraud prevention will increase. The effectiveness of internal control has a positive effect on fraud prevention. This shows that the more effective the internal control, the more fraud prevention will increase. *Tri Kaya Parisudha* was able to strengthen the influence of the whistleblowing system on fraud prevention. This shows that a good application and understanding of *Tri Kaya Parisudha* will be able to direct employees to think, say and do good so that if fraud occurs, the employee will have the courage to report the fraud. *Tri Kaya Parisudha* was unable to moderate the effect of internal control effectiveness on fraud prevention. This shows that the application and understanding of *Tri Kaya Parisudha* is not able to improve fraud prevention in terms of the effectiveness of internal controls.

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Can Green Banking Moderate the Effect of Corporate Social Responsibility on Going Concern?

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Abstract. Banking is a financial business entity that cannot be separated from the going concern desire and to achieve it in all banking activities cannot be separated from the existence of an imbalance between social and environmental so that, to overcome this, corporate social responsibility is carried out by banks. In addition, banks, which are one of the main financiers of business entities, make banks indirectly responsible for environmental damage. Therefore, banks must increase their credit lending portfolio by providing environmentally friendly loans called green banking. This research was conducted to determine the effect of corporate social responsibility on going concern and green banking can moderate the effect of corporate social responsibility on going concern. The population in this study are banking companies listed on the Indonesia Stock Exchange for 2018–2021 with a data sample of 14 companies obtained using a non-probability sampling technique using a purposive sampling method. Data processing uses classical assumption tests, data analysis uses Moderated Regression Analysis (MRA), and model feasibility tests. The results of the analysis in this study are that corporate social responsibility has no significant effect on going concern and green banking is unable to moderate the effect of corporate social responsibility on going concern.

Keywords: Going Concern · Corporate Social Responsibility · Green Banking · Indonesia

1 Introduction

The concept of “going concern” serves as a fundamental pillar of business sustainability, signifying a company’s ability to secure its long-term existence (Das Prena & Dewi, 2021). While the pursuit of profit maximization is a cornerstone in establishing a business, equally critical is the goal of ensuring business continuity, often referred to as “going concern.” This continuity not only reflects a company’s performance but also shapes its competitive position within society. To safeguard business continuity, a strategic approach is imperative, one that carefully considers internal and external factors. Unfortunately, in today’s business landscape, a predominant focus on profit often takes

precedence, sometimes at the expense of acknowledging the broader consequences of these actions. Striking a balance becomes pivotal, and businesses find themselves compelled to nurture meaningful relationships with their surrounding communities and the environment. This delicate equilibrium is attainable through the practice of corporate social responsibility (CSR).

The nexus between a company's survival, known as "going concern," and the principle of corporate social responsibility is well-explained through the lens of legitimacy theory, as elucidated by Firmansyah and Venusita (2021). Legitimacy theory revolves around the alignment of businesses with government, individuals, and society. It delves into the intricate relationship that businesses have with society, emphasizing the need to adhere to societal norms as a contractual obligation. The alignment between business entities and society is crucial, given that society is a significant stakeholder wielding influence over business operations, both internally and externally. This alignment calls for businesses to operate in harmony with prevailing societal norms and values while actively contributing to the well-being and needs of the community.

Corporate Social Responsibility (CSR) emerges as a commitment by businesses to the welfare of their local communities and the broader society, as underscored by Malinton and Kampo (2019). The significance of implementing CSR has risen notably within the context of sustainable development. This shift reflects an investment in the growth and sustainability of businesses, encompassing economic, social, and environmental considerations, as highlighted by Fatimah (2014) and Narisyah (2018). In this evolving landscape, CSR should no longer be solely profit-centric. Instead, it should align with a triple bottom line, incorporating profit, people, and the planet (Purusotama, M. R., & Isyuardhana, D., 2021). The implementation of CSR plays a pivotal role in securing the ongoing success and survival (going concern) of businesses, elevating their image and value among stakeholders, including investors seeking to support socially responsible enterprises.

The banking sector, being integral to the economic fabric, plays an indispensable role in striving for business sustainability, particularly in the context of "going concern." Banking activities inherently involve strategic decisions that carry social and environmental implications. Therefore, banks are increasingly integrating corporate social responsibility activities to maintain a balance between their financial operations and their societal and environmental responsibilities. While banking may not be the primary contributor to environmental harm, it remains a significant source of funding for businesses with the potential to impact society and the environment negatively. To address this, banks are implementing strategies that include providing loans for renewable and environmentally friendly projects. This move signifies the banking sector's growing awareness of the environmental risks associated with the projects they finance, which can adversely affect their reputation.

Stakeholder theory underlines the importance of businesses providing benefits to various stakeholder groups, not just pursuing their own interests (Dewi & Dewi, 2017). Stakeholders possess significant influence over business entities due to their access to vital resources necessary for business operations. To maintain strong relationships between stakeholders and management and protect the interests of all parties involved, businesses issue sustainability reports. These reports offer information on economic,

environmental, and social aspects of their activities, contributing to the achievement of sustainable development goals.

Sustainable development, a global endeavor, strives to enhance the quality of life while respecting the finite limits of natural resources (Rahadian, 2016). As the world grapples with resource limitations and imbalances across economic, environmental, and social domains, sustainable development gains greater attention. Environmental crises, economic downturns, social challenges, and more have underscored the need for balance in managing natural resources, transcending profit-focused business models.

The emergence of the green economy is a response to the growing concerns about environmental sustainability. It places environmental protection at its core, offering both short-term and long-term benefits (Firmansyah, 2022). The green economy concept has spurred a movement emphasizing sustainability in various economic fields, including green computing, green strategic management, and green banking.

Green banking represents a priority for financial institutions as they seek to align their business practices with sustainability (Suryaman, 2016). By promoting environmentally friendly practices and reducing carbon footprints in banking activities, green banking aims to protect the environment (Ahuja, 2015). It primarily involves providing loans exclusively for companies engaged in renewable and environmentally friendly business activities. Given its alignment with the principles of sustainability and environmental responsibility, green banking stands as a crucial component of the financial sector's commitment to sustainable development. To support the implementation of green banking activities, regulatory frameworks have been established in Indonesia, emphasizing the importance of environmental perspectives in banking operations. These regulations necessitate an analysis of prospective debtors to assess their environmental management practices.

Furthermore, the significance of green banking is highlighted by the findings of Forest & Finance, which uncovered substantial funds provided by global banks to mining companies, some of which are associated with environmental destruction, water pollution, and human rights violations. The sizable loans extended to companies in Southeast Asia underscore the urgent need for sustainable banking practices.

The variances in research outcomes regarding the impact of corporate social responsibility on "going concern" and green banking have prompted further investigation (Firmansyah and Venusita, 2021; Romli and Reza Zaputra, 2022; Das Prena and Dewi, 2021; Setiawan and Dewianawati, 2021; Wardani et al., 2022; Malinton and Kampo, 2019; Dewi and Dewi, 2017). Specifically, this research explores the connection between CSR and business continuity within the banking sector, employing green banking as a moderating variable. This study distinguishes itself through its unique sample, focusing on banking companies listed on the Indonesia Stock Exchange from 2018 to 2021. The conceptual framework employed in this study is illustrated in Fig. 1.

Accordingly, the following hypotheses are formulated:

H1: Corporate Social Responsibility has a positive effect on Going Concern

H2: Green Banking strengthens the influence of Corporate Social Responsibility on Going Concern

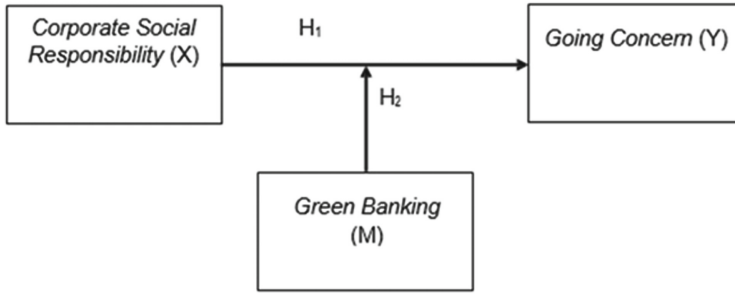


Fig. 1. Research framework

2 Research Methodology

The study focused on banks that were listed on the Indonesia Stock Exchange from 2018 to 2021. The sample acquisition in this study used a non-probability sampling technique, specifically using purposive sampling. This method led to the selection of 14 banking companies that met the specific criteria, which required them to be listed on the Indonesian stock exchange and have a sustainability report. These 14 companies were observed over a span of 4 years, resulting in a total of 56 observations. The specific companies used as samples can be found in Table 1, following the predetermined criteria.

Table 1. List of Company Names

No	Name of Companies	Issuer
1	PT Bank Central Asia Tbk	BBCA
2	PT bank KB Bukopin Tbk	BBKP
3	PT Bank Negara Indonesia (persero) Tbk	BBNI
4	PT Bank Rakyat Indonesia (persero) Tbk	BBRI
5	PT Bank Tabungan Negara (persero) Tbk	BBTN
6	Bank Pembangunan Daerah Jawa Barat dan Banten Tbk	BJBR
7	PT Bank Mandiri (persero) Tbk	BMRI
8	PT Bank CIMB Niaga Tbk	BNGA
9	PT Bank Maybank Indonesia Tbk	BNII
10	PT Bank Permata Tbk	BNLI
11	PT Bank Syariah Indonesia Tbk	BRIS
12	Bank Artha Graha Internasional Tbk	INPC
13	PT Bank China Construction Bank Indonesia Tbk	MCOR
14	PT Bank OCBC NISP Tbk	NISP

The measurement of the going-concern variable in this study uses ratio calculations using the price-to-book value formula, namely the ratio of stock prices divided by book value of shares. This is in accordance with research measurements (Dewi & Dewi, 2017), (Das prena & Dewi, 2021), and (Malinton & Kampo, 2019).

With the Going Concern calculation formula as follow:

$$PBV = \frac{SharePrice}{TotalEquity / Numberofoutstandingshares}$$

With the steps taken to get CSRI results according to Primario (2014) as follows:

1. The score of disclosed corporate social responsibility items will be given a value of 1 while undisclosed corporate social responsibility items will be given a value of 0.
2. The scores obtained are added up to get the total score.
3. The calculation is done by dividing the number of disclosure criteria by the expected total score.

The formula for calculating Corporate Social Responsibility is:

$$CSRIj = \frac{\sum Xij}{Nj}$$

The measurement of the green banking variable in this study uses a dummy variable seen from the disclosures in the company's sustainability report. If the company discloses item i, it is given a value of 1, while if the company does not disclose item i, it is given a value of 0. This is in accordance with research measurements (Dewi & Dewi, 2017).

3 Results and Discussion

3.1 Classical Assumption Test Results

The Kolmogorov-Smirnov (K-S) non-parametric statistical test was used to assess the normality of the data, and the Asymptotic Significance (2-tailed) value was found to be 0.200, which is greater than 0.05. Therefore, it can conclude that the data is normally distributed, and it satisfies the normality assumption.

In this study, a multicollinearity test was conducted by examining the tolerance value and the Variance Inflation Factor (VIF). If the tolerance value is greater than 0.10 and the VIF is less than 10, it indicates the absence of multicollinearity. For the corporate social responsibility and green banking variables, the tolerance value is 0.998 (greater than 0.10), and the VIF value is 1.002 (less than 10). Consequently, it is proven there is no evidence of multicollinearity in the data.

The study employed the Glejser test to assess the significance of coefficients with a 5% confidence level. If the test results yield a significance level greater than 0.05, it suggests the absence of a heteroscedasticity problem. The results of the heteroscedasticity test using the Glejser test indicated a significance value of 0.136 for the corporate social responsibility variable and 0.185 for the green banking variable, both of which are greater than 0.05. Thus, it can be concluded that there is no heteroscedasticity present.

Regarding the autocorrelation test, the R Square value was determined to be 0.042. The Chi Square Count was calculated using the formula $N \times R$ Square, with N representing the data size. The resulting Chi Square value was 2.352 (with $N = 56$). Therefore, the data does not exhibit signs of autocorrelation since 2.352 is both greater than 0.05 and less than 5.9915.

3.2 Hypotheses Testing

As presented in Table 2, the results indicate a constant value of 0.595, a beta coefficient of 1.078 for the corporate social responsibility variable, and a significance level (sig) of 0.194, which is greater than 0.05. This suggests that the corporate social responsibility variable does not have a significant impact on the going concern variable. Additionally, the beta coefficient for the green banking variable is 0.313. Therefore, it can be concluded that corporate social responsibility does not exert a significant influence on the going concern, leading to the rejection of Hypothesis 1 (H1). Equation 1, derived from the data in Table 2, is formulated in the MRA analysis as follows:

Table 2. t-test results for hypothesis 1

Coefficient ^a					
Model	Unstandardized Coefficient		Standardize Coefficients	t	Sig
	B	Std. Error	Beta		
1 (Constant)	.595	.350	.176	1.702	.095
Corporate Social Responsibility	1.078	.820	.144	1.315	.194
Green Banking	.313	.292		1.075	.287

a. Dependent Variable: Going Concern

$$Y = \alpha + \beta_1 \text{CSR} + \beta_2 \text{GB} + \varepsilon \quad (1)$$

$$Y = 0.595 + 1.078 \text{ CSR} + 0.313 \text{ GB}$$

According to the outcomes of the t-test displayed in Table 3, Eq. 2 is derived within the framework of the MRA analysis as follows:

$$Y = \alpha + \beta_3 \text{CSR} + \beta_4 \text{GB} + \beta_5 \text{CSR.GB} + \varepsilon \quad (2)$$

$$Y = 0.858 + 0.123 \text{ CSR} + (-0.002 \text{ GB}) + 1.157 \text{ CSR.GB}$$

Table 3. t-test results for hypothesis 2

Coefficients^a					
Model	Unstandardized Coefficient		Standardize Coefficients	t	Sig
	B	Std. Error	Beta		
1 (Constant)	.858	.611	.020	1.406	.166
Corporate Social Responsibility	.123	1.990	-.001	.062	.951
Green Banking	-.002	.666	.221	-.004	.997
Corporate Social Responsibility*Green Banking	1.157	2.192		.528	.600

a. Dependent Variable: Going Concern

When Eq. 2 is processed by introducing the interaction variable, specifically the product of corporate social responsibility and green banking, there are notable changes in the constant, beta values for each variable, and the significance (sig) values. In this context, the constant yielded a result of 0.858, with a beta coefficient of 0.123 for the corporate social responsibility variable, and a sig value of 0.951, which is greater than 0.05. Subsequently, it can be inferred that the corporate social responsibility variable in Eq. 2 does not have a significant impact on the going concern variable. For the green banking variable, the beta value was -0.002, with a sig of 0.997, which is also greater than 0.05. This indicates that the green banking variable in Eq. 2 does not significantly influence the going concern variable. Additionally, when examining the interaction between the corporate social responsibility and green banking variables, a beta result of 1.157 was obtained, with a sig of 0.600, which is once again greater than 0.05. Thus, it can be concluded that the corporate social responsibility and green banking variable does not exert a significant effect on the going concern variable. Consequently, Hypothesis 2 (H2) is rejected, suggesting that green banking does not effectively moderate the impact of corporate social responsibility on the going concern.

The interaction effect of the moderating variable was assessed using the MRA test on Eqs. 1 and 2, leading to the conclusion that the moderating variable in this study holds the potential to act as a moderator (specifically, a Homologiser Moderator). The values of β_2 and β_5 , which are 0.313 and 1.157 respectively, both had significance levels (sig) exceeding 0.05, with sig values of 0.287 and 0.600, respectively. Therefore, neither β_2 nor β_5 were deemed statistically significant. This indicates that green banking has the potential to function as a moderating variable.

3.3 Discussion

Corporate social responsibility, as observed in this study, does not exert a significant influence on going concern, leading to the rejection of Hypothesis 1. This finding contradicts the principles of legitimacy theory, which posits that it should describe business

management practices focusing on the alignment between government, individuals, and society (Firmansyah & Venusita, 2021). The absence of a substantial impact can be attributed to the perception of CSR in the banking sector by stakeholders and investors. Many view it as a resource drain that adds to the operational burden without yielding a corresponding increase in profits (Firmansyah & Venusita, 2021). Additionally, corporate social responsibility has not yet become a critical consideration for investors (Romli & Reza Zaputra, 2022). This is supported by the fact that numerous stakeholders do not emphasize the long-term outcomes stemming from CSR, making it challenging to predict its ability to influence the ongoing viability of banking operations (going concern).

In this study, CSR's impact on going concern was found to be inconsequential at Bank BCA, Bank BRI, Bank BNI, Bank Mandiri, and Bank Permata, particularly over the research period. This substantial disparity between the value of corporate social responsibility and going concern at these banks rendered the research outcomes statistically insignificant. These results align with Firmansyah and Venusita's (2021) research, which similarly concludes that corporate social responsibility does not significantly affect going concern. Nevertheless, these findings contrast with other research studies (Malinton & Kampo, 2019; Das Prena & Dewi, 2021; Setiawan & Dewianawati, 2021; Wardani et al., 2022), which assert that CSR has a substantial impact on going concerns.

Green Banking, as a moderator, does not appear to have an extensive influence on the relationship between corporate social responsibility and going concern, resulting in the rejection of Hypothesis 2. These findings do not align with the stakeholder theory, which emphasizes that companies should not solely pursue their own interests but should also deliver benefits to their stakeholders (Dewi & Dewi, 2017). The ineffectiveness of green banking as a moderator suggests that the implementation of green banking in the banking sector has not altered stakeholder assessments regarding the importance of sustaining social and environmental equilibrium for the long-term health of the banking business. Furthermore, research results indicate that investors have not been particularly responsive to the implementation of green banking in banking operations (Romli & Reza Zaputra, 2022). These results are in accordance with Malinton and Kampo's (2019) study, which suggests that green banking does not moderate the influence of corporate social responsibility on going concern, but contradict Dewi and Dewi's (2017) research, which suggests that green banking can moderate the impact of corporate social responsibility on going concern.

4 Conclusion and Recommendations

After a thorough analysis of the data and an in-depth discussion, several critical conclusions emerge. Firstly, it becomes evident that corporate social responsibility does not have a substantial influence on going concern. The significant gap between corporate social responsibility and going concern is the primary factor behind this finding. Furthermore, when examining the role of green banking as a moderating element, it becomes apparent that it does not effectively shape the connection between corporate social responsibility and going concern. This outcome can be primarily attributed to the substantial gap that exists within the interaction variables, encompassing both green banking and corporate

social responsibility, and their interplay with going concern. Based on the findings of the research, regulators could adopt a more stringent approach towards banks. This could involve conducting awareness campaigns to emphasize the significance of implementing corporate social responsibility and green banking practices for banks. These efforts should not only help maintain a balance between social and environmental concerns but also contribute to the continuity of development goals.

For further research, other variables outside the research model can be used which can explain going concern so that it can support changing stakeholder assessments regarding the implementation of corporate social responsibility and green banking activities for the sustainability of the banking business. In addition, in further research, the Green Banking Disclosure Index (GBDI) can be used to measure green banking variables.

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Financial Literacy on Sustainability Cultivation of Tabanan Robusta Coffee

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Abstract. Indonesia is a coffee producer that counts in the world. Each region in Indonesia has different characteristics of coffee. Coffee exports greatly impact the economy of farmers in Indonesia. In Bali itself, it is famous for its Kintamani and Robusta Pupuan coffee. As Pupuan Robusta coffee developed, coffee production in Pupuan decreased. This is due to an imbalance between income and expenses. This research was conducted using a qualitative method by interviewing 20 coffee farmers who are members of farmer groups. The results of this study are the lack of financial literacy owned by farmers to record expenses and income earned, so that farmers perceive that the results obtained are not in accordance with the sacrifices incurred.

Keywords: Coffee Farmer · Robusta Pupuan · Financial Literacy · Cost

1 Introduction

Indonesia, the world's fourth-largest coffee producer following Brazil, Vietnam, and Colombia, relies significantly on coffee production from its plantations in 2022. This highlights the crucial role coffee plays for Indonesian coffee farmers. In fact, this coffee variety is predominant in the country's coffee plantations (Sri Najiyanti, 2001).

For coffee farmers, particularly in Bali, coffee cultivation remains a vital pursuit due to its high economic value in the region. However, becoming a successful coffee farmer, especially in Bali, is a challenging endeavor. Coffee farming is their primary occupation, and their income heavily relies on factors like coffee bean yield, bean quality, and market coffee prices. The quantity of coffee produced is intricately linked to land productivity, which, in turn, is influenced by coffee types, land management, and maintenance practices. To enhance production and increase income, it's essential to focus on improving productivity. To avoid potential declines in selling prices, it is advisable for farmers not to immediately sell their coffee after harvesting (referred to as a cash crop) but instead consider storing or delaying the sale of coffee (Irmeilyana, 2021).

A coffee farmer's expertise must encompass not only coffee knowledge but also coffee care skills, as the production from coffee plantations heavily relies on the maintenance carried out by farmers. Indonesia boasts several renowned coffee types, such

as Aceh Gayo Arabica Coffee, Mandailing Arabica, Lampung Robusta, Flores Bajawa Coffee, Toraja Coffee, Luwak Coffee, Liberika Riau Coffee, Kintamani Arabica Coffee, and Robusta Pupuan Coffee.

Presently, Pupuan Robusta Coffee is expanding its horizons to introduce unique flavors and discover its market. With each passing year, the production of Pupuan Robusta coffee steadily increases, raising the possibility of Pupuan Robusta coffee gaining global recognition.

Robusta coffee beans are commonly used as raw material for instant coffee and blended coffee to enhance the coffee's robustness. Additionally, Robusta coffee finds its place in crafting milk-based coffee beverages like cappuccino, café latte, and macchiato (Risnandar, 2016). Nevertheless, in light of the expanding information about Pupuan Robusta coffee on a global scale, there has been a shift away from cultivating Robusta coffee due to several factors. These include declining coffee quality due to unfavorable weather conditions, rising costs of essential resources like fertilizers, and a lack of income matching the expenses incurred.

This study deliberates on absence of rigorous income and expense tracking contributes to an information gap, making it challenging for farmers to determine whether they are achieving profits or incurring losses.

2 Research Method

This study uses a qualitative approach. With the initial stages of collecting data, bringing out data reduction, supporting data with display data, ending with drawing conclusions and recommendations. After collecting the data, the researcher tested the data by triangulation and triangulation techniques. Triangulation is carried out by evaluating data obtained in the field with documentation carried out through social media. To find out the results of the study, the researcher then draws conclusions based on these findings. Table 1 shows the list of farmers.

Tabanan, Pupuan sub-district, Anggasari village is the chosen research location. The steps involved in this study were conducting a literature review, seeking references to the costs incurred by Robusta coffee farmers, and then conducting interviews with coffee farmers. The researcher conducted the analysis by reducing the data and summarizing the results of the interviews conducted.

Interviews were conducted offline by visiting Robusta coffee farmers registered with farmer groups. Researchers conducted in-depth interviews according to the topics taken.

3 Results

1. Lack of financial literacy for Robusta coffee farmers in Tabanan.

Of the 20 coffee farmers interviewed, 19 farmers admitted that they did not keep written records regarding the costs incurred to manage their coffee plantations. This is because the farmers feel it is too heavy to keep records. So, to determine whether the crop yields a loss or profit is only seen from the end result they get. Often, they feel that the final crop they get is in a profitable position. This is very unfortunate because the farmers do not know how much it costs to care for them.

However, there are farmers who have started keeping records.

Table 1. List of farmers

Informant	Costing knowledge		Cost calculation		Fertilizer			Profit/Loss		Harvest outcome	
	Yes	No	Yes	No	Bought	Organic	Aid	Profit	Loss	Satisfactory	Unsatisfactory
1	V		V	V		V		V		V	
2	V			V	V	V	V		V		V
3	V			V		V	V		V		V
4	V			V		V	V		V		V
5		V		V	V	V	V		V		V
6		V		V	V	V	V	V		V	
7		V		V	V	V	V	V		V	
8		V		V		V	V	V		V	
9	V			V	V	V	V		V		V
10		V		V		V	V	V		V	
11	V			V	V	V	V		V		V
12	V			V	V	V	V	V		V	
13	V			V		V	V	V		V	
14	V			V	V	V	V	V		V	
15	V			V	V	V	V	V		V	
16	V			V		V	V		V		V
17	V			V	V	V			V		V
18	V			V	V	V			V		V
19	V			V	V	V			V		V
20	V			V	V	V	V		V		V

“I did record but not debit and credit. I do this by noting in a book what I spend tending to my garden. Like I recorded the purchase of fertilizer, paid for daily labour, paid for seeds. But that’s a fee for my entire crop. It so happened that I did the intercropping. So, all the costs I spend on everything. Except at harvest time.”

So, it is necessary to socialize the literature regarding farmer finances so that farmers can find out how much it costs to determine the profit from their crops.

2. The impact of a lack of financial literacy on coffee farmers

In accordance with the results obtained from interviewing coffee farmers, the conclusion is that coffee farmers feel that the yields they have obtained have experienced sufficient profits. But they compare their final coffee yield to those of other crops. Thus, coffee farmers feel that planting and caring for Robusta coffee not only takes a long time but also produces little.

“It takes a long time to harvest, besides that, when compared to durian, mangosteen, salak and chocolate, this coffee yields less.”

The farmer who kept the record said

“I record globally so if I’m asked how much it costs for just coffee, I don’t know. So when asked which one is more profitable, I say the fruit that I grow because the frequency of harvesting and maintenance is not too much.”

3. Perceived benefits of coffee farmers.

Robusta coffee farmers perceive that they get benefits but not as big as other crops (Tables 2, 3 and 4).

Table 2. Calculation of the average cost incurred by Pupuan Robusta coffee farmers.

Cost Component	Farmers with subsidized fertilizer	Farmers bought their own fertilizer	Farmers with organic fertilizers
Fix Cost			
PBB	27,000.00	27,000.00	27,000.00
Cost Depreciation	750,000.00	750,000.00	750,000.00
Total Fix Cost	777,000.00	777,000.00	777,000.00
Variable Cost			
Fertilizer Cost	1,680,000.00	1,680,000.00	1,680,000.00
Labor Cost	3,840,000.00	3,840,000.00	3,840,000.00
Seed Cost	5,000,000.00	5,000,000.00	5,000,000.00
Harvest Cost	1,000,000.00	1,000,000.00	1,000,000.00
Post Harvest Cost	5,000,000.00	5,000,000.00	5,000,000.00
Total Variable Cost	16,520,000.00	18,440,000.00	15,240,000.00
Total Cost	17,297,000.00	19,217,000.00	16,017,000.00

Table 3. Calculation of the average revenue of Robusta coffee farmers

Revenue	Total Production	Total Sale	Total Revenue
Farmers with subsidized fertilizer	800	49,000.00	39,200,000.00
Farmers bought their own fertilizer	800	49,000.00	39,200,000.00
Farmers with organic fertilizers	800	49,000.00	39,200,000.00

4. Cost Analysis

Data Analysis Data analysis was carried out to determine the factors that affect the income level of coffee farmers, namely: 1. Cost Analysis It is the cost of the sum of fixed costs and variable costs that are used together in the production process. Systematically it can be written as follows (Soekartawi, 2002):

Table 4. Calculation of profits earned by coffee farmers in the harvest.

Revenue	Income	Expenses	Total Revenue
Farmers with subsidized fertilizer	39,200,000.00	17,297,000.00	21,903,000.00
Farmers bought their own fertilizer	39,200,000.00	19,217,000.00	19,983,000.00
Farmers with organic fertilizers	39,200,000.00	16,017,000.00	23,183,000.00

$$TC = FC + VC$$

Where:

TC = Total Cost (Total Cost)

FC = Fixed Cost

VC = Variable Cost

4 Conclusion

In doing business the main goal is to get as much income as possible, therefore costs and expenses must be incurred to a minimum. In addition, records must also be carried out to know the comparison between income and expenses. Along with the development of Robusta coffee in finding its market, there are many things that must be prepared.

Factors that affect the income of respondents are associated with:

- (i) internal factors of human resources, namely: the number of dependents.
- (ii) coffee fields, namely: number of trees, tree age, and land productivity.
- (iii) the performance of human resources in the production process, namely: the frequency of fertilization, the frequency of herbicide application, and the number of female workers from outside the family.
- (iv) crop yields, namely: crop production, off-harvest production, gross income, and economic conditions.
- (v) external factors, namely: the minimum price of coffee beans, the maximum price

Byrne (2007) argues that poor financial literacy will result in the preparation of wrong and biased financial plans. Financial literacy that is well implemented by business actors can be used to make strategic decisions (Muraga and Jhon, 2015). Likewise, according to Draxler, et al (2014) that the owner or manager is very closely related to making financial decisions from complex situations and the right strategy to maintain business continuity.

The lack of financial literacy in the Pupuan Robusta coffee farmers has led to many farmers having the perception that Robusta coffee is not very profitable, so there is a desire for Robusta farmers to switch lands to plant fruits.

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Impact of Leadership, Work Discipline, and Motivation on Employee Performance: A Case Study of Wistara Family Café Employees

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Abstract. A business's progress heavily relies on its employees, making it imperative to enhance their performance, which involves nurturing Leadership, Work Discipline, and Motivation. This study focuses on Wistara Family Cafe, situated in Denpasar City, Bali, and assesses Employee Performance based on aspects such as discipline, task completion, teamwork, and daily improvisation. This study utilized quantitative methods, including surveys distributed to 37 cafe employees, to investigate the hypotheses regarding the positive and substantial impacts of Leadership, Work Discipline, and Motivation on Employee Performance, as well as the collective influence of these variables. The outcome of this study proved that Leadership, Motivation, and Work Discipline are vital in improving Employees' work Performances.

Keywords: Leadership · Work Discipline · Motivation · Employee Performance

1 Introduction

Recent advancements have shifted the perspective of employees from mere energy sources to valuable assets or capital in the business world. This has led to the development of the term "Human Capital" (HC) or viewing Human Resources (HR) as capital for the industry (Susan, 2019). HR plays a pivotal role in a company's progress, and its optimal development is essential for cultivating high-quality human resources with the necessary skills to meet a company's specific needs. The performance of employees within an organization varies due to different motivating factors, such as leadership, work discipline, and work motivation. Leadership is a critical aspect that influences the growth of an organization, as it requires a superior with the knowledge and authority to guide subordinates in achieving the industry's mission (Nguyen et al., 2020; Norfiana et al., 2021). However, some previous researches proved that leadership does not impact employee performance (Lubis et al., 2019; Rompas et al., 2018). Work discipline, on the other hand, is the employees' commitment to follow organizational rules and social norms, making it a tool used by leaders to shape employees' behaviors in alignment with established guidelines (Firmansyah et al., 2020; Hidayah & Santoso, 2020). Additionally, motivation is a significant factor affecting employee performance as it reflects their

behavior at work, with highly motivated employees putting in extra effort to accomplish company objectives. Motivation serves as an encouragement to boost one's enthusiasm at work, making it a key element in enhancing employee performance, particularly when it aligns with the company's interests (Sutrisno & Sunarsi, 2019).

Wistara Family Cafe, located in Denpasar, Bali, embraces a family-friendly concept, offering a range of specialty coffees and a menu that features Indonesian, Middle Eastern, and Western dishes. This cafe provides a comfortable and Instagram-worthy environment, making it ideal for relaxation and mood improvement. Additionally, they offer free meeting rooms for various events, a musala, ample parking space, a mini playground, and Wi-Fi access. However, the cafe underwent a managerial change earlier 2022, which led to a period of unstable employee performance. During the transition, work discipline and motivation decreased as the new manager adapted to the team and introduced a gentler leadership. Employee performance is assessed daily based on factors like discipline, task completion, teamwork, and improvisation. Management and owners provide monthly evaluations based on visitor satisfaction, measured on a scale of 1–10, considering aspects like absenteeism, discipline, motivation, and following instructions from superiors. The data in Fig. 1 shows that employee performance at Wistara Family Cafe has experienced fluctuations from October 2021 to October 2022.

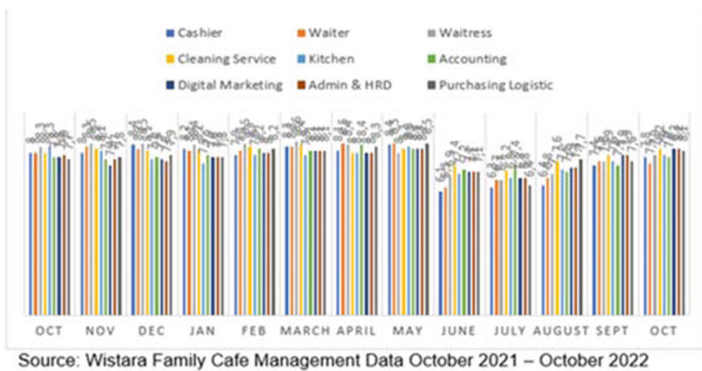


Fig. 1. Employee Performance Data

The necessity for this study arose from the inconsistent employee performance and the absence of a clear understanding of the underlying causes. Identifying this research gap and the problematic scenario indicates the need for further investigation into the relationships between leadership, work discipline, and motivation concerning employee performance.

Research Hypothesis

H1: Leadership significantly and positively impacts Employee Performance

H2: Work Discipline significantly and positively impacts Employee Performance

H3: Motivation significantly and positively impacts Employee Performance

H4: Collectively, Leadership, Work Discipline, and Motivation significantly and positively impact Employee Performance.

2 Research Methodology

In this research, the population is employees at Wistara Family Café, which is 37 people. Census Sampling was employed in the research, resulting in the inclusion of all members of the population as samples (all 37 employees of Wistara Family Café). Data for the research was gathered through a questionnaire distributed to these 37 employees and subsequently analyzed using SPSS software.

3 Results

3.1 Validity Test

The research instruments underwent validity tests, and all indicators showed a correlation coefficient greater than 0.30 with a significance value less than 0.05. This indicates that the research instrument is valid and suitable for use, as demonstrated in Table 1.

3.2 Reliability Test

The variable instruments in this study, including Leadership, Work Discipline, Motivation, and Employee Performance, are considered reliable as each of them exhibits an alpha value exceeding 0.70, as indicated in Table 2.

3.3 Descriptive Statistics

The descriptive statistics provided in Table 3 offer valuable insights into the distribution and variability of the variables examined in this study. Firstly, when considering Leadership, the scores span a range from 13 to 27, with an average score of 20.57 and a standard deviation of 3.014. This indicates that Leadership varies among employees, with some exhibiting lower scores and others higher. Secondly, in terms of Work Discipline, the scores fluctuate between 19 and 37, with an average score of 30.78 and a standard deviation of 4.638. These findings suggest that Work Discipline has a broader range and more variability among the study participants. Thirdly, when assessing Motivation, the scores fall within a range of 12.00 to 20.00, with an average score of 16.03 and a standard deviation of 2.091. This indicates that Motivation scores exhibit less variability compared to Leadership and Work Discipline. Lastly, for Employee Performance, the scores range from 12.00 to 20.00, with an average score of 16.30 and a standard deviation of 2.067. These findings provide an overview of the distribution and variability of these variables in the study, which is essential for the subsequent analyses and interpretations.

3.4 Normality Test

The normality test results, as presented in Table 4, reveal that the Asymp. Sig. (2-tailed) value is 0.200, exceeding the significance level of 0.05. This indicates that the data follows a normal distribution, satisfying the normality assumption of the model.

Table 1. Validity Tests

No	Variable	Question Items	R Table	Correlation Coefficient
1	Leadership (X1)	X1.1	0.3	0.790
		X1.2	0.3	0.808
		X1.3	0.3	0.786
		X1.4	0.3	0.799
		X1.5	0.3	0.842
2	Work Discipline (X2)	X2.1	0.3	0.749
		X2.2	0.3	0.781
		X2.3	0.3	0.798
		X2.4	0.3	0.725
		X2.5	0.3	0.824
		X2.6	0.3	0.669
		X2.7	0.3	0.766
		X2.8	0.3	0.627
3	Motivation (X3)	X3.1	0.3	0.889
		X3.2	0.3	0.815
		X3.3	0.3	0.859
		X3.4	0.3	0.811
		X3.5	0.3	0.753
4	Employee Performance (Y)	Y1	0.3	0.849
		Y2	0.3	0.893
		Y3	0.3	0.871

Table 2. Reliability Tests Results

No	Variable	Cronbach's Alpha
1	Leadership(X1)	0,861
2	Work Discipline (X2)	0,882
3	Motivation (X3)	0,883
4	Employee Performance(Y)	0,841

3.5 Multicollinearity Test

Table 5 indicates that all independent variables have tolerance values greater than 0.10, and their corresponding VIF values are below 10. This implies that the regression model

Table 3. Descriptive statistical results

	N	Minimum	Maximum	Mean	Std.Deviation
Leadership	37	13	25	20.57	3.014
Work Discipline	37	19	37	30.79	4.638
Motivation	37	12	25	20.00	2.037
Employee Performance	37	8	15	12.46	1.820
Valid N (leastwise)	37				

Table 4. Normality Test Results

		Unstandardized Residual
N		37
Normal Parameters ^{a,b}	Mean	.0000000
	Std.Deviation	.90231462
Most Extreme Difference	Absolute	.064
	Positive	.038
	Negative	-.064
Test Statistic		.064
Asymp. Sig. (2-tailed)		.200 ^{c,d}

a. Test distribution is Normal; b. Calculated from data; c. Lilliefors Significance Correction; d. This is a lower bound of the true significance

does not demonstrate multicollinearity, signifying that the independent variables are not strongly correlated with each other.

Table 5. Multicollinearity Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.629	1.196		.526	.602		
Leadership	.235	.088	.388	2.670	.012	.352	2.841
Work Discipline	.100	.046	.254	2.192	.036	.554	1.805
Motivation	.197	.087	.329	2.257	.031	.352	2.842

Dependant Variable: Employee Performance

3.6 Heteroscedasticity Test

The results of the heteroscedasticity test depicted in Fig. 2 indicate the absence of a discernible pattern, with data points scattered both above and below the Y-axis at zero. This suggests that the data is not affected by heteroscedasticity and exhibits relatively consistent variability.

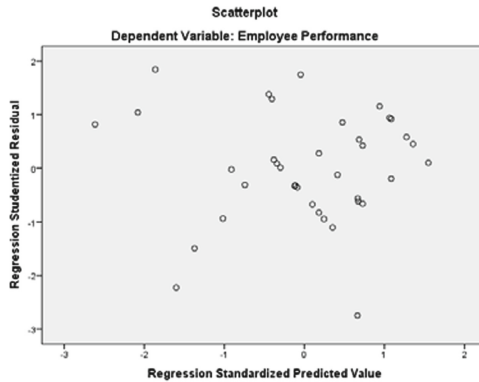


Fig. 2. Heteroscedasticity Plot

3.7 Multiple Regression Analysis

The multiple regression results provided in Table 5 reveal several crucial findings. To begin, the constant coefficient is 0.629, which implies that if the three independent variables are all set at zero (0), there will still be a positive effect on Employee Performance. Additionally, the regression coefficient for Leadership is 0.235, indicating that a one-unit increase in the Leadership variable corresponds to a 0.235 increase in Employee Performance. The regression coefficient for Work Discipline is 0.100, signifying that a one-unit increase in the Work Discipline variable leads to a 0.217 increase in Employee Performance. Lastly, the regression coefficient for Motivation is 0.197, suggesting that a one-unit increase in the Motivation variable results in a 0.197 increase in Employee Performance. These outcomes underscore the substantial positive influence of Leadership, Work Discipline, and Motivation on Employee Performance.

The multiple regression equation derived from the results in Table 5 is as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

$$= 0.629 + 0.235 + 0.100 + 0.197 + e$$

where

Y = Employee Performance

a = Constant

β_1 = Leadership

β_2 = Work Discipline

b3 = Motivation
 e = Error

3.8 Coefficient of Determination

The test results presented in Table 6 indicate that the magnitude (R^2) is 0.754, meaning that 75.4% of the variation in Employee Performance can be accounted for by the variables Leadership, Work Discipline, and Motivation. The remaining 24.6% represents external factors of the research model.

Table 6. Test Coefficient of Determination

Model Summary ^b				
Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	.868 ^a	.754	.732	.942

Note: a. Predictors. (Constant), Motiation, Work Discipline, Leadership; b. Dependent Variable. Employee Performance

3.9 Simultaneous Significance Test (Statistical Test F)

Based on Table 7, the F value is 33.734 and the value of significance value is 0.000 (which is less than 0.05). This means statistically together these three independent variables have a simultaneous and significant effect on Employee Performance. Thus, the model is considered feasible to test.

Table 7. F Simultaneous Test

ANOVA ^a						
Model		Sum of Square	df	Mean Square	F	Sig.
1	Regression	89.879	3	29.960	33.731	.000 ^b
	Residual	29.310	33	.888		
	Total	119.189	36			

Note: a. Predictors. (Constant), Motiation, Work Discipline, Leadership; b. Dependent Variable. Employee Performance

3.10 Statistical Test t

The partial regression tests (t-tests) outlined in Table 8 yielded the following key findings. To begin with, the analysis of the Leadership variable yielded a t-coefficient of

2.670, along with a significance value of 0.012, indicating a notably positive impact on Employee Performance. This led to the rejection of H0 and the acceptance of H1. Secondly, when analyzing the Work Discipline variable, it produced a t-coefficient of 2.192 with a significance value of 0.036, demonstrating a substantial positive impact on Employee Performance. This resulted in the rejection of H0 and the acceptance of H2. Lastly, the assessment of the Motivation variable revealed a t coefficient of 2.257 and a significance value of 0.031, suggesting a significant positive impact on employee performance. As a result, H0 was rejected, and H3 was accepted, confirming the positive and significant relationship between Motivation and Employee Performance.

Table 8. Partial Regression Test (t test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
		B	Std .Error	Beta			Tolerance	VIF
1	(Constant)	.629	1.196		.526	.602		
	Leadership	.235	.088	.388	2.670	.012	.352	2.841
	Work Discipline	.100	.046	.254	2.192	.036	.554	1.805
	Motivation	.197	.087	.329	2.257	.031	.352	2.842

Note: Dependent Variable. Employee Performance

4 Discussion

The study's results indicate a strong, positive, and significant influence of Leadership on Employee Performance at Wistara Family Cafe. The significance value of 0.012, lower than the typical threshold of 0.05, along with a calculated t-value of 2.670, led to the rejection of the null hypothesis (H0) and the acceptance of H1. This demonstrates that effective Leadership has a meaningful and substantial impact on Employee Performance at the cafe. These findings align with previous research by Haryono and Sulisty (2020) and Dewi and Wibow (2020), which also confirmed the positive and significant effect of leadership on employee performance. In essence, when combined with employee compliance, effective leadership contributes to enhanced employee performance at Wistara Family Cafe.

Similarly, the results of the study show that Work Discipline significantly and positively affects Employee Performance, with a significance value of 0.036 and a t-value of 2.192. Consequently, the null hypothesis (H0) was rejected, and H2 was accepted. Higher levels of Work Discipline among employees at the cafe are associated with improved Employee Performance, consistent with prior research by Astuti and Amalah (2020) and Azzahra et al. (2019), which highlighted the positive impact of discipline on employee performance. In summary, maintaining strong work discipline, adhering to company

rules, and displaying a positive attitude contribute to enhanced employee performance at Wistara Family Cafe.

Moreover, Motivation was found to have a significant positive impact on Employee Performance, with a significance value of 0.031 and a t-value of 2.257. This led to the rejection of the null hypothesis (H_0) and the acceptance of H_3 . Higher levels of employee motivation at the cafe are linked to enhanced Employee Performance, consistent with prior research, including Kuswati (2020) and Chien et al. (2020), which also identified a significant positive relationship between motivation and employee performance. Consequently, it can be concluded that motivation plays a vital and positive role in improving employee performance at the cafe, particularly when employees are motivated and well-supported by management.

Finally, the combined influence of Leadership, Work Discipline, and Motivation was assessed through an F test. The outcomes reveal that these variables collectively exert a significant positive impact on Employee Performance, as the calculated F value (0.000) is lower than the significance level (α) of 0.05, while the F table value is 33.731. This finding underscores that improved Leadership, Work Discipline, and Motivation are associated with enhanced Employee Performance at Wistara Family Cafe, aligning with previous research highlighting the positive impact of these factors on employee performance. In summary, effective leadership, work discipline, and motivation contribute to improved employee performance at Wistara Family Cafe.

5 Conclusion

In conclusion, this study sheds light on several pivotal factors that significantly influence Employee Performance at Wistara Family Cafe. Firstly, it highlights the critical role of Leadership in shaping employee performance, underlined by its robust positive impact. A more effective Leadership clearly correlates with superior Employee Performance within the cafe. Secondly, the study underscores the substantial enhancement that Work Discipline brings to Employee Performance. Enhanced Work Discipline contributes to elevated Employee Performance levels. Furthermore, Motivation emerges as another key catalyst for Employee Performance. Increased motivation leads to a discernible improvement in Employee Performance at Wistara Family Cafe. Lastly, the combined influence of Leadership, Motivation, and Work Discipline is found to be highly significant, underscoring the critical importance of nurturing and fostering these factors to achieve superior Employee Performance at the cafe.

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International Communities' Perception Towards Film Induced Tourism: The Case of “Eat, Pray, Love” and “Ticket to Paradise”

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Abstract. This article aims to provide a thorough analysis and discussion of how international communities perceive film-induced tourism, with a specific focus on the movies “Eat, Pray, Love” and “Ticket to Paradise.” To conduct this research, a wide range of scholarly literature, relevant articles, and an innovative netnography approach were used to gather data. By drawing from these diverse data sources, the study offers a comprehensive exploration of the intricate dynamics that underlie how international communities view film-induced tourism. Using a qualitative data analysis approach, the research delves into the multifaceted ways in which these cinematic depictions impact and shape Bali’s perception as a tourist destination. The investigation not only examines the cinematic narratives themselves but also assesses their influence on Bali’s broader tourism industry. Through a critical evaluation of global audiences’ responses and viewpoints, this study contributes to a nuanced comprehension of the complex interplay between film, perception, and tourism, ultimately shedding light on the transformative influence of cinematic representations on travel preferences and destination choices.

Keywords: International communities perception · Film Induced Tourism · Eat Pray Love · Ticket to Paradise · Bali

1 Introduction

“Film-induced tourism,” also known as “film tourism,” describes the phenomenon of tourists visiting locations featured in popular movies or television shows. This type of tourism is driven by the desire to experience the locations and scenes depicted on screen. When a movie or TV show garners significant attention, it can have a substantial impact on tourism in the places where it was filmed, attracting fans and curious travelers.

Prior to the late 1990s, academic literature on film-induced tourism was limited and received little recognition (Beeton, 2006). However, in subsequent years, interest in this field of study grew in parallel with the rise of popular media hype and society’s fascination with celebrities. The 21st century witnessed remarkable growth and influence in the global entertainment industry, with blockbuster movies and popular TV shows amassing massive followings. This surge in popularity led to a noticeable shift in how

people engaged with films and television. Viewers not only became captivated by the on-screen stories and characters but also developed a strong desire to connect with the filming locations of their favorite productions.

As a result, film-induced tourism emerged as a compelling and pertinent field of study, bridging the domains of popular culture, media studies, and tourism management (Connell, 2012; Croy, 2010; Hudson & Ritchie, 2006b, 2006a; Macionis & Sparks, 2009). With the entertainment industry's growing influence, academic interest in comprehending the power of film and television in driving tourism to new heights also expanded. Consequently, film-induced tourism evolved into a multidisciplinary area of research, drawing insights from sociology, marketing, geography, and cultural studies to understand the intricate interplay between media, celebrity culture, and tourism in the contemporary world.

Notably, film-induced tourism, exemplified by movies like "Eat Pray Love" and "Ticket to Paradise," has cast a captivating spotlight on Bali. These cinematic portrayals have significantly boosted the island's allure, attracting travelers to personally experience the depicted landscapes and cultures. The increasing fascination with film locations and the celebrity culture surrounding actors and directors have profoundly impacted tourism. Viewers aspire to experience the magic of movies firsthand and immerse themselves in the iconic settings from the big and small screens. This desire to be a part of the movie experience has led to the emergence of film-induced tourism as a substantial area of academic interest.

Nonetheless, as far as the author's knowledge extends, there is a notable dearth of studies dedicated to comprehending how international communities perceive and embrace film-induced tourism. Thus, this study endeavors to delve into the reception of this type of tourism by international communities, with a specific examination of two films: "Eat Pray Love" and "Ticket to Paradise." The choice of these films is well-founded due to their shared focus on Bali, Indonesia, a destination that holds substantial allure for travelers. The primary goal of this research is to provide valuable insights into how these films have impacted Bali's appeal as a tourist destination and influenced the behavior of travelers. Furthermore, this study seeks to contribute to the existing body of knowledge regarding how popular media, including films, can wield influence over travel behavior and destination choices.

2 Methodology

To understand how the films "Eat Pray Love" and "Ticket to Paradise" were perceived by international communities, a comprehensive approach was employed. A wide range of data and information was collected through extensive literature reviews, articles, and film critiques to assess the international response and viewpoints toward these movies. To comprehensively analyze the perception of international communities, a diverse range of news articles was curated from reputable media outlets across various countries, including America, Europe, Australia, and Indonesia. This meticulous selection aimed to capture a global spectrum of viewpoints, providing a holistic understanding of how these films, "Eat Pray Love" and "Ticket to Paradise," were influenced and resonated with audiences worldwide. In essence, the utilization of news articles from well-established

media outlets across multiple nations enhanced the credibility and comprehensiveness of the analysis, offering a multi-faceted exploration of how these films impacted the international communities' perception of Bali as a destination for self-discovery and cultural exploration.

In addition to traditional research methods, the netnography method was also utilized to gather insights. In this case, comments and discussions found on various online platforms, including YouTube videos, Google reviews, blog articles, and other film review platforms where viewers expressed their views and reactions to the films, were analyzed. By combining both traditional literature research and netnography, a comprehensive understanding of how the movies were received by international communities and how these perceptions may have influenced their perspectives on Bali as a travel destination was sought. The utilization of netnography allowed real-time and authentic reactions from diverse communities to be captured, enhancing the richness of the study's findings. The collected data underwent a qualitative data analysis process. This analytical technique involved employing data triangulation methods to ensure and validate the credibility of the data. By examining the data from multiple angles and viewpoints, this approach aimed to confirm the accuracy and reliability of the findings. Through this detailed and comprehensive analysis, the study sought to enhance the resilience and trustworthiness of the conclusions drawn from the collected data.

3 Discussion

3.1 International Reception Towards "Eat Pray Love" Film

The international reception towards the film "Eat Pray Love" was met with mixed reactions and varied viewpoints from audiences around the world. The portrayal of Bali in the movie presented a lush and enchanting destination that resonated with audiences and sparked curiosity about the island's real-life appeal. As tabulated in Table 1, several aspects of Bali were highlighted in the film, contributing to its attractiveness as a travel destination.

"Eat Pray Love" was released a few years after the tragic Bali bombing of October 12, 2002, which targeted popular tourist areas and significantly impacted the island's tourism industry. While the film wasn't directly related to the bombing, its release coincided with Bali's recovery efforts. Bali faced challenges in restoring its reputation as a safe and attractive travel destination, but the allure of Ubud has continued to grow since the film's debut in 2006, partly due to promotion by Oprah. As a result, Bali has attracted individuals on journeys of self-discovery.

The film received mixed reactions from international audiences, with some appreciating its exploration of self-discovery and personal transformation, while others found it overly idealistic. The film also sparked discussions about its portrayal of culture and locations. Some viewers resonated with the idea that "Eat Pray Love" effectively conveyed a sense of shared spiritual growth, allowing them to vicariously experience a similar journey of self-discovery. Elizabeth Gilbert's choice to conclude her journey on the island was driven by her desire to find a balance between worldly pleasures and deeper spirituality, a quest that resonated with international communities and inspired them to explore Bali.

Table 1. Aspects of Bali in “Eat Pray Love” Film

Aspect	Description
Landscape Beauty	The film displayed Bali's stunning and exotic scenery, Capturing iconic rice terraces, pristine beaches, and lush jungles. The captivating visuals instilled a feeling of awe and fascination, enticing viewers to explore Bali's natural beauty in person
Spirituality and Tranquillity	Bali's spiritual essence was prominent in the film, emphasizing the island's reputation as a place for self-discovery, meditation, and rejuvenation. The portrayal of traditional ceremonies and religious practices added to Bali's image as a peaceful and soulful destination
Cultural Richness	Glimpses into Bali's rich culture and artistic heritage were nicely captured in the movie. Traditional dances, vibrant ceremonies, and intricate handicrafts depicted in the film showcased Bali's cultural depth and diversity
Culinary Delights	The movie featured scenes of Elizabeth indulging in delicious Balinese cuisine, highlighting the island's culinary offerings. This portrayal introduced viewers to the mouthwatering flavors of Balinese dishes and contributed to its reputation as a food lover's paradise

“Eat Pray Love” has had a lasting impact as a marketing tool for Bali's tourism sector, remaining a topic of discussion on the internet and influencing travel choices. The film's influence is evident in travelers referencing it in their social media posts, seeking out the healer featured in the story, and even an Airbnb promoting a house where Julia Roberts, who portrayed the character, experienced Bali's enchanting ambiance in Ubud. This enduring influence has positioned Ubud as an enchanting and welcoming town and has shaped how people travel, particularly in Bali.

In a fiercely competitive tourism market, featuring destinations in films and TV shows serves as a potent marketing strategy. It effectively enhances awareness, enhances the destination's image, and generates substantial tourism growth, surpassing conventional promotional methods. Film-induced tourism offers promising prospects for destinations to achieve financial gains, increased visitor numbers, and economic development. This article, through extensive literature review and a global survey of various destinations, provides valuable insights into this emerging trend.

The book and subsequent film adaptation significantly elevated Bali's reputation as a destination for self-discovery, spirituality, and cultural exploration. The story's portrayal of Bali's beauty, serenity, and transformative potential resonated with travelers worldwide, leading to a notable surge in tourism. Tourists seeking spiritual growth flocked to Bali, with around 20 Ubud hotels training their staff in yoga and meditation, endorsed by the Bali Tourism Board for its calming effects (Time, 2010). This phenomenon illustrates how popular media can shape travel trends and impact local economies, making a literary and cinematic work a driving force in a region's tourism industry.

Conversely, some perspectives highlight that Bali doesn't align with the idyllic paradise depicted in "Eat Pray Love" (Chen, 2023). These viewpoints reveal a more complex and authentic side to the "Island of Gods," extending beyond Instagram filters. Bali is characterized by a multifaceted culture, traffic congestion, environmental challenges, and an economy profoundly affected by excessive tourism. Reviewers recommend moving beyond the illusion created by "Eat, Pray, Love" and embracing the real essence of Bali. They suggest exploring off the beaten path, engaging with locals, understanding their traditions, and supporting local businesses. This entails moving away from the picture-perfect spots promoted on Instagram and discovering the genuine Bali experience. It's a reminder that travel is about immersing in diverse cultures, gaining knowledge, and evolving throughout the journey, rather than replicating movie scenes or seeking the perfect social media snapshot.

3.2 International Reception Towards "Ticket to Paradise" Film

Following the success of "Eat Pray Love" in elevating Bali's status as a travel destination, the subsequent film "Ticket to Paradise" has further reinforced this cinematic trend. The depiction of Bali as a central location in "Ticket to Paradise" solidifies its image as an enchanting and enticing place for travelers. In 2022, Bali garnered additional global exposure through the Hollywood film "Ticket to Paradise," featuring renowned actors Julia Roberts and George Clooney. Although the movie was filmed in Queensland, Australia, it showcased Bali-like landscapes with stunning sun, sea, and sand. This romantic comedy generated substantial online discussions and was released worldwide, including in Indonesia and Bali, in October 2022, a crucial time for Bali's tourism recovery following the extended impact of the Covid-19 pandemic.

Despite not being filmed in Bali, the movie prompted a range of perceptions, encompassing both positive and negative viewpoints. These perceptions related to the film's production, storyline, and the values conveyed within the narrative. According to Galaga (2022), "Ticket to Paradise" approaches Balinese culture (see Fig. 1) with genuine affection and respect, avoiding any trivialization of Balinese representation. Instead, it presents Balinese culture as somewhat superior to the Western values embodied by the actors. The film effectively highlights the close-knit dynamics of an Asian family, contrasting with the communication gaps among the characters. "Ticket to Paradise" provides a delightful and enjoyable escape from the routines and challenges of everyday life, offering a cinematic getaway that transports audiences to a different world, providing a temporary break from their real-life concerns, similar to a vacation (Lawson, 2022).

Numerous research studies have delved into the impact of using fictional and real film locations to promote tourist destinations. These studies have generally found that concerns about location authenticity are often unfounded. Tourists tend to prioritize authentic experiences over the exact replication of movie settings, recognizing that real-life places differ from on-screen portrayals. Their motivation to explore these destinations arises from curiosity and a desire for entertainment. In essence, tourists are drawn to these places not solely due to their cinematic portrayal but for the unique experiences and entertainment they offer (Butler, 2011; Rittichainuwat, Laws, Scott, & Rattanaphinanchai, 2018).

For example, a Google review by Teresa Sullivan noted that the movie “Ticket to Paradise” provided her with insights into Balinese culture, sparking her interest in considering a visit to Bali. The portrayal of Bali in the film left a lasting impression on her, emphasizing how movies can influence perceptions of a place and contribute to tourism promotion.

However, the global response to the movie also reflects disappointment with “Ticket to Paradise.” Some critiques highlight cultural insensitivity, depicting Bali as a stereotypical paradise catering primarily to white individuals seeking self-discovery. There is also concern about the decision to film the movie in Queensland, Australia, raising authenticity issues in portraying Bali’s landscape. A Google review raises a pertinent point about the movie’s portrayal of Bali’s cleanliness, suggesting it may not align with the reality.

The concern revolves around the possibility that viewers might develop a skewed perception of Bali’s environment due to the film’s setting, potentially leading to heightened expectations that may not align with the actual experience. The movie’s portrayal of local characters is criticized for lacking depth and reducing the customs, norms, and traditions of the Balinese people to shallow and insignificant elements.



Fig. 1. Scene showcasing Balinese Tradition of the Tooth Cutting Procession at the Gede Family House

3.3 Impact on Film Induced Tourism to Bali’s Tourism Sector

Tourism promotion through films has evolved into a widely embraced and effective avenue for destination marketing. Films effectively showcase a destination’s beauty, culture, and allure, virtually transporting the audience for an immersive experience. Such films can vividly depict local life and the unique encounters travelers can enjoy. By forming emotional bonds, films inspire viewers to consider real trips to the featured destinations.

The impact of the movie “Eat Pray Love” on Bali’s tourism industry has been substantial. It played a pivotal role in revitalizing tourism on the island. The Denpasar Tourism Academy’s industry observers have attested to a significant resurgence of tourists who

are specifically drawn to Bali for spiritual development (Time, 2010). This phenomenon has resulted in a renewed interest in the island as a destination for soul-searching and self-discovery. In response to this trend, over 20 hotels in Ubud, which serves as a cultural heartland surrounded by forests, have proactively embraced the opportunity. These hotels have undertaken the initiative to train their staff in yoga and meditative practices. This aligns with a broader strategy to promote activities that foster mental tranquility and well-being.

An interesting journey were featured on The Telegraph, UK (2023), about a woman who shared a deeply personal journey of her own, revealing that she embarked on a trip to Bali with the intent of finding what she referred to as the “Eat Pray Love Experience.” This decision was motivated by a significant period of distress and turmoil lasting three years. The movie “Eat Pray Love” played a profound role in inspiring her to seek solace and renewal through a similar path. This anecdote underscores the profound impact that cinematic narratives can have on individuals’ lives. It illustrates how movies can inspire real-life journeys, guiding people towards destinations that hold the promise of restoration and self-discovery. The reviewer’s story also reflects the universal nature of the human experience, where films can serve as a source of inspiration, offering a glimmer of hope and a roadmap towards resilience and growth.

While the preceding discussions have shed light on various aspects of film tourism impacts, it is crucial to acknowledge that there are still noteworthy and essential gaps in the approach taken to understand the impacts of film tourism (Thelen, Kim, & Scherer, 2020). A traveler who had visited Bali on multiple occasions expressed concerns about the potential loss of charm and authentic Balinese culture in Ubud due to the surge in tourist crowds. However, their experience revealed a surprising outcome – Ubud has managed to retain and even enhance its genuine Balinese essence. Despite its popularity, Ubud stands out as a place that has diligently preserved its unique cultural identity, allowing visitors to truly grasp the authentic “soul” of Bali. The traveler’s positive experience serves as a testament to Ubud’s commitment to preserving its cultural integrity and creating a harmonious coexistence between tourism and local authenticity. It also highlights the potential for travel experiences to transcend initial apprehensions, revealing the enduring charm of a place that remains true to its roots.

There are potential downsides to film tourism. Idealized portrayals can lead to unrealistic expectations among tourists, potentially resulting in disappointment. Authenticity and displacement in film-induced tourism encapsulates the idea of delving into the complex interplay between cinematic portrayals and the actual experiences encountered in film-induced tourism (Bolan, Boy, & Bell, 2011). On one hand, cinematic portrayals often present an idealized version of a destination – showcasing stunning landscapes, idyllic settings, and unique experiences that may not fully reflect the day-to-day life and challenges of the local community. As travelers embark on their journeys, they may wonder if the scenes that attracted them in the movies truly align with the destination’s authentic character.

Moreover, excessive exposure can contribute to over tourism, straining local resources and disrupting communities. Balancing the benefits with these challenges is crucial for responsible and sustainable destination marketing. A simple Google search using the keywords “over tourism in Bali” yields a multitude of articles and posts that

attribute blame to the “Eat Pray Love” phenomenon for propelling Bali’s popularity and subsequently triggering an ongoing surge in tourism. Certain sources even assert that the movie has been detrimental to Bali, going as far as claiming that it has caused harm. Admittedly, there have been moments of contemplation, to some extent, regarding this perspective.

The mention of contemplating this perspective to a certain degree implies that there’s an acknowledgment of the complexities involved. While the movie may have contributed to a surge in tourism, there’s also an awareness that the issue is multifaceted. This contemplation likely stems from an understanding that the movie’s impact, while significant, is just one of several factors influencing Bali’s current tourism challenges. It highlights the critical role that media and popular culture can play in shaping travel trends and the subsequent repercussions that may arise.

Tourism encounters have evolved over time because of film-related tourism, along with the subsequent shifts in the roles and purposes of destinations where these experiences unfold, has been incomplete (Kim & Reijnders, 2018). Some critics and audience members expressed concerns about the film perpetuating stereotypes and oversimplifying the cultural aspects of the featured countries. They argued that the movie presented a somewhat clichéd and idealized view of the locations, lacking deeper cultural nuances. While the film contributed to promoting Bali as a travel destination, it also raised concerns about the potential effects of increased tourism on the island’s cultural and environmental sustainability.

It is crucial that the areas spotlighted by film-induced tourism receive appropriate acknowledgment and focus. By doing so, these locations can harness their significant potential for the continued growth and development of film-induced tourism. Moreover, these opportunities must be recognized and seized upon to effectively address any issues related to displacement. Rather than being overlooked or dismissed, these opportunities should be fully embraced and utilized to create positive outcomes for both the destination and its communities.

4 Conclusion

The movies “Eat Pray Love” and “Ticket to Paradise” have a profound impact beyond the screen, inspiring travelers to embark on their own journeys of self-discovery and personal growth, mirroring the characters in these films. Both movies depict Bali as a compelling destination for transformation, whether through solitude in “Eat Pray Love” or shared experiences in “Ticket to Paradise.” Bali’s portrayal as a place for self-discovery motivates deep engagement, not just with its picturesque landscapes but also with the authentic lives and traditions of its people.

The combined effect of these movies strengthens Bali’s appeal, highlighting the powerful synergy between cinema and tourism, turning films into bridges between imagination and reality, leaving a lasting impact on both travelers and the destination. However, film-induced tourism has potential downsides, including the distortion of tourists’ expectations and the risk of over-tourism.

To address these challenges, destinations must carefully manage the impact of film-induced tourism through sustainable practices, responsible management, and community involvement. It's essential to strike a balance between leveraging the promotional benefits of film exposure and preserving the destination's authenticity, cultural heritage, and ecological well-being.

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The Influence of Digital Marketing on Tourists' Decision with Brand Image as an Intervening Variable (A Study at a Hotel in Bali)

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Abstract. Main objective of this investigation was to evaluate and study how digital marketing affects the brand image of a hotel in Bali. Additionally, it aimed to obtain insight of how the brand image, in turn, affects the decisions made by tourists staying at the same hotel. Furthermore, the research delved into the potential impact of digital advertising on travelers' judgments at the resort by examining whether the brand image serves as a mediator in this process. Three categories of variables were utilized, and validity tests were conducted via SPSS program. An element is regarded as valid if its correlation (r) is equal to or greater than 0.30; values below this threshold are seen as invalid and can be eliminated. Reliability was assessed by examining a Cronbach alpha value that exceeded 0.6. To summarize, the findings suggest that digital marketing has a substantial and positive influence on the brand image. In summary, the results indicate that digital marketing has a substantial and convinced impact on the brand image. However, digital marketing does not completely influence tourists' decisions. On the other hand, the brand image does have a positive influence on tourists' decisions. Indirectly, digital marketing does not affect tourists' decisions positively through the brand image, as the brand image does not mediate the relationship between digital marketing and tourists' decisions.

Keywords: Digital Marketing · Brand Image · Tourist Decision

1 Introduction

Digital marketing presents a substantial opportunity for businesses to establish their presence and engage with both potential and current customers. It plays a crucial role in streamlining the room reservation process. Nevertheless, when not leveraged effectively, this opportunity can transform into a threat. The landscape of business competition intensifies, as all enterprises can showcase their offerings to potential customers, not only on a domestic but also on an international scale.

According to Wymbs (2011), the utilization of digital technology in the marketing process has revolutionized conventional marketing practices. The onset of the digital marketing era has transitioned the traditional marketing approach, which relied on advertising in newspapers, magazines, and print media, to digital platforms like social media, pay-per-click (PPC) advertising, digital advertising, and more. He also explains that digital technology marketing provides various new marketing channels to promote products and services, in addition to building relationships and loyalty with customers. Leveraging digital technology simplifies the direct communication between marketers and their customers, facilitating the continuous adaptation of products and services to cater to evolving consumer requirements.

A more intricate perspective on the definition of digital marketing is the process of adapting to technology, where companies or marketers work in collaboration with customers and partners to collectively generate, communicate, deliver, and sustain the value of products and services for various stakeholders (Bughin, 2015). Digitally enabled procedures generate value by fostering new customer experiences and interactions among customers (Kotler, et al., 2019).

In addition to facilitating the connection between marketers and customers to promote their products and services and gain insights into customer characteristics, the digital landscape also makes it easier for customers to share their product reviews and experiences with a particular brand or company through electronic word of mouth (Kannan & Li, 2016). Regarding purchase decisions, it is explained that brand knowledge and brand relationships will have a significant influence on purchase choices. If the current purchase meets the consumer's satisfaction, it is likely to lead to future purchases (Kotler & Armstrong, 2010; Esch, et al., 2006). Furthermore, the connection between brand image and decision-making is explored by Adenan et al. (2018), who found that consumers attach significant importance to both the brand image and the image of the product's country of origin. This is because consumers are highly involved in seeking information during the product purchase decision-making process.

Furthermore, the research carried out by Widhayanti and Soesanto (2017) discovered that brand ambassadors and sales promotions collectively have a positive and substantial impact on the brand image. Simultaneously, they also have a substantial impact on purchase decisions. The decisions to purchase are further fortified when brand representatives and sales promotions are interconnected through a robust brand image. Considering the observed phenomenon and relevant research, this study addresses the following inquiries: (1) To what extent does digital marketing impact the development of a brand image in a Bali-based hotel? (2) What is the degree of influence that brand image wields over the decision-making process of tourists choosing a hotel in Bali? (3) How does digital marketing affect tourists' decision-making at this hotel, with brand image acting as an intermediary factor?

2 Literature Review

There are various digital media channels that companies can choose for their digital marketing strategies. Some of these channels include websites, online ads, and emails (Merisavo, M. and R. Mika, 2004), as well as social media platforms (Foroudi, et al.,

2017) such as Facebook, LinkedIn, and Twitter (Michaelidou, et al., 2011). Various social media channels can directly connect users to the company's website (Karjaluo, et al., 2015). This helps companies understand their digital media users, including the content that can attract the interest of consumers and potential consumers.

Internet marketing is a subset of digital marketing (Singh & Singh, 2017) and is a crucial component of digital marketing because a significant portion of digital marketing activities and budgets are allocated to internet marketing. The primary channels of internet marketing include Social Media Marketing, Search Engine Marketing (SEM), email marketing, and mobile marketing. In digital marketing, the marketing mix isn't limited to just the traditional 4 Ps; it introduces a strategy with 10 Ps, which are Performance, Presence, Pleasure, Proximity, Pertinence, Process, Personalization, Preferences, Profit, and People.

Customer trust in a brand can be built through the influence of the brand image itself. The strength of the brand image in the consumer's mind will lead to increased confidence in using the purchased product (Pusparani & Rastini 2014; Kotler, 2009; Anandan, 2009).

There are three crucial dimensions influencing brand image formation: brand association strength, brand association favourability, and brand association uniqueness. On the other hand, indicators that affect a product's brand image, including consumer perceptions of product recognition, quality, size, durability, design, including color and decoration, and product location.

Building upon the background of previous research, the researcher's objective is to examine the influence of digital marketing on tourists' decisions at a hotel in Bali, with the brand image serving as an intervening variable. The conceptual framework for this analysis is illustrated in Fig. 1.

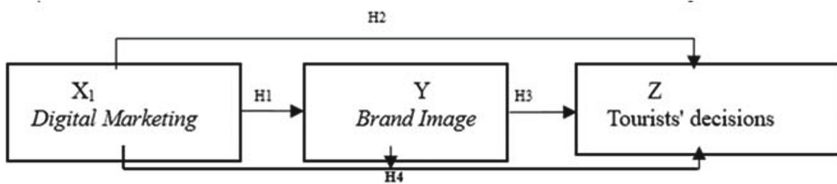


Fig. 1. Conceptual Framework

Hypotheses:

H1: Digital Marketing has a positive impact on brand image.

H2: Digital marketing has a positive impact on tourists' decisions.

H3: Brand Image has a positive impact on tourists' decisions.

H4: Digital marketing has a positive impact on tourists' decisions through brand image.

3 Research Method

This research is a causal study and utilizes a survey method with a questionnaire as the research instrument. Data collection will be conducted simultaneously with the respondents and guided by the researcher. The research will be carried out at a hotel in Bali over a period of 4 months, from January to April 2020. The researcher employs three types of variables: the dependent variable, the independent variable, and the intervening variable. The exogenous variable is Digital Marketing (X_1), and the endogenous variables are Brand Image (Y) and Tourists' Decisions (Z).

The operational definitions, indicators, and statement items are provided in the following table (Table 1):

Table 1. Operational Variables, Research Indicators, and Statement Items

Operational Variables	Indicator	Question Items
Digital Marketing (X_1)	1) Social media ($X_{1,1}$) 2) Website ($X_{1,2}$) 3) Content marketing ($X_{1,3}$) 4) Search engine ($X_{1,4}$) 5) Email marketing ($X_{1,5}$) 6) Mobile marketing ($X_{1,6}$)	1) Interested in becoming followers 2) Engaging website content 3) Attractive digital marketing content 4) Easy to find through search engines (Google, Bing, etc.) 5) Interested in subscribing to newsletters 6) Ease of interaction using mobile phones
Brand Image (Y)	1) Product attributes (Y_1) 2) Consumer benefits (Y_2) 3) Brand personality (Y_3)	1) The product exudes traditional luxury 2) Fulfillment of all tourists' needs 3) Aligns with the hotel's tagline, "Heart. Felt."
Tourist's Decision (Z)	1) Benefit association (Z_1 & Z_2) 2) Priority in purchasing (Z_3 & Z_4) 3) Purchase frequency (Z_5 & Z_6)	1. Positive benefits exist 2. The hotel's name is easy to remember 3. Completeness of information is a tourist priority 4. The hotel's quality is superior to its competitors 5. Tourists are willing to stay in this hotel again 6. Tourists are willing to recommend this hotel to friends and family

Source: Velnampy & Sivesan (2012), Sutisna (2002) and Plummer (2007)

The population in this study consists of consumers at a hotel in Bali, and the sampling technique used is purposive sampling, which amounts to 95 respondents. The

questionnaire employs a five-alternative Likert scale to measure the attitudes, opinions, and perceptions of the respondents. To test the research instrument, preliminary testing was conducted with 30 collected sample data.

The validity test is carried out using the SPSS software, and an instrument is considered valid if it shows a correlation value (r) of ≥ 0.30 . If the value is less than this threshold, it is deemed invalid, and the possibility of eliminating the respective variable can be explored. When it comes to assessing reliability, the Cronbach alpha value should be higher than 0.6 (Cronbach alpha ≥ 0.6) (Sugiyono, 2017).

The chosen data analysis technique is Path Analysis, which involves evaluating the direct and indirect effects of each exogenous variable on the endogenous variables (Riduwan, et al., 2017). To determine the indirect relationship between an exogenous variable and an endogenous variable through a mediating variable in path analysis, the Sobel Test is applied. The assumptions that underlie the decisions made based on the Sobel Test include the following:

- a. If the Z value is greater than 1.98 at a 5% significance level, it suggests that the mediating variable can mediate the relationship between the exogenous variable and the endogenous variable.
- b. If the Z value is less than 1.98 at a 5% significance level, it suggests that the mediating variable cannot mediate the relationship between the exogenous variable and the endogenous variable.

4 Data Analysis and Discussion

The analysis findings validate the initial hypothesis, confirming that Digital Marketing has a positive impact on Brand Image. Strengthening Digital Marketing initiatives for The Oberoi Beach Resort, Bali could further enhance its Brand Image. Nonetheless, the relatively modest direct effect, at 17.1%, suggests room for improvement in the hotel's Digital Marketing strategies. This outcome is consistent with a study conducted by Kevin and Purnamasari (2018) on Kini Capsule Hotel in Jakarta, which reported a mere 7.9% influence of online media marketing on shaping the hotel's brand image (Kevin & Sari, 2018).

In contrast to the findings of this study and the research by Kevin & Sari (2018), Hermawan Kartajaya underscores the significance of marketers shifting from traditional to digital strategies to align with the advancements in technology. This transition is especially crucial in shaping a brand's image for potential customers who may not have personal experiences or recommendations from friends and family. He emphasizes that in the digital age, brands can improve their image by engaging customers, humanizing the brand, focusing on the quality of content, and fostering online interactions within the community (Aldebert et al., 2011).

Kotler & Kartajaya's theory aligns with Kamil & Putri's 2019 study on Go-Jek, which highlighted the significant impact of digital marketing on Brand Image formation. While Kamil & Putri focused on just two digital marketing channels (website and social media) for a digital-based company, Go-Jek, their research revealed that push notifications and in-app banners played equally significant roles in shaping Go-Jek's brand image. This underscores the importance of a strong digital presence. Respondents indicated that

social media and email marketing channels received the lowest responses, suggesting these channels are underutilized and less engaging. This situation offers a noteworthy opportunity for enhancement. To fully capitalize on these channels, the hotel should increase its engagement on social media and invest in email marketing. It's crucial to align these efforts with Kotler and Kartajaya's (2019) approach, which focuses on humanizing the brand, emphasizing quality content, and nurturing customer interactions within the online community (Regalli Raghava, Siva Rama Krishna, 2019).

Interviews with respondents revealed a general sentiment of low activity in the hotel's digital marketing efforts. Some respondents recommended increased photo and post uploads on the hotel's social media accounts. Surprisingly, a few respondents were unaware of the hotel's social media presence. Dissatisfaction was expressed by a minority due to repetitive website and online booking channel images that didn't do justice to the hotel's true beauty. Most respondents indicated a need for more active digital marketing. This inactivity was seen as failing to contribute to the hotel's brand image formation.

However, the analysis outcomes have led to the dismissal of the third hypothesis, suggesting that there is no direct influence of digital marketing on tourists' decisions to choose to stay at The Oberoi Beach Resort, Bali. This contrasts with previous research by Shantharam, Balaji & Jagadeesan (2019), who emphasized the increasing influence of digital marketing, particularly social media, on purchasing decisions over time. Their work highlighted the significance of social media's experiential and informational factors in shaping modern purchasing decisions. When a company actively presents enjoyable personal experiences, user testimonials, attractive visuals, and product or service usage content on social media, it becomes more appealing to potential customers (Shantharam, et al., 2019).

Over time, the transition from ordinary citizens to netizens, individuals accustomed to using the internet in their daily lives, has become more pronounced (Kartajaya, 2019). Consequently, Kartajaya emphasizes the substantial impact of successful digital marketing on purchase decisions. He also notes a shift in the market from traditional to digital, with the new market comprised of youth, women, and loyal internet users (youth, women, and netizens). Youngsters frequently lead the way as early enthusiasts, trend influencers, and change-makers. Women are renowned for their ability to gather information, their holistic shopping approach, and their role in managing households, all of which are instrumental in capturing a larger share of the digital economy market. Dedicated internet users serve as social links, vocal advocates, and contributors of content, playing a vital role in cultivating brand loyalty.

These groups represent potential market segments in the era of Marketing 4.0. In the initial discussion, it's surprising that the results of the analysis regarding the impact of Digital Marketing on Tourist Decisions do not align with previous similar studies. Digital Marketing was expected to have a significant positive impact on Tourist Decisions based on earlier research. However, considering Hermawan Kartajaya's perspective, the results of this study become comprehensible. The guests at The Oberoi Beach Resort, Bali, are primarily aged 46 and above, predominantly male, and rely on recommendations from friends and family for information, not matching the potential market segment Kartajaya describes. Thus, this study's findings indicating that Digital Marketing does not significantly affect Tourist Decisions are reasonable.

The analysis results support the fifth hypothesis in this study, confirming that Brand Image does have a positive and substantial influence on Tourist Decisions. This aligns with a previous study by Saleh, Haerani, and Reni (2019) on luxury car buyers in Makassar, which found that factors related to brand image, user image, and product image significantly impact purchasing choices. Despite the high cost, consumers opt to buy the car due to its strong brand image, consequently enhancing their own image as users. Similarly, a study by Gunawan, et al. (2019) exploring determinants of purchasing decisions in Jakarta's e-commerce businesses emphasized the paramount influence of brand image over price among the factors analyzed. This study concurs that a strong brand image elevates the user's brand image, diminishing the significance of price considerations for consumers.

This study reveals that The Oberoi Beach Resort, Bali enjoys a highly positive and robust brand image among its guests. Guests experience traditional luxury service tailored to their expectations, and they perceive the service as genuinely heartfelt. Interviews with guests further support these findings; some were already familiar with the Oberoi brand through other Oberoi hotels and opted to stay at The Oberoi Beach Resort, Bali. Likewise, guests previously unfamiliar with the Oberoi brand express interest in future stays at Oberoi hotels, drawn by the strong brand image.

Regarding H4, which addresses the impact of Digital Marketing (X1) on Tourists' Decisions (Z) mediated by Brand Image (Y), Sobel Test results show a Z value of 1.92, falling short of the 1.98 threshold. This indicates that the brand image does not serve as a mediator between digital marketing and tourists' purchase decisions.

The analysis supports H1, indicating that Digital Marketing positively influences Brand Image. Improving a hotel's Digital Marketing efforts enhances its Brand Image. Nevertheless, the relatively modest direct effect of 17.1% suggests room for further enhancement in the hotel's Digital Marketing efforts to strengthen its Brand Image. This finding is consistent with a study by Kevin and Purnamasari (2018) at Kini Capsule hotel in Jakarta, where online media marketing had only a 7.9% impact on shaping the hotel's brand image.

In contrast to the outcomes of this study, the research conducted by Kevin & Sari (2018), and the theory presented by Kotler & Kartajaya (2017), which all suggest a substantial impact of digital marketing on Brand Image, there exists another study that aligns with Kotler and Kartajaya's theory. The analysis results indicate the rejection of H3, implying that there is no direct influence of Digital Marketing on tourists' decisions to stay at a Bali hotel. This finding contradicts the conclusions of Shantharam, Balaji, and Jagadeesan (2019), who argue that Digital Marketing increasingly influences the decision to purchase a product or service over time. They propose that when a company actively presents information on social media that recounts positive personal experiences, including user testimonials, appealing photos, or product/service usage videos, it becomes more attractive to potential customers, ultimately leading to more purchases (Shantharam, et al., 2019).

The outcomes of the research conducted at a Bali hotel are not in accordance with the study by Nugraha and Muhammad Fajar (2018). Nugraha and Muhammad Fajar's study suggested that content, context, and various digital marketing activities have a stronger impact on the decision to purchase a product or service compared to other factors such

as advertising, public relations, personal selling, or direct marketing. Based on prior research, Digital Marketing should exert a positive and significant influence on tourists' decisions. However, considering Hermawan Kartajaya's insights, this research aligns with the idea that the hotel's guests in Bali are primarily aged 46 and above (rather than being youth), predominantly male (not women), and typically receive information about the hotel through recommendations from friends and family (as opposed to netizens) (Autio, E. 2017).

Hypothesis three (H3), which posits that Brand Image has a positive and significant influence on Tourists' Decisions, is in line with previous research carried out by Saleh, Haerani, and Reni (2019). Their study concluded that all variables related to brand image, consumer image, and product image have a positive and significant impact on purchase decisions (Saleh et al., 2019). Additionally, research by Gunawan et al. (2019) asserted that among the various factors examined, brand image exerts the most dominant and positive influence in comparison to price. This research also supports the idea that a positive brand image can enhance the consumer's image, ultimately making price a less significant factor in consumers' decision-making processes.

The outcomes of data analysis on the indirect influence of Digital Marketing on Tourists' Decisions through Brand Image indicate that H4 is not supported. This finding contradicts previous research conducted by Martin-Consuegra (2018), which focused on a fashion brand in Spain. Furthermore, research carried out by Tilasenda et al. (2019) and Yan Yin Lee, Mohammad F. (2019) explored the context of mobile phone purchases, suggesting that online celebrity endorsements are essential components of the digital marketing strategies employed by mobile phone companies.

5 Conclusion

The conclusions of this research are as follows:

- a) Digital marketing has a positive and significant influence on brand image, indicating that improving digital marketing efforts can enhance the brand's image.
- b) Digital marketing does not have a positive impact on tourists' decisions, suggesting that the current digital marketing efforts are insufficient to influence tourists' decisions due to poor room occupancy distribution.
- c) Brand image has a positive and significant influence on tourists' decisions. This means that an improved brand image of the hotel will lead to an increase in tourists' decisions.
- d) Indirectly, digital marketing does not have a positive impact on tourists' decisions through brand image, as brand image cannot mediate the relationship between digital marketing and tourists' decisions. This is due to the inadequacy of current digital marketing efforts.

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The Analysis of Visual Appearance of Coffee Product Packaging on the Purchase Decisions and Brand Image Competition

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Abstract. The coffee shop trend in Indonesia was experiencing significant growth. Coffee shops were becoming popular social spaces, offering a variety of coffee styles, from traditional Indonesian coffee to international favorites. The atmosphere often focused on cozy and aesthetically pleasing interiors, making them popular spots for socializing, working, or simply enjoying a cup of coffee. The visual appearance of coffee packaging was a crucial aspect of a coffee shop's branding and customer engagement. Somehow, the coffee shop owners sometimes overlooked the importance of the coffee packaging. This article investigated further the influence of visual appearance of coffee packaging on the customers' purchase decisions and the coffee shop's brand image. A descriptive qualitative research design was used for this study by conducting a semi-structured interview with the informants. The interviews showed that the visual packaging elements such as color, logo, material, label, shape, and size affected the customers' purchase decisions and brand image perceptions. In addition, unique and innovative packaging was not just to protect the coffee effectively but also enhanced the brand image of the coffee products and positively gained purchase interest among the customers.

Keywords: Indonesia · Coffee Packaging · Visual Appearance · Coffee Shop · Purchase Decisions · Brand Image

1 Introduction

Indonesia was the fourth largest coffee producer in the world [1, 2]. Therefore, coffee had been an important source of income for rural communities in Indonesia [1]. Recently, coffee consumption trend became part of the daily life which attracted many entrepreneurs to run their own coffee shop business [3]. The coffee shop was not only for the customers who enjoys having their coffee drinks, but also became an alternative place to hang out, work or even hold a meeting [3]. Coffee shop business grew as competitive industry due to its great prospect and high average profit margin estimated around 35–40 percent from total sales [4]. However, to stay relevant in the coffee shop industry was

a big challenge, especially for a local coffee shop which needed to compete with international coffee brands [5]. Therefore, the coffee shop owner should always be creative to sustain their positions in the coffee industry. According to Reinoso-Carvalho et al. (2021), the packaging of a food or beverage product might be considered as “visiting card” to attract customers’ attention during the purchasing process. [7] stated that the existence of the image on coffee packaging affected expectation, whereas the image’s position affected perceptions of coffee strength and purchase intentions. A study by [8] investigated the relationship between products packaging and purchase intention using brand image as mediation role. They found that brand image and packaging elements such as picture, font, shape and color were more influential factors towards purchase intention in comparison with other factors like product info and packaging material. [9] identified brand image as one of cognitive drivers to form customers’ brand loyalty in the coffee shop industry.

Previously, the study of coffee shop industry had been presented by various perspectives and notions. Numerous prior works focused on brand loyalty of coffee shops associated with store atmosphere, service quality, customer’s satisfaction, promotions, and pricing factor [9–12]. To the best author’s knowledge, lack of research investigated the impact of visual appearance of coffee product packaging at coffee shops. Although visual appearance of product packaging played a crucial role in customer decision-making and brand perception [7, 13, 14], the coffee shop owners sometimes did not pay much attention to that issue. Instead, they put focus solely on providing coffee products. Research performed by [15] was the closest subject with this work but the respondents were randomly selected. In this work the targeted respondents were coffee shop regular customers and the coffee shop owners as well to understand their point of view since they were attached to coffee products very well. The focus of this study was two main research questions (RQ):

RQ1: How did packaging visual appearance influence the customer purchasing decision?

RQ2: Did packaging visual appearance capable of enhancing the brand image of coffee products?

2 Methodology

Descriptive qualitative research design was used for the study. According to research needs, the population sampled by this method consisted of individuals or data that are thought to have extensive knowledge [16]. As a result, this study employed the purposive sample technique. Purposive sampling was a technique used to pinpoint elements that influence consumer decision-making and brand perception based on the visual appearance of coffee products conducted at two coffee shops located at Jln Serma Madepil, Denpasar. The coffee shops selected were Humble Espresso and Domus Kopi. For this study, the author conducted a semi-structured interview. There were seven respondents who were attached to the coffee products very well. Five of them were coffee shop regular customers and two of them were coffee shop owners. The interview questions were developed to elicit informant responses related to the research questions, RQ as followed:

Customer:

Q1. Between these two products (plain packaging and high quality), which one do you choose?

Q2. Do you like to buy coffee products with colored products?

Q3. Do you like to choose the shape and size for buying coffee products yourself?

Q4. Are you interested in the packaging materials used by coffee shops?

Q5. Do you like buying coffee products with innovative packaging?

Q6. Is it necessary to see information label before buying coffee products?

Q7. In your opinion, does a coffee shop logo itself affect the brand image when applied to product packaging?

Q8. In your opinion, does a unique visual appearance improve the product image of a coffee shop?

Q9. Can unique packaging for coffee products increase brand awareness?

Owner:

Q1. Do you agree that visual appearance can influence consumer purchasing decisions?

Q2. Do you think that unique and innovative packaging will increase customer interest in buying your product?

Q3. Does the visual appearance help the brand image of your coffee product?

Q4. Does creating innovative packaging help to meet customer's needs?

Q5. Do you think innovative packaging strategies increase business profits?

3 Results and Discussions

3.1 How Did Packaging Visual Appearance Influence the Customer Purchasing Decision?

The customers preferred high quality packaging because it enhanced their perceptions towards coffee quality. With the high-quality packaging, the consumer could clearly see the design, information, and logo of the coffee product instead of plain packaging. The use of high-quality graphics also captured the attention of customers, conveyed an image of quality to consumers, and produced a substantial number of impulsive buying behaviors among consumers. The quality graphics would give high perception and cover the quality problems. Informant 1 (customer) who often bought coffee or non-coffee using takeaway cups expressed:

"I personally prefer high quality because it is definitely interesting and of course a good brand creates high quality packaging and it is impossible for them to use poor quality because they want to stand out from the others." (Informant 1)

Same thought by Informant 2 (customer):

"I shall definitely choose high quality packaging because I believe that higher quality packaging reflected better quality products inside." (Informant 2)

One of the coffee shop owners also agreed the positive influence of visual packaging on customer's purchase decision:

"Of course, the visual appearance greatly influences consumer purchasing decisions at Domus Kopi. The visualization of the packaging works as silent salesman to attract customers' attention before they see and taste the coffee product inside." (Informant 7)

The plain packaging showed less positive attitude towards the products and brand itself and reduce the intention to purchase the products [17].

In addition, colored packaging was more attractive to increase the customer's purchasing decision [8, 18]. [8] added that packaging color contributed to emotional responses and strengthened customers' memory about a specific product. Color of packaging also characterized special identity of a product that differed from other products [19]. The response from the Informant 3 (customer) and Informant 4 (customer) agreed that colored packaging caught more attention:

"I am attracted more to colored packaging because it looks more unique and can give a good impression for the coffee shop." (Informant 3)

"Actually, I have no specific preferences for the color of packaging. My top priority is packaging quality. But if I have to choose, I will definitely go for colored products because I'm a girl, so I prefer cute and interesting things." (Informant 4)

Packaging size and shape was one of the main elements of visual packaging [20] to increase purchase intention of the customers. Informant 1 (customer) and Informant 5 (customer) expressed that:

"A coffee shop that can offer various sizes of coffee cups or packets shows that the owner well understands the demand of the customers." (Informant 1)

"If given a choice, I prefer to choose the big one. Large size drinks give me more satisfaction." (Informant 5)

Followed by the Informant 4 (customer) stated:

"It is favorable if the customers can choose the coffee cup size according to their needs. Sometimes we want to drink just a small cup of coffee or sometimes we want to drink a large cup of coffee." (Informant 4)

Hence, it was necessary to design products with the appropriate size and shape. This observation was supported by a study conducted on organic food packaging which exposed that the consumers with high construal level was more attracted to small package size while consumers with low construal level had low interest on small package size because they considered large packaging to be favorable [21].

Another thing that must be considered in product packaging is the suitable and practical packaging materials. Many coffee shops in this area used plastic materials in general, but rarely they used cardboard as the basis for their cups, which started to gain demand in the coffee industry. The feedback from the informants clearly preferred for sustainable packaging:

The Informant 3 (customer) stated:

"I am more interested on cardboard packaging compared to plastic packaging because it is more eco-friendly."(Informant 3)

Also supported by Informant 2 (customer) and Informant 5 (customer) stated:

"I prefer biodegradable ones, it's safer for the environment." (Informant 2)

"I prefer cardboard packaging over plastic because I support Go Green activities and also that is the uniqueness of a packaging." (Informant 5)

It can be concluded that packaging material with eco-friendly or have positive impact on the environment increased the demand of coffee product. Also, the great quality packaging material was more durable than the other with low quality material. A study by [22] reported that most of the consumers paid attention on material's type of food packaging

which influence their purchase decisions. Interestingly, most of the correspondents in their study committed to support product packaging with lower environmental impact regardless extra cost up to 5% more incurred for products.

Innovative product packaging features also influenced customers' purchase decisions. Some of customers' opinions were:

"Yes, I'm interested because innovative packaging can be more attractive so it can be used as a snapgram." (Informant 3)

The coffee shop owner pointed out that innovative packaging is beneficial to the customers in terms of products quality and safety. He said that:

"Innovative packaging should be able to increase durability and functionality of a packaging. For example, the packaging can avoid coffee cups leaks and spills issue from takeaway or food delivery service. Packaging that fails to cater those issues will give bad impressions to the customers about the products." (Informant 7)

Information labels on packaging guided customers about food nutrition and ingredients to make their choice [23]. The customers highlighted:

"Yes, it is necessary for me to see the information label because I want to know the ingredients of the coffee." (Informant 2)

"I often read the labels to find out the coffee ingredients and compositions such as the caffeine level. So, the information label on packaging is important for me."

(Informant 5)

It can be concluded that packaging products with label information enhanced the purchasing decision of customers.

3.2 Did Packaging Visual Appearance Capable of Enhancing the Brand Image of Coffee Products?

There were many things that must be considered when making product packaging, but when a product was good but not recognized by many people, this can be detrimental to the coffee shop. Thus, the logo was the initial fundamental of a coffee shop, not just the name, but the logo also has an important role in brand awareness and branding marketing. As stated by the informants:

"From my perspective, if you put a logo, whether dine in or takeaway, it's part of branding and marketing. If you sell something special or different, the logo is a differentiator. For example, if we have two plastic cups of coffee with the same coffee colors, we can tell the difference by looking at the presented logo only." (Informant 4)

"Very influential, the iconic twin-tailed siren on Starbucks' logo for instance is recognized to serve high quality coffee and received high demand from the customers. Same goes to other coffee brands such as Steamboat and Torabika that are easily known by the customers just looking at their logos." (Informant 2)

It can be concluded that coffee packaging with logos enhanced the brand image of a coffee shop. Logo was part of branding and marketing; the logo created special identity and image for the coffee shop that stored in customers' mind. Currently, logo design for various products were presented by certain elements including colors, typeface, symmetrical design, and logo shape which proven to influence the customers' judgement on the product brand [24]. According to [10] the good brand image built strong brand competitiveness.

The coffee shop owners agreed that the impact of visual appearance on packaging towards coffee brand image establishment was undeniable:

“Personally, I don’t think too much about visuals, but most people attach to idealism. So, whether I like it or not, the visual appearance of coffee packaging is top priority to increase the brand image of our coffee products.” (Informant 6)

“Of course, it affects the brand image. As a simple example, a drink prepared with garnishes will look much better than a drink without garnish. I believe that good visuals on packaging will enhance our products branding.” (Informant 7)

The unique visual appearance also helped to increase the brand image as the customers said that the uniqueness attracted them to buy the product. If the visual appearance was not interesting or had bad visual appearance quality, it decreased the demand from the customers. This also impacted on the brand image of the product, because it gave perception to the customers that the product was not so good and affected their satisfaction with the product. The uniqueness of food packaging indicated the brand premium-ness of a product [25]. The relationship between unique visual appearance and brand image to attract the customers was reflected by customers as stated by:

“Unique visual packaging is a good marketing to attract new customers and definitely will improve the product image of a coffee shop. No matter what, the owners also must ensure to serve coffee with good quality and taste to secure repeat orders and loyal customers. If both packaging and product quality are good, the brand image will be stronger” (Informant 4)

“No doubt unique visual appearance will increase product sales as well as product image because unique packaging can easily catch the customer’s attention” (Informant 3).

Apart from unique packaging, the coffee shop owner also admitted the impact of innovative packaging to create strong brand image that attract more customers:

“Innovative packaging usually accompanied by product branding. Innovative packaging is not limited to product protection but also improved the functionality of a packaging. Therefore, it will attract the customers’ interest and increase the product brand awareness. Packaging without brand identification especially new brands cause the customers unable to find the product source. For example, when a person requests special food online delivery for someone else and the receiver feel interested on the food but he/she is unable to identify the product due to no brand identification” (Informant 7)

On the other hand, the coffee shop owners nowadays should look forward for innovative packaging to promote their products by cooperating on environmental-friendly packaging whereby the owners were not just performed their corporate social responsibility but significantly gained brand image recognition [26].

4 Conclusion

The results showed that visual appearance affected the coffee purchasing decision and coffee shop’s brand image. The customers easily chose the product with the eye-catching one, the attractive graphics and colors. After they found the desired products, they began to analyze the product on the shape and size, package material, and technology. Each customer had different preferences on the packaging shape and size. The customers

were also drawn to eco-friendly packaging and innovative packaging that could enhance the durability of packaging. Then, the customers would identify the label information because they have different levels of caffeine and consumption preferences. All the purchasing stages finally generated to purchase decisions of the customers. After that, the customers reflected on the advantages and disadvantages of the products post purchase. This was why visual appearance of product packaging was important to customers' purchasing decision.

On the other hand, logos were an essential element in brand image. Logo played important roles on the brand awareness and gave message to customers. The logo might be accompanied by a tagline or a brief description of the brand's value or mission. The customers emphasized that without a logo, it was difficult to get familiar with the product and brand. Brand image gave perceptions, emotions, and attitude in relation to the mental image of the product. The unique visual appearance of packaging increased the brand image since the uniqueness attracted the customers to buy the products. Uninteresting visual appearance decreased the interest of the customers and demand of the products. This also impacted on the brand image of a product because it gave the perception to the customers that the product gained less attention from other customers caused by poor quality and would affect their satisfaction with the product. Therefore, well-designed packaging had superior influence to entice the customers to purchase a product and created strong brand image of a product.

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Smart Village Development Efforts Based on Communication Strategy Formulation and Policy Advocacy

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Abstract. Smart village development is not solely about introducing advanced technology to rural areas but also entails transforming these communities to achieve higher levels of well-being and prosperity while making sustainable use of their available resources. Essentially, the use of information and communication technology has the capacity to stimulate creativity and innovation within rural communities, narrowing the gap with their urban counterparts. A village can be deemed “smart” when it employs information technology innovatively to enhance the quality of life, economic efficiency, and competitiveness across sustainability dimensions. The objective of this study is to devise communication and policy advocacy strategies to facilitate the realization of “smart village” concept in Indonesian rural areas. This concept introduced by the government, seeks to empower village administrations and communities by leveraging information technology to effectively manage local resources, thereby enhancing the village’s economic prospects and the well-being of its residents.

Keywords: Smart Village · Communication and Policy Advocacy

1 Introduction

Indonesia, characterized by its numerous islands, is governed both centrally and regionally, necessitating effective management in each region to promote progress and territorial development (Hendriyani & Suartin 2019). Development signifies a deliberate series of growth and transformation initiatives intended to bring about positive change. The main objective of development is to establish an equitable and prosperous society characterized by both material and spiritual well-being (Gai et al. 2020).

In Indonesia, particular attention should be directed toward rural development, as a significant portion of the country comprises rural areas (Huda et al. 2020). Rural areas represent a form of regional development in Indonesia, and according to Law Number 6 of 2014 concerning Villages, are legally recognized community entities with well-defined territorial boundaries, granted the authority to oversee and manage local matters. The Indonesian government system has acknowledged these rights which are

founded on community initiatives, ancestral rights, and/or traditional rights (Gai et al. 2020).

The evolution of village governance has taken on various forms, necessitating protection and empowerment to ensure strength, advancement, independence, and democracy. These attributes establish a strong basis for efficient governance and progress, contributing to a fair and affluent society (Mutaqqin 2023). Villages are pivotal in shaping national policies and development trajectories, underscoring the importance of prioritizing rural development. The government bears the responsibility of elevating rural areas to the forefront of human, infrastructural, economic, and social development (Huda et al. 2020).

The innovative village programs have catalyzed the emergence of a smart village development model. Disruption, rather than being a hindrance, is viewed as an opportunity for innovation (Ohoitmur 2018). This concept is adapted from the smart city model, which was already familiar in Indonesia (Subekti & Damayanti 2019). Smart villages serve as catalysts for enhancing the village economy and public services by implementing government and community service systems while promoting community empowerment through information technology utilization (Irzharsyah et al. 2022).

Smart villages, also known as smart villages, represent a development concept emphasizing that village communities can intelligently address local challenges by efficiently utilizing their available resources and adhering to local cultural customs and norms (Haniyuhana 2023). The government has introduced the “smart village” concept, which focuses on empowering village governments and communities through the use of information technology. This approach enables efficient management of local resources, promotes economic development in villages, and enhances the welfare-being of residents. It is essentially an extension of the smart city concept adapted for rural areas, empowering villages to address challenges intelligently.

These smart village initiatives not only concentrate on technological advancement within villages but also aspire to uplift the community’s overall well-being. This includes raising awareness about the significance of innovation in small businesses, promoting entrepreneurship, encouraging community engagement, and enhancing service quality in rural areas (Laksono, Chawa, and Yuliati 2020).

2 Research Methods

This research utilizes a qualitative methodology involving a literature review.. The research is primarily concerned with objective identification, focusing on discerning and characterizing the subject matter rather than delving into an in-depth analysis of the underlying social structures. Its core objective is to formulate strategies for smart village development within the realms of communication studies and policy advocacy.

Philosophically, research methods are a fundamental component of the scientific process dedicated to investigating procedures in the quest for truth (Pahleviannur et al. 2022). Research methodology encompasses the entire sequence of activities performed during the research process, spanning from the inception of the study to its conclusion. In the course of conducting a literature review, the author endeavors to gain a more lucid and comprehensive understanding of statutory regulations, implementing guidelines, and other relevant references concerning the research questions addressed in this study.

3 Results and Discussion

3.1 Smart Village Development

The government has introduced the “Smart Village” concept to enhance the capabilities of village governments and communities by leveraging information technology for efficient management of local resources. This approach aims to promote economic development within villages and enhance the well-being of their residents (Nuraini et al. 2021). Smart Village initiatives encompass various aspects of rural life, engage multiple stakeholders, and emphasize self-sufficiency. Key focus areas for achieving sustainable development in villages include agriculture, education, healthcare, energy, water and waste management, as well as governance (Degada et al. 2021).

When conducting Focus Group Discussions (FGD) on digital-based service management practices, it is essential to recognize the significance of digital public services in today’s era. These practices involve a communication approach and policy advocacy directed towards the public. In this concept, society is also required to be able to be independent according to the competencies, abilities and opportunities they have. In this case, the concept of communication is considered an effective way to strengthen public services today. For example: community participation as *capitalgood governance* so that there are no misunderstandings and a strong system of accountability to the community. This concept is considered effective with good openness and community participation in overseeing every protection, both physical and non-physical (Izharsyah et al. 2022).

The “smart economy” notion, rooted in information and communication technology, seeks to establish a resilient economic ecosystem, with a focus on rural regions, to effectively address the rapid changes and adapt to the demands of the disruptive era. Economic disruption is characterized by the shift of economic activities from the physical world to the virtual realm (Lasmawan 2019).

Village development is an integral aspect of village governance functions. With the enactment of Law Number 6 of 2014 regarding Villages, there has been a shift in the authority for development management from regional government to village government. In the village development process, the use of information technology is important and is part of encouraging the success of village development. Information technology serves as a tool that not only streamlines the preparation and execution of village development but also acts as a platform for uniting various stakeholders involved in village development. Information technology brings together various interests so that they can be formulated together into a village development policy. Additionally, the success of the smart village concept relies on enhancing the knowledge of village communities through education and skill development. In this context, the village government’s role will be further optimized to manage village resources effectively, efficiently, and sustainably. The smart village implementation takes place at the village office or village hall, encouraging continued community engagement with these locations. This fosters a positive relationship between village residents and the village government. The village office or village hall can potentially serve as a hub for resident creativity, allowing the community to contribute ideas and innovations for village development (Nuraini et al. 2021).

Several supporting components of smart village presented by Sutriadi (2018) can be described as follows:

- a) Community cohesion and engagement, involving the community's commitment to enhancing their skills and driving positive change for improved living standards.
- b) Cultural heritage and historical significance of villages play a vital role in knowledge-based development.
- c) The spatial context in terms of urban and regional planning, recognizing rural areas as integral components within regional and national spatial planning frameworks.
- d) Economic diversity, comprising primary and secondary sectors, can enhance collaboration with the tertiary sector and foster growth in urban areas.
- e) Technology readiness is influenced by rural spatial functions in the regional context and the promotion of specific rural resources to strengthen urban-rural connections, aligning with the concept of smart and sustainable rural development.
- f) Synergy between Infrastructure and Telecommunications: Rural areas benefit from the synergy between physical infrastructure and telecommunications, fostering improved connectivity.
- g) Substitution Effect: The limited physical movement in rural regions can be replaced by and made more accessible through virtual interactions.
- h) Generational Impact: Rural areas can achieve increased sustainability and competitiveness through the integration of physical infrastructure and telecommunications. As rural economies grow, these regions become more attractive, efficient, and better connected to urban centers, with enhanced physical networks (such as roads, trains, water, energy, and irrigation) ensuring effective rural-urban connectivity.
- i) Combining technical and political processes leads to innovative solutions in translating rural policies into collective rural initiatives for the betterment of rural living conditions. Additionally, involving various stakeholders fosters active participation and collaboration among development actors in rural settings, promoting well-rounded development efforts.

3.2 Smart Village Model

The creation of a smart village model draws not only from existing research but also requires supportive regulations for effective implementation. The model encompasses six key dimensions, as outlined by Aziiza (2020):

- a) Governance, this dimension refers to realizing effective, efficient, communicative and innovative governance. This dimension is focused on developing good governance in internal and inter-village governance. The government plays an important role in this dimension because it has the duty to provide good public services (Mishbah et al. 2018).
- b) In the realm of public services, technology is harnessed to deliver information and ensure transparency, encompassing financial transparency and information openness. Village governance relies on the pivotal role of the village head as a decision-maker, fostering leadership and community interaction through public participation in local policy decisions (Santoso et al. 2019). Presently, ICT serves mainly as a medium for information collection and dissemination, lacking integration in managing tourism

- villages, including aspects like homestay and tourist attraction management, visitation statistics, assessment of basic tourist requirements, government input, and infrastructure development for tourism (Rudwiarti et al. 2021).
- c) Village resources encompass natural resources, water, energy, human capital, economy, and infrastructure. In the field of human resources, a critical focus is placed on education, with the aim of promoting the development of smart villages (Ella & Andari 2018).
 - d) Village Services refer to fundamental offerings extended to the village community, including essential services like education and healthcare (Ella & Andari 2018).
 - e) Smart Quality of Life encompasses aspects related to the quality of life, including health, housing, education, and social cohesion, to foster civil communities and social inclusion in villages (Sutri Santoso et al. 2019).
 - f) Tourism is an integral component of the proposed smart village model, incorporating tourism development and village promotion. It contributes to the creation of new employment opportunities, infrastructure development, and the enhancement of social interactions within the area (Mishbah 2018).

4 Conclusion

The smart village concept encompasses various facets of rural life, engages multiple stakeholders, and necessitates self-sufficiency. It establishes a symbiotic relationship between rural physical infrastructure and telecommunications systems, introducing a substitution effect. To foster smart village development, it's essential to employ digital-based service management strategies along with communication tactics and community-oriented policy advocacy. In this context, individuals are encouraged to demonstrate self-reliance commensurate with their competencies, skills, and opportunities. Communication plays a pivotal role in enhancing public services, exemplified by community engagement as a valuable asset in ensuring good governance, minimizing misunderstandings, and establishing a robust system of accountability to the community.

Furthermore, the smart village model emphasizes the importance of a smart economy and smart governance. This strategic support comprises six dimensions: governance, technology, resources, village services, smart living, and tourism. The village government's role is further optimized to ensure effective, efficient, and sustainable management of village resources, aligning with the overarching goal of smart village development.

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Development of Museum as Tourism Attraction Based on Virtual Digital in Ubud Bali

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Abstract. Tourism is a crucial industry in Indonesia, and it has embraced technological advancements to enhance its operations. Cultural tourism, a favored form of tourism in the country, is keen to keep pace with technology to attract more visitors. Ubud, a prominent cultural tourism destination in Bali known for its art and culture museums, witnessed a decline in museum visits from 2014 to 2019, as reported by the Bali Provincial Tourism Office. This research aims to unlock the potential of museum tourist attractions using digital virtual technology to stimulate local community engagement and tourist interest. The research employs qualitative analysis through case studies, involving interviews with officials or representatives from four art museums in Ubud. The findings from these interviews are subjected to SWOT analysis, and the results are further validated using the AHP method to ensure data consistency. The study reveals that the WT (Weaknesses-Threats) strategy within the SWOT framework is the most effective approach for developing virtualized museum attractions in Ubud. This strategy emphasizes the need to recruit museum staff who understand the concept of virtualized museums and can establish strong connections with museums in the Ubud region. The ultimate product of this strategy would be the creation of an official page on Google Arts and Culture, contributing to the promotion of Ubud's cultural treasures in the digital realm.

Keywords: Museum · SWOT Strategy · Virtual Digital

1 Introduction

Bali, a province in Indonesia, boasts a rich tapestry of traditions and historical significance within each of its regions, making it a compelling destination for tourists drawn to its diverse cultural distinctiveness and its practical applications. Among these regions, Ubud stands out as a frontrunner in cultural tourism in Bali. Preserving and showcasing the unique culture of Ubud requires a dedicated platform, a “vessel,” if you will, to

safeguard and exhibit the artistic works and historical artifacts that are an integral part of this heritage. Consequently, a plethora of human-made tourist attractions, known as museums, have been established. These museums serve as custodians of Ubud's cultural and historical legacy, with both government and private entities taking charge of their management, providing a platform to celebrate and protect the cultural and historical treasures of Ubud [1, 2].

The onset of the COVID-19 pandemic in early 2020 had far-reaching global consequences, impacting various sectors, including the economy, society, and tourism. This crisis prompted nations worldwide to seek solutions to combat the pandemic's multi-faceted challenges. The museum sector was not spared, experiencing significant disruptions. A survey conducted by UNESCO in 2020 revealed that out of 90,000 museums across the globe, a staggering 90% ceased operations due to the pandemic, with roughly 10% contemplating permanent closure. Museum directors, who often rely on public donations and income, needed to explore alternative measures to sustain their institutions. Embracing digital technology emerged as one of the most promising avenues [3].

Notably, several museums in Ubud embarked on innovative initiatives to digitize their collections. Puri Paintings Museum, for instance, launched "Museum Marketing 3.0 - Metaverse, Phase 1" during the World Marketing Forum in October 2022. This online platform offers visitors a virtual reality experience, complete with the accompaniment of Balinese music as they explore the museum. Similarly, the ARMA Museum in the Ubud region adopted the concept of museum virtualization using the Google Arts & Culture application even before the pandemic, allowing online visitors to view a selection of the museum's collections and receive explanations from virtual assistants.

The relatively recent introduction of virtual museum innovations does not guarantee an immediate surge in interest in museum visits [4]. This is because the development of these programs is still in its infancy, particularly within the realm of museum tourism in Indonesia, especially in Bali. Given this context, the authors are motivated to investigate the development of virtual museums in Ubud, marking the culmination of the concept of virtualizing museum tourism on a digital platform in Bali.

With this background in mind, the research aims to achieve the following objectives:

1. Examine the primary focus areas for implementing the concept of museum virtualization to enhance the appeal of museums in Ubud as tourist attractions.
2. Formulate a plan for the development of museum virtualization in those museums capable of implementing this concept.
3. Assess the effectiveness of digital virtual museums by examining their impact on museum visitation rates.

2 Methodology

This research focuses on four prominent museums in Gianyar, specifically in Ubud, Bali, with a primary exhibition theme centered around painting. The selected museums, namely Museum Puri Lukisan, Neka Museum, ARMA Museum, and Rudana Museum, are not restricted by any specific management type, allowing for a comprehensive analysis of various museum structures.

Data for this study was gathered through interactions with museum curators, directors, and operational managers. Purposive sampling was employed, a method chosen for its ability to provide in-depth insights into the museum's operations and collections. Informants were carefully selected based on their ability to offer comprehensive information about the virtualization efforts undertaken by the respective museums.

To conduct the interviews effectively, an interview guide was employed. This guide included indirect questions that encouraged informants to provide specific and clear information without constraints, allowing researchers to acquire data closely aligned with the research objectives. Prior to use, the interview guide was reviewed and approved by the research supervisor to ensure its suitability as a research instrument.

The research methodology adopted for this study is a case study qualitative analysis technique, culminating in inductive final conclusions. Interview data was transcribed and analyzed to extract key points, forming the basis for the study's results. These key points were then compared to relevant theories in the field, allowing for a thorough examination of each research problem. This comparative analysis resulted in estimated findings, representing a simplified interpretation of the research problems in the context of existing theories. These estimated findings were subsequently subjected to a SWOT analysis. After this, the data derived from the SWOT analysis underwent further analysis using the Analytic Hierarchy Process (AHP) methodology.

3 Findings and Discussion

The authors conducted in-depth interviews with four museums to identify 5 to 10 opportunities and threats affecting the development of virtual and digital museums in Ubud. These factors fall into two categories: internal factors, encompassing strengths and weaknesses within the museums, and external factors, including opportunities and threats from the broader museum environment. These factors are summarized in a grand strategy matrix (Table 1). The matrix highlights five key variables used for factor analysis, which are linked to the strategies developed. Four strategic types are formulated, each consisting of three essential variables. These strategies draw from empirical studies emphasizing the importance of an effective approach to presenting museums through virtual reality. Key considerations include aspects such as virtual experiences, personalization, interaction, education, and the repackaging of displayed collections [5]. The diffusion theory of innovation by Rogers [6] plays a crucial role in shaping the general SWOT strategy. This theory underscores the need for a deep understanding of innovation, communication, time, and the social dynamics in adopting new technologies like museum virtualization. Additionally, the general strategy takes cues from the approaches implemented at the National Museum of Indonesia, particularly in increasing visitation through virtual museums [7]. It provides a comprehensive framework for the development of virtual and digital museums in Ubud, incorporating insights from various sources and theories to ensure effective and innovative strategies in this context.

Once all the SWOT factors are identified, the next step involves constructing a hierarchical structure and verifying the data's consistency. The hierarchical structure of the SWOT problem is analyzed by comparing priorities, a process based on the outcomes of interviews. The priority comparisons from each museum are amalgamated,

Table 1. Matrix Grand Strategy from the result of interview with 4 museums around Ubud, Bali.

Matrix SWOT Museum Based on Virtual Digital on Ubud Bali	<p>Opportunity</p> <ol style="list-style-type: none"> 1. Support from the private sector and stakeholders 2. The enthusiasm of netizens 3. Technological developments that are increasingly easy to use 4. The virtual museum trend is on the rise 5. Opportunities for cooperation with educational institutions 	<p>Threat</p> <ol style="list-style-type: none"> 1. Competition between museums 2. Lack of local community support 3. The lack of interest of the younger generation in maintaining the museum 4. The condition of internet access is not yet stable 5. Recognition of government assistance is difficult for private museums
<p>Strength</p> <ol style="list-style-type: none"> 1. A digital marketing strategy has been implemented 2. Collection of interesting artifacts 3. Immersive museum environment 4. Vision and Mission aligned with the virtualization function 5. History of a large collection 	<p>SO Strategy</p> <ol style="list-style-type: none"> 1. Increasing the interval for uploading museum articles and documentation to social media 2. Improving the quality of museums to attract investors 3. Virtual museum trial activities for educational institutions 	<p>ST Strategy</p> <ol style="list-style-type: none"> 1. Outreach to local communities 2. Notice to the government about the importance of digitizing museums 3. Search for a more stable internet provider to increase online interaction
<p>Weakness</p> <ol style="list-style-type: none"> 1. Strong museum idealism 2. Lack of understanding human resources 3. Lack of funds for museum's development 4. Lack of museum operational completeness 5. Results of training that hard to be applied 	<p>WO Strategy</p> <ol style="list-style-type: none"> 1. Selection of competent museum staff 2. Collaborating on research with educational institutions on digital visual-based museum 3. Selective marketing and cash flow review of museum priority placement 	<p>WT Strategy</p> <ol style="list-style-type: none"> 1. Search for staff who understand the museum's digital visual basis 2. Invite local people to be involved in museum activities 3. Establish a good relationship with the museum around Ubud

and the average value is calculated to determine the priority for each variable. As the hierarchical structure is derived through the AHP method, there is no need for IFAS (Internal Factors Analysis Summary) and EFAS (External Factors Analysis Summary) matrix analysis. It is essential to limit the number of factors within each SWOT group to no more than 10. This restriction is necessary because having more factors would lead to a proliferation of pairwise comparisons, potentially compromising the data's validity. In these comparisons, respondents assess each factor on a scale of 1 to 9. A rating of 1 indicates both factors are equally important, while a rating of 9 signifies one factor's

absolute importance over the other. The results of these comparisons are then used to calculate the geometric mean, which normalizes the values for each factor.

Table 2 presents the outcomes of SWOT internal factor assessment, determining priority vector values. These values signify the relative importance of each factor, with higher values indicating greater importance [8]. The top two results, with priority values of 12.8% and 12%, stand out as the most crucial and warrant immediate attention. The most influential factor, with a priority value of 0.128 (12.8%), pertains to the lack of human resources well-versed in the concept of developing museum virtualization. The second most influential factor, with a priority value of 0.120 (12%), involves a strong commitment to idealism, making museums spaces for specific groups and preserving traditional elements.

Table 2. Normalization of Internal SWOT Factors

NORMALIZATION OF INTERNAL FACTOR				
	Total	Priority Vector	Matrix x Priority	Consistency
Marketing Strategy	0,831	0,083	1,084	13,032
Artifact Interest	1,088	0,109	1,084	9,961
Museum Environment	1,112	0,111	1,084	9,741
Digitalization Motivation	0,977	0,098	1,084	11,093
Collections History	0,802	0,080	1,084	13,515
Strict Idealism	1,198	0,120	1,084	9,045
Low Human Resources	1,281	0,128	1,084	8,457
Limited Funds	1,036	0,104	1,084	10,464
Tools completeness	0,798	0,080	1,084	13,577
Abstract Guidelines	0,877	0,088	1,084	12,359

Table 3 displays the results of the SWOT external factor assessment, revealing priority vector values. Higher values indicate the greater importance of each factor. The two most significant factors, with priority values of 14.4% and 12.8%, are crucial and require prioritization. The primary external factor, with a priority value of 0.144 (14.4%), underscores the need to avoid introducing competition during the development of museum digitization in Ubud. The second significant external factor, with a priority value of 0.128 (12.8%), emphasizes the importance of museums forging partnerships with educational institutions to integrate technology literacy with students' understanding of museums and foster innovative ideas for implementing museum virtualization.

Table 4 reveals the results of the Internal Factor Consistency Ratio (CR) calculation, yielding a CR value of 0.084 (8.4%). Since this CR value is less than 0.1, the data for determining the hierarchy of internal factor variables is deemed valid and can be confidently applied in the selection of SWOT strategies.

Table 5 presents the outcomes of the External Factor Consistency Ratio (CR) calculation, resulting in a CR value of 0.025 (2.5%). With this CR value being less than 0.1, it

Table 3. Normalization of External SWOT Factors

NORMALIZATION OF EXTERNAL FACTOR				
	Total	Priority Vector	Matrix x Priority	Consistency
Stakeholders	0,710	0,071	0,974	13,732
Netizen Enthusiasm	0,838	0,084	0,974	11,623
Technology Ease	0,956	0,096	0,974	10,196
Virtualization Trends	0,722	0,072	0,974	13,498
Collaboration with educational institutions	1,281	0,128	0,974	7,607
Competition between museums	1,441	0,144	0,974	6,761
Local Community Excitement	0,739	0,074	0,974	13,188
Less young generation interested	0,948	0,095	0,974	10,279
Slow Internet Access	1,228	0,123	0,974	7,933
Minimal government assistance	1,138	0,114	0,974	8,565

Table 4. Consistency Ratio of Internal Factors

Consistency Ratio Internal Factors Criteria	
λ Maks	11,124
CI	0,124922685
RI	1,49
CR	0,083840728

confirms that the data for establishing the hierarchy of external factor variables is valid and can be employed in the selection of SWOT strategies.

Table 5. Consistency Ratio of External Factors

Consistency Ratio External Factors Criteria	
λ Maks	10,338
CI	0,037574596
RI	1,49
CR	0,02521785

The SWOT analysis reveals that the most influential internal factors fall under weaknesses (W), while the pivotal external factors are associated with threats (T). Consequently, the most effective strategy is the WT strategy. No further AHP testing is required for each strategy, as the highest-priority variable corresponds to a single strategy. Thus, the SWOT strategy outcomes are based on consistent and validated data.

3.1 Focus of the Most Important Strategy

The WT strategy emerges as the most effective approach in the study, highlighting critical internal and external factors. These factors emphasize the need to acquire capable human resources for museums and foster strong collaborations with museum associations in Ubud. Research by Gutowski et al. [9] emphasizes the significant role of operations, particularly software (IT Engine), and maintenance technicians in digital museum development. This aligns with the study's primary finding, which prioritizes human resources responsible for managing the technical and knowledge aspects of presenting digital museum content.

The focus on internal factors is reflected in statements from interviewees, revealing that museum staff primarily comprises older individuals with limited technological expertise. In contrast, the younger generation generally possesses more advanced technological knowledge. However, few young individuals express interest in sustaining and advancing museums into the realm of virtualization. This lack of enthusiasm stems from the perception that careers in museums offer limited development potential, and technology graduates seldom consider museums as viable employers.

Regarding external factors, the competitive dynamics between museums remain evident at the time of data collection. Each museum predominantly concentrates on its individual digitalization initiatives. Consequently, various museums independently implement diverse virtual digital applications. The lack of cooperation and coordination between museums hinders the full potential of virtualization. As suggested by Komarac et al. [10], managing competition between museums differs from traditional business competition. Successful museum managers must maintain an open-minded approach, fostering collaboration to collectively attract more museum visitors.

3.2 Planning of Virtualization Museum Development

The study's findings reveal that the development of museum virtualization in Ubud is currently at a very nascent stage. Most museums primarily focus on marketing via social media and content creation on third-party platforms, categorizing their activities as part of E-Tourism, denoting the application of technology in industrial management. However, the transition to full virtual museums remains distant, as many institutions are yet to digitize and virtually catalog their art collections comprehensively. Moreover, digital access to these collections is often limited to private audiences.

The WT strategy implies that Ubud's museums are currently in a precarious situation and must first address their internal weaknesses to mitigate external threats before capitalizing on their strengths. Several preventive measures are recommended:

1. Recruit museum staff with backgrounds in tourism or information technology to enhance their understanding of museum virtualization.

2. Engage the local community, particularly the younger generation, to instill a sense of appreciation for the museums' sustainability.
3. Foster collaborative relationships with other Ubud museums to avoid competition and pursue mutually beneficial approaches to virtualization.

These preventive steps are essential prerequisites before proceeding to the development phase, following the SO strategy. The initial step in this direction involves utilizing the Google Arts and Culture platform, which focuses on cultural reservations within museums. However, out of the four research objects, only two museums have integrated with Google Arts and Culture, and they need to update their platform content to enhance their popularity.

While Google Arts and Culture serves as a gateway for museum virtualization, it does not qualify as a virtual museum itself [11]. Being a non-profit, copyright-free platform, it is essential to create a dedicated platform for the final step of digital museum virtualization, which entails constructing a true virtual museum. This process is unique and requires a specialized creative team. It involves utilizing private server hosting with WebGL development and 3D rendering applications such as Unity to create a virtual museum experience. This approach simplifies the addition of video and audio elements from third-party sources. Notably, there are currently no private museums in Indonesia that have adopted virtual museum technology.

A successful example of a private museum implementing the virtual museum concept is the Barnes Foundation in Philadelphia. Utilizing WebGL technology and video call applications, it offers interactive virtual tours. This technology also facilitates the hosting of virtual events and workshops, including practical art classes and art history sessions. The development of virtual museums holds great potential in enhancing museum engagement and accessibility.

4 Conclusion

The study reveals that the development of digital virtual museums in Ubud is still in its early stages, primarily due to the absence of clear guidelines and experts in this field. Despite this, there's a notable interest from tourists in museum innovation, especially virtualization. This enthusiasm is evident through positive online reviews and engagement on social media and museum websites. Importantly, whenever a museum introduces virtualization, there is a consistent increase in museum visits, demonstrated by reports from museums that have updated their websites to facilitate online ticket reservations. Furthermore, based on the findings from the SWOT-AHP research, the study emphasizes the urgent need to prioritize the development of digital virtual museums in Ubud, aligning with the WT (Weaknesses-Threats) strategy. This strategy is designed to address internal weaknesses and external threats, ensuring the survival of these institutions. It underscores the critical stage of digital museum development in Ubud and highlights specific actions to be taken, primarily focusing on nurturing a skilled workforce and establishing cooperative relationships with other museums in the area.

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Fostering Tourism Resilience: Analyzing the Characteristics of Ebeca Innovation and Its Diffusion in Business Continuity Management

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Abstract. In the dynamic landscape of sustainable tourism, the eBECA innovation emerges as a pioneering solution to transportation challenges in tourist destinations. This study employs the Innovation Diffusion Model to dissect eBECA's key characteristics, including its relative advantage, complexity, compatibility, observability, and trialability, elucidating its transformative potential within the tourism industry and its seamless integration into business continuity management. By paving the way for cleaner, more efficient transportation, eBECA promises sustainable and enriching impacts on the community, thus contributing to the evolution of responsible tourism practices. Central to our research is the mixed-methods approach, which underscores the power of triangulation to amplify research insights. The convergence of quantitative data and qualitative perspectives enables us to provide a comprehensive and nuanced understanding of eBECA's adoption within business continuity management strategies in the tourism sector. This methodological synergy exemplifies the strengths of both quantitative and qualitative methodologies in enhancing research validity and credibility, shedding light on the multifaceted dynamics of eBECA's integration into the tourism industry's resilience planning.

Keywords: Innovation management · diffusion of innovation · business continuity management

1 Introduction

Tourism, as a crucial driver of economic growth and cultural exchange, continues to evolve in response to changing consumer preferences, environmental concerns, and technological advancements. In this dynamic landscape, innovations have become essential

for the sustainable development of the tourism sector. The integration of renewable energy sources, such as solar power, with innovative modes of transportation presents an exciting avenue for transforming the tourism experience. One such innovation that embodies these principles is the Solar Powered Electric Beca (eBECA) – a novel electric tricycle designed to revolutionize local transportation within tourist destinations. This paper delves into the characteristics of eBECA through the lens of the Innovation Diffusion Model, proposed by Everett Rogers [15], while also exploring its sustainability potential and contribution to the community [6].

Business Continuity Management (BCM) is an effective program for organizations to continue or resume their operations during a crisis, and a preliminary systematic literature review found that several papers have been published since 1999, with the most frequently mentioned subjects being IT security, implementing BCM into diverse study disciplines, implementing new toolkits into BCM associated studies, BCM improvement, resilience, lessons learned, supply chain, and BCM advantages, which lays a foundation for future studies in similar fields [3]. Introducing business continuity management in the context of eBECA, we recognize the vital need for a strategic framework that ensures the uninterrupted operation of tourism services while harnessing the innovative potential of sustainable transportation solutions [12]. As tourist destinations embrace eBECA, a revolutionary electric trishaw innovation, they not only enhance their environmental sustainability but also fortify their resilience in the face of potential disruptions [5]. Business continuity management, in this context, becomes the linchpin for proactively identifying and mitigating risks, diversifying transportation options, fostering community engagement, optimizing cost-efficiency, and bolstering the destination's brand identity as a responsible and adaptable player in the ever-evolving tourism landscape. With the clear understanding of what rural tourism should ideally encompass, the findings from the study from [2] can be used to guide the Malaysian Government in re-positioning rural tourism as a key niche industry and boost the tourism industry higher up the value chain. In addition, [13] investigates the effectiveness of government policy responses to the COVID-19 pandemic.

1.1 eBECA: An Innovation at the Nexus of Tourism and Sustainability

eBECA revolutionizes traditional cycle rickshaws, known as “becas,” by seamlessly integrating sustainable solar power technology. These eco-friendly vehicles offer tourists a unique and intimate way to explore local attractions while significantly reducing carbon emissions and dependency on non-renewable energy sources. This innovation aligns with the global shift towards sustainable tourism, addressing concerns such as air pollution, noise, and traffic congestion associated with conventional gasoline-powered vehicles. Supported by [16], eBECA qualifies as both an innovation and a product innovation, aligning with the dynamic landscape of the tourism industry [10].

1.2 Description of Technologies

Trishaws, typically with a single rider and two passengers and lightweight bodies, often employ electric wheels that have reduced torque. However, due to the added weight from passengers and cargo, trishaws require increased torque. To attract riders, trishaws

are adorned with decorations, further increasing their weight, which cannot be reduced. These electric wheels must handle a load of 400 kg.

Designing and building an eBECA involves several key steps. Initially, the trishaw frame must align with the rider's style, comfort, and objectives. Once the frame is chosen, measurements and calculations are performed to select an appropriate motor, which depends on factors like desired top speed, vehicle frontal area, weight, wind drag, air density, friction, and desired velocity. The trishaw frame should accommodate a recumbent seating position and reach speeds of 30 km/h.

eBECA encompasses a high-torque BLDC motor, a solar panel, a high-power battery, a controller, and entertainment accessories. This comprehensive understanding of eBECA, its unique attributes, and potential market impact is detailed in the following figures: Fig. 1 showcases its physical appearance, Fig. 2 provides precise technical specifications, and Fig. 3 offers an illustrative drawing outlining its design and functionality.



Fig. 1. eBeca visual representation

Figure 2 illustrates solar cell integration under protective glass for light penetration and weather protection. A series connection increases peak DC voltage, while a parallel connection boosts current, powering eBECA's roof with a 50-W solar panel. A solar charge controller prevents overcharging, enhancing efficiency and offering features like lighting terminals. Motor selection is crucial for eBECA's efficiency. Brushless DC (BLDC) motors, favored for versatility and reliability, provide speed control, regenerative braking, and avoid issues like brush wear and interference. The 48V, 1500W BLDC motor in eBECA employs Hall Effect sensors for efficient propulsion.

The BLDC motor is managed by a central motor controller, converting DC to AC and ensuring optimal performance. It activates upon battery voltage receipt, supplies power based on throttle input, and safeguards against low voltage and over-discharge. A 48V, 35 Amps controller complements the 1500W BLDC motor, ensuring efficient acceleration and speed control. A high-capacity 48V, 30AH lithium-ion battery powers eBECA, offering extended runtime, light weight, high energy density, minimal self-discharge, and durability. A protection circuit ensures safe operation, while lithium iron phosphate (LiFePO₄) polymer batteries enable fast, safe charging and high power. eBECA enhances the tourist experience with sound systems, LED lights, decorations, flags, LED screens, and displays for an engaging and visually appealing ride.

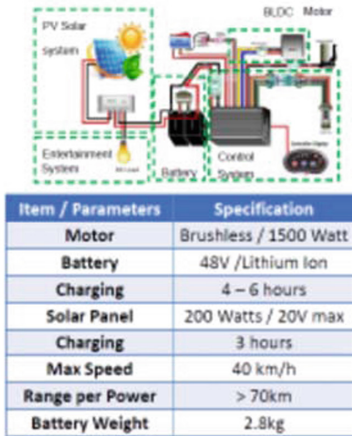


Fig. 2. Technical Specifications of eBeca Battery



Fig. 3. Technical Drawing of eBeca

1.3 The Innovation Diffusion Model: A Framework for Analysis

As indicated by [15], Innovation Diffusion Model provides a structured framework to analyze the adoption and diffusion of innovations within a society. This model outlines five key attributes that influence an innovation’s acceptance: relative advantage, complexity, compatibility, observability, and trialability. By examining eBECA considering these attributes, we can gain insights into the factors shaping its adoption and its potential impact on the tourism industry.

1.3.1 Relative Advantage

[18] highlight that tourists’ adoption of eBECA is influenced by perceived relative advantage and complexity, emphasizing eco-friendliness and cultural significance. [1] support this, stressing the role of perceived relative advantage. Sustainable tourism criteria, like local employment and diversity promotion, enhance eBECA’s relative advantage. However, perceived complexity, often due to unfamiliarity, can hinder adoption. eBECA offers reduced operating costs through solar power, improved sustainability, and a better tourist experience. This aligns with business continuity principles, providing a competitive edge for tourist businesses by offering eco-friendly and reliable transportation services.

1.3.2 Complexity

To ensure eBECA’s adoption in tourism and benefit local communities through sustainable initiatives [9], addressing perceived complexity is crucial. Complexity in innovation refers to its ease of understanding and use. While eBECA’s technology may initially seem complex with its solar power and electric propulsion, its user-friendly design caters to both drivers and passengers. Simplifying the charging process and offering driver training

can mitigate perceived complexity and expedite adoption. Effective business continuity management involves streamlining complex processes for seamless operation during disruptions. Customizing eBECA's design and operation to reduce complexity can enhance reliability, making it easier to maintain and operate during challenging circumstances, ensuring its dependability in times of crisis.

1.3.3 Compatibility

[7] propose that eBECA's eco-friendliness supports ecosystem-based adaptation (EbA), enhancing its compatibility as a sustainable transport option. Collaborative efforts among stakeholders [8] promote sustainable practices and encourage eBECA adoption, aligning it with sustainable tourism principles. Integrating eBECA into sustainable tourism plans maximizes positive impacts and minimizes negatives within communities.

Compatibility refers to how well an innovation aligns with the values, practices, and needs of potential adopters. eBECA's integration into the beca culture ensures compatibility with tourists seeking unique, culturally immersive experiences. Its alignment with sustainable tourism practices and environmental consciousness resonates with both tourists and destination communities. In business continuity, compatibility ensures new solutions align with existing systems. eBECA's compatibility with sustainability goals and eco-conscious traveler preferences makes it a suitable addition to tourist destinations looking to enhance their continuity plans. Integrating eBECA seamlessly into the transportation network ensures it complements existing infrastructure while offering a sustainable alternative.

1.3.4 Observability

A study by [18] examined tourism users' adoption intentions and found that perceived observability influences tourists' decisions. This implies that eBECA's visibility, including its use by other tourists and in the local community, can impact its adoption as a transportation mode. Sustainable tourism practices, as emphasized by Tourism Wikipedia, promote responsible travel behavior and support local communities. By positioning eBECA as a sustainable transportation mode that benefits communities and encourages responsible travel, tourism businesses can drive its adoption. Local visibility of eBECA can raise awareness of its advantages and facilitate collaboration among stakeholders, as suggested by [20]. Collaborative efforts among stakeholders can create an environment conducive to sustainable tourism, further promoting eBECA's adoption.

Observability pertains to an innovation's visibility and the ease with which its benefits can be observed by others. eBECA's use of solar panels and a quiet electric propulsion system makes its eco-friendly features highly visible. This visibility can trigger positive word-of-mouth recommendations and drive interest and adoption. In business continuity management, observability is crucial for detecting disruptions early and responding effectively. eBECA's technology can integrate with real-time monitoring systems to proactively address maintenance issues and provide data for predictive maintenance, contributing to transportation system resilience.

1.3.5 Trialability

Observability highlights eBECA's visibility in tourism, influencing its adoption. When tourists and locals see eBECA in action, it aligns with sustainability and piques interest, driving adoption. Observing others use eBECA and experiencing its positive impacts on the environment and communities contribute to this.

Trialability, as proposed by [18], lets tourists test eBECA, offering firsthand experience and boosting adoption. It helps them become comfortable, overcome hesitations, and provide feedback for improvement, supporting eBECA's adoption in tourism.

In summary, observability and trialability both drive eBECA adoption. Observability generates interest, while trialability provides practical experience and supports continuous improvement, encouraging sustainable eBECA use in tourism.

Trialability eases limited testing of an innovation. Offering tourists and beca drivers' trial eBECA runs lets them experience its benefits, build trust, and encourage adoption. This aligns with eBECA's role in continuity planning, testing new solutions for tourism resilience.

1.4 Sustainability of eBECA and Community Contributions

The sustainability of eBECA extends beyond its eco-friendly design. By integrating renewable energy sources, eBECA reduces the carbon footprint associated with conventional modes of transportation. Additionally, the adoption of eBECA supports the local economy by creating employment opportunities for beca drivers and fostering partnerships between tourism operators and renewable energy suppliers.

Furthermore, eBECA contributes to the community by enhancing the overall tourist experience. Its unique blend of tradition and innovation adds a novel dimension to sightseeing, while its sustainable design aligns with growing consumer preferences for responsible travel. The integration of solar panels also serves as an educational tool, allowing tourists to witness clean energy technology in action and raising awareness about environmental sustainability.

Incorporating eBECA's characteristics into business continuity management allows tourist destinations to harness the innovation's strengths in sustainability, simplicity, compatibility, observability, and trialability to enhance their resilience. By strategically adopting and optimizing eBECA within their continuity plans, businesses can ensure the uninterrupted provision of transportation services and maintain their competitive edge in the tourism industry, even in challenging scenarios.

2 Research Methodology

This research adopts a mixed-method approach to investigate the characteristics and sustainability of the Solar Powered Electric Beca (eBECA) within the framework of the Innovation Diffusion Model. By combining quantitative and qualitative techniques, we aim to comprehensively understand the factors shaping eBECA adoption in the tourism context.

In the quantitative phase, we collected and analyzed numerical data to identify the most influential factors driving eBECA adoption. To enhance validity, we employed

triangulation by conducting qualitative interviews with 25 randomly selected users. This qualitative exploration corroborated and enriched the quantitative findings, providing a holistic understanding of eBECA's diffusion influenced by its characteristics. The convergence of these two methods bolstered the credibility of our conclusions.

This study underscores the potential of triangulation to amplify research insights, showcasing the synergy between quantitative data and qualitative perspectives. As suggested by [14], this strategy enhances data validity and deepens comprehension, particularly when a triangulated design is used to mitigate potential bias in data collection.

2.1 Research Model

Figure 4 displays the research model of eBECA.

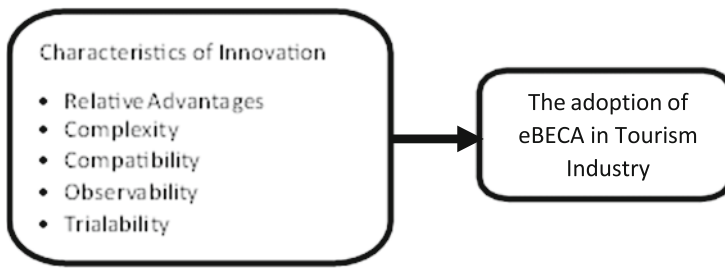


Fig. 4. Diffusion Innovation Model of eBECA

2.2 Quantitative Data Collection and Analysis

To gather quantitative data, a quantitative questionnaire survey was administered to a diverse sample of 385 participants. This survey aimed to identify the most significant factors contributing to the adoption of eBECA. Participants were selected from various backgrounds, including local and international tourists, to ensure a representative sample. The survey included questions pertaining to the participants' travel preferences, perception of eBECA's characteristics, and willingness to adopt the innovation.

The collected numerical data were subjected to rigorous statistical analysis. Descriptive statistics were used to summarize the participants' demographic information, while inferential statistics, such as regression analysis and correlation coefficients, were applied to identify relationships between the variables. This quantitative analysis enabled us to pinpoint the key factors that influence the adoption of eBECA within the tourism context.

2.3 Research Strategy

[17] describe goal-oriented research methods. A research strategy, according to [1], addresses a research challenge. Research strategies aid study design, execution, and

monitoring. The philosophy's methodological connection to fact-gathering and analysis is crucial. Research methodologies also emphasize data gathering, analysis, and researcher attitude. [17] recommend ethnography, narrative inquiry, action research, grounded theory, experiment, survey, archival and documentary research, and case study.

This survey, theory, and research study studied eBECA adoption in Malaysia, according to [17]. Software analysis and surveys. Previous research informed the present inquiry.

2.3.1 Pilot Test

[17] suggest pilot testing to simplify data gathering and enhance the questionnaire. Because this research is confined to eBECA adoption in Malaysia and time is limited, pilot testing would be limited to a small number of respondents who may at least affect the major variations in the population, which would modify the results. A population is a nation or group with a characteristic. To learn from and validate the target group, the population must be identified. [19] adds that the population also shows how to apply knowledge. Pilot testing with 30 online beca users refined the questionnaire for future data collection. Online questionnaire dissemination is excellent due to COVID-19 and movement control order.

2.3.2 Questionnaire Design

The research employed surveys as its primary data collection method, focusing on non-Beca users to understand the factors impacting the adoption of Malaysia's E-Beca technology. The survey questionnaire was structured into three sections.

The first section collected demographic information through closed-ended multiple-choice questions, categorizing respondents as Beca users, local residents, local tourists, or foreigners. Given the historical context of Malaysia and the higher likelihood of foreign tourists using E-Beca, it was crucial to include them in the survey. An online version of the questionnaire was distributed to international tourists using databases from the Malaysian tourism department.

The second section assessed how innovation characteristics influence the acceptability of E-Beca in Malaysia, particularly focusing on user-friendliness and eco-friendliness, which are essential for adoption within the Beca community. Adapting to market demand, as highlighted by [11], was considered to gain a competitive edge and generate substantial revenues.

The final section evaluated Malaysia's E-Beca adoption as the dependent variable, emphasizing its potential impact on Malaysia's tourism industry and economy. Successful adoption of E-Beca is expected to contribute significantly to these sectors. [17] say Likert-style rating questions are most often used to ask respondents how strongly they agree or disagree with a topic. This poll employed a 5-point Likert scale. 1 was "strongly disagree," 2 "disagree," 3 "neutral," 4 "agree," and 5 "strongly agree" on the Likert scale.

Respondent Profile/Background includes Age, Gender, Citizen, Respondent type, Experiences of using or riding beca, Numbers of using or riding beca. The assessment of Independent Variables (Innovation Factor) is all five (5) factors involving the characteristics of eBECA in Malaysia.

2.4 Qualitative Data Collection and Analysis

To enhance quantitative findings' validity and gain deeper insights into adoption, we used a triangulation approach. We conducted qualitative interviews with 25 diverse tourists to capture nuanced motivations, perceptions, and experiences related to eBECA. These open-ended interviews explored interactions, advantages, disadvantages, and overall impressions. Qualitative data underwent thematic analysis to identify patterns. Combining quantitative and qualitative methods provided a holistic understanding of eBECA's diffusion. Quantitative analysis identified significant factors, while qualitative interviews delved deeper into perceptions and experiences. Triangulation involved comparing and contrasting both sets of findings to ensure consistency and validity, enriching our study's overall comprehensiveness.

3 Findings and Discussion

Clean, transform, and model data to gain business insights. Data analysis aids decision-making. Data analysis permits the unplanned investigation of new results, according to [17]. Thus, it formalizes the behavior of discovering new data associations.

Computers ease this too. SPSS evaluated the Malaysia E-Beca adoption survey. This program simplifies quantitative research data collecting and tabulation by managing massive data sets. Multiple regression analysis explored independent-dependent relationships. Multiple regression analysis examined how innovation characteristics influenced eBECA uptake in Malaysia.

Next, the Pearson Correlation Coefficient was used to analyze Malaysia's eBECA uptake's characteristics of innovation. [17] define a correlation coefficient as the linear link between two ranking or numerical variables.

H0: The characteristics of innovation are not positively associated with the adoption of eBECA.

H1: The characteristics of innovation are positively associated with the adoption of E-Beca in Kuala Terengganu.

Based on Table 1. below, the Multiple Regression Analysis indicate that the characteristic of innovation is significant to the adoption of eBECA. It has a beta value of 0.308 with the significance value of 0.001. Hence, this showed that there is a significant between both variables. Therefore, the researcher concludes that from the hypothesis testing, the null hypothesis (H0) is rejected.

The Table 2. indicate the significance level of the independent variables toward the dependent variable. The correlation value of characteristics of innovation is 0.631 with the significance value of 0.000. This showed that there is a positive correlation and strong relation between the characteristics of innovation and the adoption of eBECA in Kuala Terengganu.

The study reveals a strong positive correlation between distinct innovation attributes and the adoption of Electric Trishaws (eBECA) as electric vehicles for business continuity management. These attributes include Relative Advantage, Complexity, Compatibility, Observability, and Trialability. Through rigorous data analysis, each innovation characteristic is shown to significantly contribute to the integration of eBECA within business continuity strategies, especially in the electric trishaw domain.

Table 1. Multiple Regression Analysis (Coefficients)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.150	0.202		5.699	0.000
	INDEPENDENTVARIABLE	0.308	0.089	0.273	3.470	0.001

(Sources: SPSS Output)

Table 2. Pearson’s Correlations between Independent Variables and Dependent Variable

		INDEPENDENT VARIABLE 1	DEPENDENT VARIABLE
INDEPENDENT VARIABLE	Pearson Correlation	1	0.631**
	Sig. (2-tailed)		0.001
	N	385	385
DEPENDENT VARIABLE	Pearson Correlation	0.631**	1
	Sig. (2-tailed)	0.001	
	N	385	385

** Correlation is significant at the level (2-tailed)

(Sources: SPSS Output)

Qualitative research methods, including in-depth interviews with industry stakeholders and focus group discussions, were employed to gain deeper insights into eBECA’s adoption. Thematic analysis of qualitative data unveiled patterns and themes, shedding light on the motivations, challenges, and opportunities associated with adopting eBECA. Relative Advantage emerges as a key factor, indicating that users perceive eBECA as offering clear advantages over conventional transportation methods, fostering a favorable disposition toward adoption. Complexity, while a factor, remains influential when perceived as manageable, preserving readiness to adopt with adequate support. Compatibility underscores eBECA’s alignment with prevailing transportation practices, facilitating seamless integration. Observability highlights the visible benefits, such as reduced emissions, driving wider adoption. Trialability’s impact is seen through opportunities for limited eBECA experiences, mitigating concerns and boosting user confidence.

In summary, this study establishes the interplay between innovation attributes and eBECA’s adoption, advancing our understanding of technology adoption dynamics. It emphasizes strategic implications for integrating electric vehicles like eBECA into transportation networks and highlights the undeniable correlation between eBECA’s innovation attributes and its adoption in business continuity strategies. By recognizing this connection, businesses and tourism destinations can glean valuable insights for bolstering their resilience through the incorporation of eBECA into their transportation

infrastructure. [4] identifies practices of business-to-business relationship management that lead to building resilience during crisis. In business continuity, eBECA is vital for eco-friendly and reliable transportation. This study aids decision-makers in integrating eBECA for uninterrupted operations.

4 Limitation and Conclusion

This research has limitations, including respondents' potential lack of honesty, time constraints in face-to-face surveys, and the necessity for digital data collection platforms. To ensure comprehensive reports, researchers should identify appropriate respondents and streamline outreach. Language and knowledge barriers can impact respondents' comprehension of questions, so careful wording in questionnaires is essential for truthful responses. Reducing the number of questions can also maintain respondent interest. Future researchers should plan early, identifying limitations and taking necessary actions to enhance findings' relevance and benefit. This research investigates eBECA adoption within the BECA community and beyond, with three independent variables: innovation characteristics, user characteristics, and external factors. Data analysis employed Multiple Regression and Pearson's Correlation Analysis, accepting two hypotheses related to innovation and external factors, while rejecting those involving user characteristics. These findings contribute valuable insights, promoting further eBECA development and community engagement, ultimately achieving the research objectives successfully.

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Examining the Contribution of Entrepreneurial Education Programs and Entrepreneurial Human Capital on Small and Medium Enterprises Perceived Business Performance in the United Arab Emirates, UAE: The Mediating Role of Absorptive Capacity

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Abstract. This study investigates the impact of entrepreneurial education and human capital on Small and Medium Enterprises (SMEs) in the UAE, with a focus on their performance within the context of constraints that often hinder survival and innovation. It emphasizes the significance of entrepreneurial education and prior entrepreneurial experience for SME founders and employees, highlighting their role in skill acquisition and proficiency development. Additionally, the research underscores how human capital enhances absorptive capacity, enabling SMEs to effectively leverage external knowledge.

Employing a hybrid methodology that combines quantitative and qualitative data sources, the study provides a comprehensive understanding of the intricate mechanisms governing SME strategy implementation, serving as a model for future SME strategy research. This research advances our comprehension of business strategy by exploring the interplay between entrepreneurial education, human capital, and SME performance in the UAE, with a focus on the mediating role of absorptive capacity. The findings offer practical implications for SMEs, educators, and policymakers, promoting enhanced entrepreneurial capabilities, innovation, and competitiveness. However, limitations such as potential response bias and limited generalizability highlight the need for future longitudinal research.

Keywords: SMEs · entrepreneurial education · human capital · absorptive capacity · Competitive Strategies · UAE

1 Introduction

Small and medium enterprises (SMEs) often encounter financial challenges and limited managerial infrastructure, which can lead to reduced investments in research and development (R&D) (Jones & Craven 2001; Lim & Klobas 2000; Nooteboom 1993). This lack of investment can impede their innovation efforts. To remain competitive, SMEs

must explore alternative internal factors, such as enhancing their human capital (Wang, Wang, & Horng 2010). The importance of human resources as intangible assets for sustained success has grown, surpassing the traditional sources of competitive advantage for these businesses (Harel & Tzafrir 1999).

The educational and entrepreneurial experience of firm owners/managers and employees play a crucial role in expanding individuals' entrepreneurial knowledge, skills, and mindsets, garnering significant attention from scholars and policymakers (Walter & Block 2016). Specifically, entrepreneurship education and development programs are designed to enhance the cognitive capabilities and proficiencies of aspiring small business owners and managers, equipping them with the necessary competencies for opportunity recognition, problem-solving, creative thinking, networking, risk-taking, and venture management (Cushion 1997). Moreover, the existing literature commonly supports the notion that prior entrepreneurial experiences foster the acquisition of unique abilities and competencies that distinguish them from those obtained through regular employment or formal education. These experiences not only enhance and expand the knowledge base of firms but also have the potential to create new and complementary networks which can positively impact the firm (Minniti & Bygrave 2001; Parker 2013).

While previous research has primarily focused on the significant impact of entrepreneurship education programs (EEPs) on shaping entrepreneurial intentions, acknowledging a positive association influenced by cultural values and national contexts (Bae, Qian, Miao, & Fiet 2014; Nabi, Liñán, Fayolle, Krueger, & Walmsley 2017; Zhang, Li, Zeng, Zhang, & Lu 2022), it has also recognized the presence of heterogeneous effects and subtle nuances in this relationship, including adverse and nonlinear impacts (Nabi et al. 2017; Pérez-Macías, Fernández-Fernández, & Vieites 2022). However, a gap remains regarding the translation of intentions into actual entrepreneurial performance. Two gaps in the existing literature become apparent. Firstly, recent studies underscore the requirement to delve into the interconnections between education tailored for entrepreneurship, the resulting human capital assets, and the eventual outcomes in entrepreneurship. Secondly, prevailing perspectives on the correlation between human capital and its consequences have traditionally remained fixed. Nevertheless, contemporary research suggests that exploring the dynamic facets of human capital could yield valuable insights (Martin, McNally, & Kay 2013).

Moreover, it is essential to note that the human capital associated with prior entrepreneurial experiences has been largely neglected in prior research investigating the association between employee attributes and firm-level productivity (Braunerhjelm & Lappi 2023). The preexisting knowledge held by personnel within an organization has the potential to contribute significantly to its absorptive capacity (AC), which pertains to an organization's capacity to grasp and implement recently acquired knowledge to the process of creating new products or improving existing ones (Cohen & Levinthal 1990; Zahra & George 2002). Shane (2000) studied patented technology commercialization by entrepreneurs, finding that prior knowledge of markets, customer needs, and problem-solving influenced opportunity identification for each entrepreneur.

In addition to the above research gaps, we have identified a lack of adequate integration of a range of theoretical frameworks in the examination of entrepreneurship, particularly with a concentrated emphasis on the significance of human capital. While

acknowledging the fundamental importance of human capital in the understanding of entrepreneurship, an untapped opportunity exists to enhance our understanding by incorporating a broader array of theories more comprehensively. Theories of learning frequently highlight the progressive aspect of human capital and the significance of acquiring knowledge. However, there is a scarcity of empirical research that investigates the process of learning within the context of entrepreneurship (Marvel, Davis, & Sproul 2016). For example, one such avenue is the exploration of absorptive capacity, which has the potential to contribute valuable insights to the existing body of knowledge and assist us in comprehending the strategies employed by resource-limited entrepreneurs to gather the necessary means for initiating their ventures. SMEs actively seek knowledge from external sources, but assimilating external knowledge requires a certain level of absorptive capacity (Dyck, Starke, Mischke, & Mauws 2005; Stock, Greis, & Fischer 2001). Notably, the characteristics of founders and managers, such as their educational attainment and industry experience, exert significant effects on firm performance (Colombo & Grilli 2005; Grilli & Murtinu 2018; Mion & Opromolla 2014).

Therefore, this study emphasizes the importance of entrepreneurial education and prior experiences of owners and employees in shaping the absorptive capacity of knowledge within SMEs, given their limited resources and connections to scientific communities. This research endeavors to create a theoretical framework to examine how entrepreneurial human capital (EHC) and entrepreneurial education programs (EEPs) influence the perceived business performance of SMEs in the UAE. Specifically, it focuses on how SMEs can optimize their human capital resources to enhance absorptive capacity (AC), adopt competitive strategies, and succeed in highly competitive business environments. By understanding how SMEs leverage their entrepreneurial human capital and education to build absorptive capacity (AC) and utilize various competitive strategies, valuable insights can be gained to enhance SMEs' competitive advantage and overall success.

The proposed research will follow a conventional research structure common in business management. It will include a structured abstract covering objectives, methods, results, limitations, contributions to literature, practical implications, implications, and originality. The introduction will address the current status, knowledge gaps, significance, research questions, and objectives. Theoretical framework and research model sections will clarify employed theories and variables. The literature review will encompass relevant studies, and the research method will detail data sources, scope, methodologies, design, and analytical approaches. Data analyses will assess representativeness, biases, reliabilities, and validities using qualitative coding, triangulation, synthesis, comparison, and hypothesis testing. Results and interpretation will present findings, followed by conclusive remarks proposing measures. The contributions and implications section will elucidate the knowledge contributions, while the limitations and future research section will acknowledge the research's limitations. References will follow APA style, and appendices, if needed, will be labeled accordingly. This structured approach ensures a systematic exploration of business management research.

2 Theoretical Background and Hypotheses Development

Given the complexity of the entrepreneurial process, it is essential for research efforts to integrate diverse theories within the field of entrepreneurship. This multifaceted phenomenon benefits from a variety of perspectives, which can significantly improve our understanding (Marvel et al. 2016). To address this research question, various theoretical perspectives have been explored. The theoretical background of this study draws on significant approaches that shed light on the connection between EEPs, EHC, and the perceived performance of the company or business. Notably, the “Human Capital” theory, “Resource-based” theory, “Dynamic Capabilities” theory, and “Absorptive Capacity” theory offer valuable insights into this relationship (Barney 1991; Capaldo & Zollo 2001; Cohen & Levinthal 1990; Grant 1991; Sweetland 1996; Zahra & George 2002).

Human Capital Theory: According to (Becker 1964), experience and education form the core attributes of the human capital concept. Human capital theory suggests that individuals or groups with higher levels of knowledge, skills, and competencies are expected to achieve superior performance outcomes compared to those with lower capacities. Standard measures of human capital include educational attainment, work history, being raised by entrepreneurial parents, and diverse life experiences (Martin et al. 2013).

The field of academic research on human capital theory encompasses various forms of education, including formal and informal education, on-the-job training, and vocational education. These significantly influence the research design of studies focusing on human capital and individuals’ economic capabilities (Sweetland 1996).

Becker (1964) introduced a theory on human capital investments, wherein he distinctly classified two types of capital: general and specific. General human capital comprises knowledge and skills that can be applied in diverse economic settings and is typically acquired through formal education. Specific human capital pertains to context-specific knowledge and skills gained through practical experience or education.

One specific area of interest within the realm of education is Entrepreneurial Education Programs (EEPs), developed with the intention of providing individuals with the essential skills and knowledge for entrepreneurial careers (Rauch & Hulsink 2015). The term “entrepreneurship education” (Fayolle & Klandt 2006) refers to any instructional program or educational method designed to develop entrepreneurial attitudes and skills.

Participation in EEPs has been found to enhance managerial practices, improve performance, and foster a proactive approach in navigating uncertainties and encouraging resourceful improvisation to overcome environmental constraints (Reuber, Dyke, & Fischer 1990; Scazziota, Andreassi, Serra, & Guerrazzi 2020). Creative skills cultivated through EEPs play a critical role in generating fresh ideas and identifying opportunities (Gundry, Ofstein, & Kickul 2014). EEPs also enhance knowledge, skills, attitudes, and self-belief, all of which significantly contribute to overall entrepreneurial success (Munawar, Yousaf, Ahmed, & Rehman 2023). Learning entrepreneurial skills, an ongoing process, fosters the acquisition of knowledge and behavior for effective venture management (Corbett 2002; Ronstadt 1988; Shane & Venkataraman 2000). In the majority of instances, EEPs not only aim to cultivate objective entrepreneurial competencies that

lead to successful business ventures and value creation but also actively foster individuals' creativity and innovation, encouraging them to develop unique business concepts (Lackéus 2014). Thus, we propose the following hypothesis:

H1: *Increased participation in Entrepreneurship Education/Programs (EEPs) by firm owners/managers and employees positively influences perceived business performance of SMEs.*

On the other hand, previous entrepreneurial experience contributes to practical wisdom and behavioral change, highlighting the significance of entrepreneurial learning in shaping successful entrepreneurs (Kolb 1984; Politis 2005; Reuber et al. 1990). Owner/managers and employees who have previously engaged in entrepreneurial activities possess a distinct type of specialized knowledge which significantly influences their business performance (Rauch & Rijsdijk 2013). As an illustration, Shane (2000) identified three dimensions of prior knowledge necessary for identifying opportunities in the high-technology context: knowledge of markets, methods to cater to markets, and customer issues. This prior experience not only offers valuable learning opportunities, allowing individuals to learn from past mistakes and make more informed decisions in future ventures (Farmer, Yao, & Kung-Mcintyre 2011), but also fosters a more practical understanding of the challenges associated with business success, which helps in tempering the overconfidence often observed in entrepreneurs (Koellinger, Minniti, & Schade 2007). As a result entrepreneurs are more likely to have cautious and realistic growth expectations for their new ventures (Corbett 2005).

Recent empirical evidence highlights the strong association between EHC among employees and increased firm productivity. Braunerhjelm & Lippi (2023) demonstrate that a 10% increase in the proportion of employees with prior entrepreneurial experience leads to a significant 3.9% rise in firm-level productivity. With this in mind, we propose the following hypothesis:

H2: *Higher levels of prior entrepreneurial experience among firm owners/managers and employees positively influence perceived business performance of SMEs.*

Resource-Based View Theory: Scholars' comprehension and examination of the role of human capital in entrepreneurship have significantly drawn from the principles of strategic management theories. This tendency to integrate insights from related fields is a prevalent practice in entrepreneurship research, providing guiding frameworks for exploration (Marvel et al. 2016).

The resource-based view (RBV) and dynamic capabilities view (DCV) are two essential perspectives for understanding firm performance. RBV, introduced by Barney (1991), emphasizes how the advantage derived from the resources of a firm contributes to its competitive advantage and superior performance. The foundation for sustaining a competitive edge lies in recognizing that a firm's resource advantage is derived from its possession of valuable, rare, difficult-to-imitate, and non-substitutable resources (VRIN/VRIO). According to the Resource-Based View (RBV), traditional factors such as natural resources, technology, or economies of scale are no longer the sole determinants of competitive advantage, as they are susceptible to easy replication. Instead, it hinges on an organization's valuable, rare, and hard-to-imitate internal resources. Human capital, often seen as an "invisible asset," plays a vital role in this equation (Stiles & Kulvisaechana 2003).

Nevertheless, the RBV faces criticism regarding its potential for practical implementation in organizational research. Research on this topic has been subject to definitional challenges, with certain authors pointing out its relevance in relatively stable environments that require both stability within the organization and in its external environment (Lengnick-Hall & Wolff 1999; Priem & Butler 2001). To overcome such limitations, a considerable expansion of the RBV arises through the concept of ‘dynamic capabilities’ (DC), representing a set of organizational capabilities that empower companies to skillfully adjust or respond to changes in fluctuating or ever-changing contexts (Eisenhardt & Martin 2000; Teece, Pisano, & Shuen 1997; Teece 2007).

Dynamic Capabilities Theory: Dynamic capabilities (DCs) create a clear differentiation between a company’s resources and capabilities, emphasizing the importance of effectively deploying such resources to achieve desired objectives. Dynamic capabilities (DCs) refer to an organization’s ability to efficiently integrate, develop, and adapt internal and external competencies in response to rapidly changing environments. Unlike traditional resources, DCs are not necessarily difficult to copy but are crucial for maintaining competitiveness in dynamic conditions. DCs involve learning processes, allowing organizations to reorganize resources and established procedures to stay competitive.

The increasing accumulated knowledge and studies regarding dynamic capabilities (DC) have been subject to critique, highlighting the requirement for additional empirical studies or investigations. Scholars advocate identifying distinctive organizational procedures or methods as DCs to generate empirical data for further developing and validating theoretical frameworks (Killen et al., 2012). As this field has progressed, it has come to recognize the organization’s absorptive capacity (AC) as an integral component of dynamic capabilities in the context of knowledge-based competition (Fosfuri & Tribó 2008; Zahra & George 2002).

Absorptive Capacity Theory: Although the RBV and DCV perspectives have demonstrated their value, there exists an opportunity to enhance our understanding of how human capital influences entrepreneurship. The suggestion put forth is that by incorporating additional theoretical perspectives, we can significantly augment the extent of research in this field. A promising avenue involves exploring how entrepreneurs gather and utilize knowledge over time. This inquiry has the potential to yield valuable insights into the complex role that human capital plays in guiding entrepreneurial achievements (Marvel et al. 2016).

The growing importance of external knowledge resources has led to the prominence of absorptive capacity (AC) as a highly significant concept for knowledge acquisition and strategic advantage (Camisón & Forés 2010). The concept was significantly influenced by the early work of Cohen and Levinthal (1990), which emphasized the importance of absorptive capacity (AC) in obtaining external knowledge resources and facilitating innovation and dynamic behavior. At its core, it entails acknowledging the worth of novel external knowledge, assimilating it internally, and applying it commercially. Absorptive Capacity (AC) plays a central role in bridging dynamic capabilities, the organizational learning process, and knowledge management practices. Its versatile application spans multiple research fields.

According to Grant (2021), knowledge stands as the most vital competitive advantage for a firm. According to Spender (1996), knowledge and the firm’s ability to create it

are the fundamental pillars of the firm's theory. A considerable amount of knowledge within a firm is embedded within its human capital. Consequently, the strategic process of selecting, developing, and effectively utilizing human capital can be harnessed to generate value for the firm (Hitt, Bierman, Shimizu, & Kochhar 2001). Firms attain exceptional performance not just by having superior resources but also by having a unique ability to efficiently leverage these resources. This alignment is consistent with the firm's viewpoints on capabilities and dynamic capabilities, as outlined by Penrose (1959) and further expounded upon by Varadarajan (2023).

For improved innovation performance, organizations must gather information from diverse sources, including industry spillover knowledge and knowledge from academia and research institutions (Cohen & Levinthal 1989; Julien, Andriambelison, & Ramanalahy 2004). The inclusion of diverse knowledge sources has been found to enhance organizational learning and innovation performance (George, Zahra, Wheatley, & Khan 2001; Jones & Craven 2001). Consequently, small and medium enterprises (SMEs) can enhance their performance by collecting information from a variety of sources and maintaining a diverse range of knowledge bases.

Therefore, we propose the following hypotheses for testing:

H3: *Greater involvement of firm owners/managers and employees in Entrepreneurship Education/Programs (EEPs) positively impacts the firms' absorptive capacity, enabling them to effectively assimilate and utilize new knowledge for innovative ventures.*

H4: *Increased participation in Entrepreneurship Education/Programs (EEPs) by firm owners/managers and employees enhances the firms' absorptive capacity, enabling them to efficiently apply existing knowledge and refine established practices for improved performance.*

H5: *Higher levels of prior entrepreneurial experience among firm owners/managers and employees enhances the firms' absorptive capacity, enabling them to effectively assimilate and utilize new knowledge for innovative ventures.*

H6: *Higher levels of prior entrepreneurial experience among firm owners/managers and employees enhances the firms' absorptive capacity, enabling them to efficiently apply existing knowledge and refine established practices for improved performance.*

Entrepreneurship encompasses the recognition and pursuit of entrepreneurial opportunities. However, for entrepreneurial firms to maximize their value, they must also engage in strategic actions (Hitt, Ireland, Camp, & Sexto 2001). Entrepreneurs effectively convert their education and experiences into knowledge through two primary processes: exploitation and exploration (Enkel, Heil, Hengstler, & Wirth, 2017; Minniti & Bygrave, 2001). Exploitation involves utilizing existing knowledge to refine and implement established practices (Holmqvist 2000). On the contrary, exploration entails pursuing new possibilities through experimentation and innovation (March 1991). Both exploitative and exploratory transformations contribute to knowledge development. Exploitative transformations provide stability and faster decision-making based on established knowledge (March 1991), while exploratory transformations foster innovation and the adoption of new managerial practices (March 1991).

Entrepreneurs who prioritize exploration are more effective in identifying and capitalizing on opportunities (Hall 1995; Katz 1995; MacMillan 1986; Westhead & Wright 1998). Exploratory business strategies involve understanding new customer demands and developing innovative value propositions (Benner, M. J., & Tushman, M. L 2003;

Wei, Z., Yang, D., Sun, B., & Gu, M. 2014). Therefore, explorative strategies require adaptability, diversity, and decision-making autonomy, often resulting in the creation of new business models (O'Reilly & Tushman 2008). With this in mind, we hypothesize that:

H.7: *SMEs that opt for an exploratory competitive advantage strategy will experience a positive impact on their perceived business performance.*

An exploitation strategy, on the other hand, is oriented toward enhancing the efficiency of organizational processes and routines (Benner & Tushman 2003). Empirical evidence suggests that SMEs leveraging expertise in exploitation can result in improved transaction transparency, reduced information asymmetries, and decreased coordination costs within the organization and in its interactions with customers and suppliers (Müller, Buliga, & Voigt 2021). Considering Zott & Amit (2008) argument that heightened transaction efficiency leads to a comprehensive improvement in the efficiency of the business model, we propose the following hypothesis:

H.8: *SMEs that choose an exploitative competitive advantage strategy will observe a positive influence on their perceived business performance.*

Based on the research findings, it can be argued that the exploitation-exploration relationship is often perceived as conflicting by several researchers (Chakma, Paul, & Dhir 2021). This perspective arises from the fact that it necessitates diverse organizational structures, capabilities, processes, and strategies, potentially leading to internal conflicts or contradictions when allocating resources within a firm (Smith, Gilbert, & Sutherland 2017). However, prior studies emphasize the significance of affording equal importance to both exploitation and exploration, which is crucial for businesses aiming to gain a competitive edge and ensure long-term viability (Chakma et al. 2021; March 1991; Vahlne & Jonsson 2017).

Research on organizational ambidexterity demonstrates its strong theoretical link to enhancing firm performance and profitability (Junni, Sarala, Taras, & Tarba 2013), driving sales growth (Dolz, Iborra, & Safón 2019; He & Wong 2004), ensuring firm survival during crises (Dhanalakshmi & Jwalapuram 2023; Dolz et al. 2019), and fostering innovation performance (Argade & Mazumdar 2023; Tian, Dogbe, Pomegbe, Sarsah, & Otoo 2021). Based on these insights, it can be hypothesized that:

H.9: *SMEs that strike a balance between exploratory and exploitative competitive strategies will experience higher perceived business performance compared to those that prioritize one strategy over the other.*

The hypotheses are outlined in the conceptual model diagram (Fig. 1).

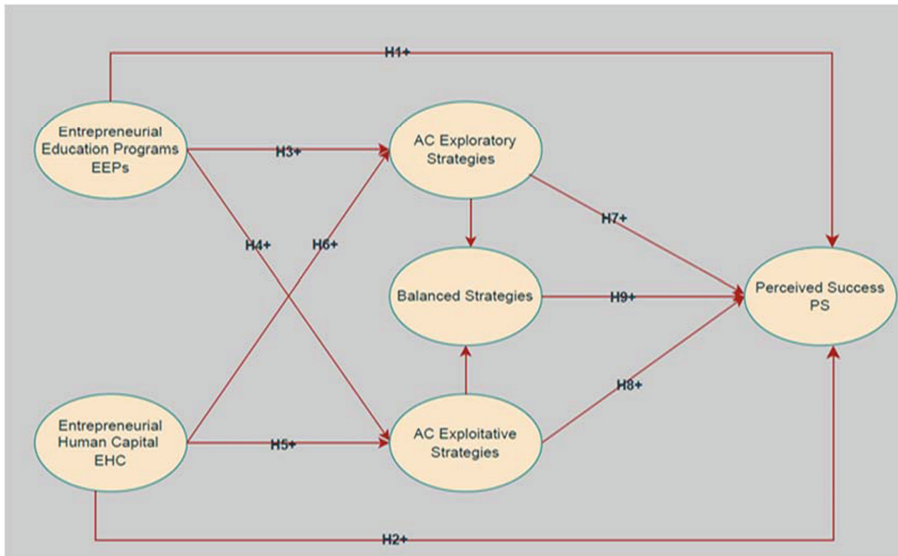


Fig. 1. Conceptual Model

3 Research Methodology

Population: This research focuses on Small and Medium Enterprises (SMEs) located in the United Arab Emirates (UAE) as the population of interest. These SMEs will serve as the target population from which the sample will be selected.

Sample and Sampling Procedure: The research will employ a purposive sampling technique to carefully select a representative sample of SMEs from the UAE. The sample will include SMEs from diverse sectors of business and geographical locations within the UAE. The determination of the sample size will be conducted based on the principle of saturation, ensuring that sufficient data is collected to achieve data adequacy and thematic saturation in the qualitative component, and achieving an appropriate sample size for statistical analysis in the quantitative component.

Data Collection: Combining both quantitative and qualitative data collection methods, the research will gather quantitative data through surveys or questionnaires administered to SME owners/managers and employees. The survey instrument will include established scales that have undergone previous validation and testing to measure variables such as prior participation in Entrepreneurship Education/Programs (EEPs), the level of Entrepreneurial Human Capital (EHC), and firm-perceived performance indicators.

In the qualitative aspect, the research will involve conducting in-depth interviews or focus group discussions with selected SME owners/managers and employees to gain deeper insights into their experiences and perceptions.

Measurement: The quantitative data collection will utilize reliable and validated measurement scales to assess the variables of interest, such as EEP participation, EHC, firm-perceived performance, and Absorptive Capacity (AC). These measurement scales will be selected based on previous research and their appropriateness for the study objectives.

For the qualitative data collection, interview protocols or focus group guides will be developed to ensure consistent and relevant data collection.

Data Analytic Strategy: The quantitative data collected will be analyzed using statistical techniques, such as partial least squares (PLS) modeling. PLS modeling allows for the examination of complex relationships and can handle both formative and reflective constructs within the same model. This approach will enable the examination of direct relationships between EEP, EHC, and firm success, as well as the mediating role of AC.

Thematic analysis or other appropriate qualitative analysis methods will be utilized to examine the qualitative data and uncover significant themes and patterns related to the impact of EEP and EHC on firm success.

4 Conclusion

Potential Contribution to the Strategy Literature: The proposed research carries the potential to make a noteworthy contribution to the field of business strategy by exploring the dynamic relationship between entrepreneurial education, human capital, and firm performance in the context of SMEs. Historically, entrepreneurship research has played a pivotal role in demonstrating the practical relevance of various academic disciplines, challenging assumptions, and providing valuable insights (Thurik et al. 2023). This study aims to shed light on an essential aspect of strategic management by examining how SMEs leverage their entrepreneurial human capital to implement both exploratory and exploitative competitive strategies.

The research design is particularly noteworthy as it adopts a hybrid methodology that combines data from both quantitative and qualitative sources. This comprehensive approach will provide a nuanced understanding of the underlying mechanisms involved in strategy implementation. By setting an exemplary model for future studies, this research enables a holistic view of strategy and performance in SMEs.

Furthermore, this investigation goes beyond exploring individual components and delves into the mediating role of absorptive capacity, enhancing our understanding of how these factors interconnect and impact the overall performance of SMEs. By revealing the delicate balance between exploration and exploitation, the study provides SMEs with crucial insights to gain a competitive advantage and ensure long-term sustainability in a dynamic business environment. It also highlights that an organization's knowledge absorptive capacity is not limited solely to the organization itself but also depends on the capabilities of individuals within the organization (Lane, Koka, & Pathak 2006). The research not only enhances our comprehension of SMEs' strategic practices but also uncovers new perspectives and avenues for further scholarly exploration in the field of business strategy. These valuable contributions will enrich the existing body of knowledge and promote advancements in strategic management practices.

Implications: The research findings have practical implications for SMEs, educators, and policymakers. SMEs can use these insights to strengthen their entrepreneurial capabilities, boost innovation, and enhance competitiveness. Educators can refine entrepreneurial education programs to align with the identified success factors. Policymakers can formulate policies that promote entrepreneurship and provide resources for SMEs to develop their human capital effectively.

Limitations: It's important to acknowledge the limitations of this study. The research relies on self-reported data, which may introduce response bias. The sample size is finite, limiting the generalizability of the findings. Longitudinal studies could offer a more comprehensive understanding of the dynamic relationships explored in this research.

Future Research Directions: Future studies could explore the role of cultural and contextual factors in shaping the impact of entrepreneurial education. Long-term studies could track the evolution of entrepreneurial capabilities and their effects on performance over time. Comparative studies across different regions and industries could provide insights into variations in strategy implementation and performance outcomes among SMEs. Furthermore, future research could explore the dual aspects of technology and digitalization, examining their influence on absorptive capacity and strategy execution in SMEs. This research could also investigate the impact of Industry 4.0 on established industrial frameworks with the introduction of novel technologies, thus offering a comprehensive understanding of this transformative phenomenon.

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The Influence of Leadership Styles on *Organizational Performance* to Small and Medium Telecom Enterprises

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Abstract. The rapidly changing and highly competitive global business environment requires that Telecom Enterprises (TEs) practice high levels of management innovation to achieve customers satisfaction and gain competitive advantage over competitors. The results of which ensure long-term survivability in the marketplace. Businesses must therefore promote research and development and embrace new technological advancements in their business practices. Moreover, businesses should, keep the operational environment under constant surveillance, regularly assess performance, and strive for improvement. Therefore, knowledge management is a critical requirement for businesses' success and innovation. Harnessing knowledge requires a leadership that can effectively integrate knowledge and innovation. There are several leadership styles that are employed in running businesses where each style has a different impact on the outcome of challenges faced by TE. In the Kingdom of Saudi Arabia TEs contributed to the Saudi GDP reached SAR (\$53 billion) in 2022, and the challenges that limit their growth include low managerial and technical skills as well as limited access to information. The study employed a quantitative approach, the current researcher hypothesized four testable hypotheses from theories of literature review. In term of testing the hypotheses, primary data were collected from TEs have operated in Saudi Arabia as well as 200 were drawn for study. Additionally, the current researcher applied a mix of statistical tests to analyses the data. The finding results were shown some of hypotheses support the literature and part of the partially support. The results of these studies confirmed that the leadership styles effected on organizational performance. The results were not matching with kind of leadership styles. Furthermore, the TEs leadership were connected to best style.

Keywords: leadership · organizational performance · Regression · Telecom sector and Saudi Arabia

1 Introduction

Today's the business is highly competitive and fast-changing, requiring high levels of innovation to keep up with customer needs and sustain operations (Soto-Acosta, Popa, & Martinez-Conesa 2018; Soto-Acosta, Popa, & Palacios-Marqués 2017). Innovation is the

process that enables organizations to effectively and successfully advance, compete and distinguish themselves in the marketplace. This is achieved by transforming knowledge, ideas, concepts, and designs into improved processes, services, and products (Baregheh, Rowley, & Sambrook 2009).

According to Hill, Nancarrow, & Tiu Wright (2002); Morrison & Bergin-Seers (2002); Salojärvi, Furu, & Sveiby (2005), the success of an organization depends on its capacity to produce, exploit, and grow its knowledge-based resources.

Thus, knowledge is the most strategically significant resource, that enables organizations to compete and survive in the marketplace. The ability of business organizations to distinguish themselves hinges upon their competence in assimilating their innovation management practices with their knowledge management practices to harness knowledge for innovation (Dasgupta & Gupta 2009).

During the last five decades, knowledge, innovation, and technology have been at the center of the global economic development and business growth (Andersson, Ngels Dasí, Mudambi, & Pedersen 2016). Knowledge management is a process that involves a number of components such as technology, human resources practices, culture and organizational structures used for maximizing an organization's knowledge economy and gain competitive advantage (Abubakar, Elrehail, Alatailat, & Elçi 2019).

2 Conceptual Framework

Leadership has been defined in several ways. Kets de Fries defined it as a set of attributes, such as personality characteristics and behavior patterns, that enhances the effectiveness of a group of people in achieving a set of goals (Kets de Fries 2006). According to Yukl, leadership is a procedure of persuading others to understand and agree about what must be done and how effectively it is done. Thus, leadership is a process of enabling individual and collective efforts to achieve the shared objectives (Yukl 2013). The leadership in an organization determines the strategic direction, policies, the allocation of resources for different organizational activities and methods for accomplishing objectives (Al Khajer 2018; Kock 2012). Organizational functioning, cooperation among team members and quality of performance are influenced by how happy and motivated a member feels in the group setting (David De Cremer 2006; elly & Barsade 2001). Thus, leadership is a critical factor for the success of a business.

Leadership can be divided into five broad groups or styles: Autocratic, Democratic, Laissez-faire, Transactional, and Transformational (Cherry n.d.; Kramer 2020). Autocratic leadership is characterized by a well-defined team hierarchy and concentration of decision-making and directive power in a single individual (Hoogh, Greer, & Hartog 2015). Kurt Lewin, the founder of modern social psychology, illustrated that Autocratic leadership is authoritarian in nature and the leaders who possess authoritarian traits exclude their team members from the decision-making process.

Generally, autocratic leadership is regarded as damaging to organizational morale and performance (David De Cremer 2006; Hoogh et al. 2015). This is due to the fact that centralized authority results in an increased sense of discrimination (Hoogh et al. 2015) and a feeling of being undervalued among subordinates (Anderson & Brown 2010). The Autocratic leadership style should be used in moderation, as its overuse and reliance have

a domineering and tyrannical effect on workers, which is detrimental to the productivity of the organization.

As a result of autocratic leadership, the workers may feel unacknowledged, demotivated, and unattached to the group because their input is never requested.

According to (Hoogh et al. 2015), autocratic leadership is not always detrimental to group dynamics and organizational performance have positive effects by creating a predictable and secure hierarchically-ordered environment.

Authoritarian leadership is seen as the most effective leadership style in situations that require quick decision-making as the leaders using this style quickly decides on what needs to be done. This works well in situations where the leader is the most educated, knowledgeable, and capable individual in the given group or organization.

The democratic leadership style, also known as distributed, shared, team and participative leadership, is characterized by decision-making decentralization with the leader as well as team members participating or sharing in the decision-making process (Al Khajer 2018; Bhatti, Maitlo, Shaikh, Hashmi, & Shaikh 2012; Mehrad, Fernández-Castro, & de Olmedo 2020). It tends to increase team members' motivation and performance because their opinions are appreciated and they feel assured of their destiny (Bhatti et al. 2012; Mehrad et al. 2020).

Laissez-faire leadership is characterized by low levels or lack of leadership, as there is virtually no exchange or cooperation between the leader and the subordinates (Skogstad, Einarsen, Torsheim, Aasland, & Hetland 2007). According to (Hinkin & Schriesheim 2008), the main distinguishing attributes of laissez-faire leadership were the absence of a reaction from the leader to various potential inputs or stimuli in different circumstances, as well as not responding to subordinates' needs and performance. Leaders possessing laissez-faire traits are delegative in nature as they allow their subordinates to make decisions for themselves in their groups. There are lots of positives to laissez-faire leadership as subordinates may view the lack of involvement of a leader as a sign of respect of boundaries, which may result in low dependency, high self-determination, and self-directed motivation among subordinates. However, this is usually workable when the group members are highly educated, skilled, and knowledgeable. This may increase the creativity and productivity of the organization. However, Laissez-Faire leadership may result in a lack of leadership and direction due to its nature of giving workers free reign with no direction from the top (Skogstad et al. 2007). The hypothesis four-A (H4a) can be estimated as laissez-faire not be used in telecom firm that operated in KSA. Furthermore, its impact on the organization may include workplace stress and bullying, role conflict and ambiguity, conflicts with co-workers, demotivation and overall negative organizational outcomes (Judge & Piccol 2004; Skogstad et al. 2007).

The general objective of Transactional leaderships is to supervise subordinates through the use of rewards such as bonuses, promotion, performance-related pay, praise and acknowledgement as compensation for effort, performance and successful completion of assignments (Al Khajer 2018; Bass, Avolio, Jung, & Berson 2003; Bono & Judge 2004; Kippenberger 2002). Transactional leadership is generally associated with having well defined job descriptions, allocation of responsibility, setting of clear objectives that are well communicated and coordinated, and carrying out performance appraisals

(Kippenberger 2002). By connecting performance to rewards and providing employees with the necessary resources for the jobs and assignments, transactional leadership allows organizations to realize their objectives more efficiently (Zhu, Chew, & Spangler 2005). Although a study by (Sofi & Devanadhen 2015) concluded that Transactional leadership has no direct impact on organizational performance because it discourages creativity among employees. Creating an optimal environment for performance, Transactional leadership has a positive effect on organizational performance and outcomes (Longe 2014). The Transactional leadership is exciting in Telecom enterprises firms can be proposed as hypotheses four (H4).

Transformational leadership focuses on influencing hearts and minds, empowering subordinates, creating an environment that enables the workforce to continually learn, and pursue change and improvement (Kippenberger 2002). It is comprised of four constituents intellectual stimulation, inspirational motivation, individualized consideration and charismatic role modelling (Bass & Avolio 1993; Gumusluoglu & Ilsev 2009). Through intellectual stimulation, transformational leadership raises and widens curiosities, and encourages subordinates to broaden their views on challenges. Inspirational motivation expresses a strong and exciting vision of the future, builds, and enhances confidence and inspiration among subordinates. Through individualized consideration, the leader identifies and recognizes individual needs and aspirations for growth and development and promotes and encourages the growth of subordinates through mentoring and coaching. Charismatic leaders have a powerful vision, strong belief, and a high level of confidence. They inspire, respect, admire, influence, and encourage loyalty. Transformational leadership is closely associated with vision, support for innovation, autonomy, recognition, encouragement and challenge, all of which are causal factors of creativity and innovation (Elkins & Keller 2003). Generally, transformational leadership has been shown to have a positive effect on organizational performance (Jyoti & Bhau 2015; Sofi & Devanadhen 2015).

3 Methodology

The target population of this research is the joint telecom companies. This sector is one of the largest and well-developed services sectors in the country. We applied a mix of parametric and non-parametric tests to analyses the data firms, the questionnaire was shared with leader of telecom firms. The correlation test and regression were used in finding results.

3.1 Bivariate Correlation

Table 1 presents bivariate correlation matrix of five dependents and 5 independent variables to find the strengths of association between two variables in enterprises. The correlation matrix interpreted some important meaning. The dependent variables were represented in columns (6–10) that are Transformational leadership, Democratic leadership, Laissez-Faire leadership, Autocratic leadership, and Transactional leadership. However, independent variables were represented in columns (1–5) that are age of leader, experience, firm size, sales, and nationality. Row 2 shows that employee age positively

correlated with autocratic ($r = 0.161, p < 0.05$), training ($r = 0.552, p < 0.01$), incentive retaining, ($r = 0.407, p < 0.01$), attitude reward ($r = 0.474, p < 0.01$), appraisal feedback ($r = 0.221, p < 0.01$).

Experience of leader in column 2 was positively correlated with transnormal ($r = 0.364, p < 0.01$) and democratic ($r = 0.310, p < 0.01$). This correlation indicated that the experience of leader positively reflected to transnormal and autocratic leadership. Furthermore, column 1 shows that high education leader positively correlated with transactional leadership ($r = 0.238, p < 0.05$), Transformational ($r = 0.351, p < 0.01$), autocratic ($r = 0.235, p < 0.05$). On the other hand, the educated leader has weak col-oration with Laissez-Faire leadership ($r = 0.008$) and, Autocratic ($r = 0.0103$). Thus, results pointed the leader with high education has positively affected on Transactional and Transformational leadership and probably he not preferred Laissez-Faire leadership and Autocratic leadership.

Table 1. Bivariate correlation of TEs

D& Ind	1	2	3	4	5	6	7	8	9	10
1	1									
2	0.18*	1								
3	-0.42	0.007	1							
4	-0.25	0.23	0.493**	1						
5	0.34**	0.007	0.33	0.51**	1					
6	0.103	0.22*	-0.567	0.18*	0.051	1				
7	0.011	0.310**	0.101	0.04	0.074	0.06	1			
8	0.351**	0.364**	0.133*	0.44**	0.22*	0.155	0.312	1		
9	0.008	-0.044	0.098	0.32	0.13*	0.022	0.076	0.432**	1	
10	0.238*	-0.082	0.133	0.101	0.021	-0.089	0.08	0.759	0.088	1

Variables 1–5 (Independent variables): 1. Education, 2. Experience, 3. Personality, 4. Firm size, 5. Sales, Variables 6–10 in the table are dependent variables stand for '6. Autocratic, 7. Democratic, 8. Transformational; 9. Laissez-Faire leadership, 10. Transactional leadership. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

3.2 Regression

Multivariate regression analysis was used to five leadership due to the assumption requirement of linearity, homogeneity, absence of outliers and multilinearity were met to these practices. A series of multiple linear regression models were presented for the purpose of identifying the significant factors. In addition, the regression model was used to indicate the various associations of each model's independent and dependant variables. The regression models were used in this study to investigate the hypotheses relations between the constructs in the proposed contingency model are shown below:

Model 1: $Y1 = a1 + \beta1x1 + \beta2X2 + \beta3x1 + \beta4X4 + \beta5x5$

Model 2: $Y2 = a1 + \beta1x1 + \beta2X2 + \beta3x1 + \beta4X4 + \beta5x5$

Model 3: $Y3 = a1 + \beta1x1 + \beta2X2 + \beta3x1 + \beta4X4 + \beta5x5$

Model 4: $Y4 = a1 + \beta1x1 + \beta2X2 + \beta3x1 + \beta4X4 + \beta5x5$

Model 5: $Y5 = a1 + \beta1x1 + \beta2X2 + \beta3x1 + \beta4X4 + \beta5x5$

Where: Y1 = Autocratic, Y2 = Democratic, ‘Y3 = Transformational, Y4 = Laissez-Faire leadership, Y5 = Transactional, b0: = Intercept, (X1–X5) = predictors, X1 = Education, X2 = Experience, X3 = Nationality, X4 = Firm size (number of employees) X5 = sales revenue

There are five models that will be statistically tested: Model 1, Model 2, Model 3, Model 4 and Model 5.

Model 1: Table 2 shows in term of the linkage between firm treaties and the Auto- cratic. The statically significant were the flowing: firm size ($\beta = -0.168, p < 0.05$), company sized ($\beta = -0.25, p < 0.01$) in MNE, Table 2 shows firm revenue ($\beta = 0.269, p < 0.05$), were statically significant. On the other hand, level of education to autocratic leader was insignificantly. The H1 was true and it in same line forward with literature that linkage is partially between autocratic leadership and organizational performance Model 2: this model was tested that Democratic leadership. The ANOVA test in Table 2 shows that the model was statically significant ($F = 7.3, P < 0.01$), included MNEs variation of the model ($R^2 = 65.7\%$). The results straight stand out in Table 2 that the leader with high experience was statistically significant ($\beta = 0.78, p < 0.01$), which tells that the leader with high experience was more likely to select democratic leadership. Additionally, the educated leader in firms was statistically significant ($\beta = -0.1, p < 0.1$), which informs that the leader with high degree interest with democratic leadership. The remaining models are model 3, model 4 and model 5 where significantly as well as, the statistical result presented in Table 2, as well as the statistically examined to these models shown in Table 2.

Table 2. Regression result to Models (M1, M2, M3, M4 and M5)

Predictor	Mdel1	Model2	Mdel3	Model4	Model5
Education	-0.134	0.022	0.416***	0.076	0.433**
Experience	0.206	0.266*	0.114**	0.13	0.194*
Turnover	0.09	0.23	0.132*	0.238**	0.042
Firm size	0.25*	0.064	0.046	0.266	0.176**
sales revenue	0.168**	0.007	0.22*	0.084	0.073
ANOVA	1.2(0.044)	0.78(0.64)	1.8(0.057)	2.7(0.006)	3.01(0.003)
R square	30%	24.90%	63%	23%	21%

Dependant variables: Model1 = Autocratic, model2 = Democratic, Model3 = Transformational, model4 = Laissez-Faire leadership, model 5 = Transactional; *Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

4 Contribution

The data was collected from Saudi Arabia as well as, this collected data was used in the first research concerned in leader styles. The finding will help the Saudi and foreigner employers to understand the local manpower have ability to enhance the performance of the firms. The telecom firms were resulted improving to the economy in Saudi Arabia. This research was provided data collection that can be shared on future research. The research provided the linkage between firms and leader styles.

5 Implications

There were a lot of suggestions were developed from the findings, while a few will be mentioned here. This study was studied leadership practices of Telcom enterprises in KSA including impacts on economy of the firms. The neglecting or mismanagement to transnormal leadership will be resulted negative impact on the performance of the firm. The transactional leadership not required high educated degree to leader. The transactional leadership was a forward step to improve the efficiency in TEs.

6 Limitations

The religion culture is important to be studied in this research and observed the impact of religion culture in development practice. However, some responses have believed religion culture as personality. For example, the researcher asked responses in pilot test about Saudi government has forced firms to be closed during prayer time. The current researcher omitted this question from research due to response rate of the question was very low.

7 Suggestions for Further Research

This study was focused on five leadership styles in the kingdom of Saudi Arabia in telecom firms. Also, the linkage between leadership practice and firm's features was funded. The future studies could be used the same styles in other failed such as: health, chemical, oil firms and banking. Furthermore, the future studies may be used same leadership styles in different country such as neighbored country of Saudi Arabia and to be used same data collection.

8 Recommendation

Some part of non-western region has shortage of interesting some leadership styles. Particularly, there is shortages leadership in the Kingdom of Saudi Arabia due to limited study in this area. Additionally, this research will be added value to the existing literature of Saudi context, including the weak of recent economy (2023) and break down of medium, small, and large firms in Saudi Arabia, this research assumes special importance to TEs. Furthermore, the researcher suggested autocratic leader have long experience were required to invite new employees to training course more than old employees to increase the experience and move new employees to work hard.

9 Conclusion

The leadership styles that have been researched and published within this time frame are Transformational leadership, Democratic leadership, Laissez-Faire leadership, Autocratic leadership, and Transactional leadership. Transformational leadership was one of the most researched and has the most positive impact on organizational performance in TEs in KSA. Laissez-faire was also one of the most researched leadership styles and yet has the most negative effect on TEs. Other leadership styles that were not investigated in this research were also found to have been researched and published in the period under investigation. All articles were found to have examined more than one leadership style. The Transformational leadership style was found to increase the competency of employees, resulting in higher productivity, higher employee morale, and excellent organizational performance. The outcome of which led to innovation and positive knowledge generation management. Transformational, Transactional, and Democratic leadership have a positive impact on good financial performance of TEs, while Laissez-faire style was found to result in as role conflict and missed opportunities.

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Literature Review: Advanced Computational Tools for Patent Analysis

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Abstract. The integration of Artificial Intelligence (AI)-Powered Technologies is becoming increasingly pervasive across manufacturing and operational domains, offering a valuable avenue for informed decision-making and the exploration of cutting-edge technologies. Notably, AI incorporates a variety of advanced tools, such as machine learning, deep learning, natural language processing, data visualization, clustering etc., that play a prominent role in patent analysis. These adaptable methodologies enable researchers and industries to partake in a wide array of patent-related endeavors, encompassing the anticipation of forthcoming technological patterns and strategic technology mapping, as well as the evaluation of patent quality, recognizing infringements, and recognizing emerging technology domains and gaps in patent coverage. In this comprehensive review, our objective is to present the current advancements in the utilization of advanced computational tools for patent analysis. We achieve this by analyzing 61 articles sourced from the Web of Science database. Additionally, we offer an overview of various patent analysis techniques through a detailed taxonomy. We anticipate that this review will prove invaluable to both scholars and practitioners seeking the latest developments in the realm of patent analytics, fostering innovation and informed decision-making in the process.

Keywords: patent analysis · artificial intelligence · machine learning

1 Introduction

In the contemporary dynamic realm of technology, securing patents is crucial for organizations seeking a competitive edge and innovation protection. According to Abbas, A. *et al.* [2] patents, representing novel inventions, provide vital information for legal considerations and strategic technology planning. To develop effective Research and Development scheme, it's essential to comprehend the dynamic scientific and technological domain and stay updated with recent developments. Organizations use patent data for various purposes, including assessing novelty, tracking patent trends, predicting technological advancements, and identifying competitors. The growing volume of

patent data underscores the importance of patent search and analysis. Several tools and approaches support professionals in patent analysis, corporate management, and technology departments. The recent surge in AI has revolutionized patent data analysis [2, 37, 48, 60]. Previous research, as exemplified in Hanbury, A. *et al.*'s survey [26], has explored aspects such as visual content retrieval from patents. Aristodemou, L., Tietze, F. [6] categorized patent analysis into text mining and visualization methods, while Moura, L.C.M.A. *et al.* [49] examined scientific advancements in solar cells through patent analysis. However, a critical gap persists: the lack of a comprehensive guide for patent analytics using AI techniques. This study addresses this gap by conducting an extensive literature review focused specifically on AI methods applied in patent data analysis across various technical domains. We also propose a taxonomy for classifying AI methodologies used in extracting and analyzing patent data. We aim to offer up-to-date perspectives on the application of machine learning tools in patent analytic.

This paper is organised as follows. We summarised some of previous work in Sect. 2. Section 3 described the methodology used in this work. The analysis of data extracted from the selected paper, presented in Sect. 4. We present conclusion and future work in Sect. 5.

2 Previous Work

The rapid growth of patent data within specific technological domains poses significant challenges for analysis. Relying solely on the expertise of professionals for patent analysis, as previously suggested by Yoon, B., Park, Y [64], is no longer feasible. Hence, the adoption of computer-aided techniques has become essential to effectively evaluate patents. Abbas, A. *et al.* [2] conducts an extensive literature survey to offer an in-depth overview of patent analysis. The paper explores various intelligent tools and approaches, such as text mining and visualization, employed in patent analysis. It underscores the critical need for advanced technologies capable of efficiently analyzing the vast amounts of structured and unstructured data within patent documents. Furthermore, the study highlights the necessity for advancements in semantic-based methodologies for information retrieval. This review emphasizes the importance of implementing more efficient and adaptable strategies to meet the evolving demands of patent analysis. Aristodemou, L., Tietze, F. [6] analyzes 57 recent articles in intellectual property analytics, focusing on artificial intelligence methods. These articles are categorized into four domains: knowledge management, technology management, economic valuation, and information extraction. According to the updated literature, deep learning models and support vector machines (SVM) have prominently featured in recent intellectual property analytics. Baumann, M. *et al.* [7] conducts bibliometric research, examining patenting trends in energy transition technologies across selected countries. It provides insights into research, technology trends, and market shifts. While Germany's patenting activity is lower in some areas compared to Japan, China, and the US, it remains competitive in batteries and hydrogen. The paper emphasizes the importance of a broader perspective beyond patent statistics, highlighting that patenting alone does not guarantee market success. Knowledge generation, demonstration projects, and manufacturing investments are critical for technology development and adoption.

3 Methodology

Figure 1 shows the process flow of our methodology. We searched the Web WOS platform for this systematic literature review. Papers from the years 2018–2022 were selected from the. After conducting the initial search, which yielded 169 papers, we proceeded to apply exclusion criteria to delve deeper into the papers' content and assess their quality, ultimately selecting a total of 61 papers for our systematic literature rereview.

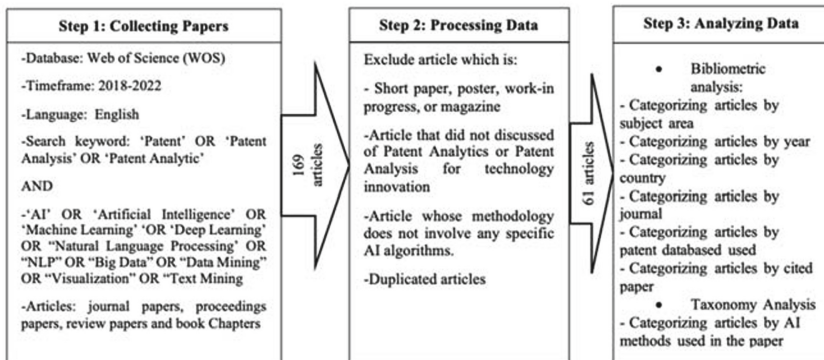


Fig. 1. Research flow

4 Result

4.1 Bibliographic Analysis Results

In this section, study involves examining the bibliographic information of the 61 publications under consideration.

Distribution of Publication by Research Area

Figure 2 illustrates the timeline of articles across various scientific fields, and we performed a qualitative trend analysis in domains like Technology and Innovation Management, Computer Science, Engineering, Strategic Management, Environmental Science, Energy, Biochemistry, Infrastructure, Chemical Engineering, and Mechanical Engineering over the past four years to identify key areas of interest in AI-based patent analysis. The category of Technology and Innovation Management is the most represented, with 38.71% of the articles. Computer Science constitutes 16.13% of the research landscape, while Energy and Engineering each contribute 9.68%. Strategic management and environmental studies account for 6.45% each, while Biochemistry, Infrastructure, and Medicine each have 3.23% of the total articles. Chemical and Mechanical sectors represent 1.61% each.

This distribution highlights the importance of Technology and Innovation Management and the diverse interests covered by various subject areas.

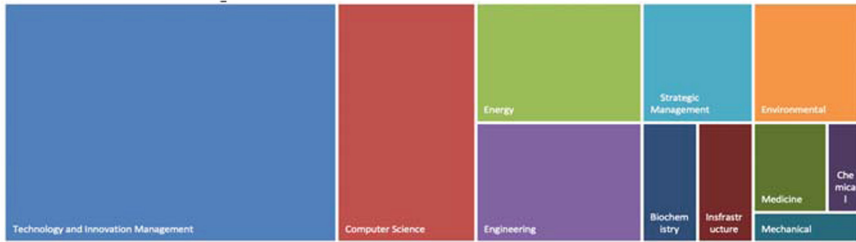


Fig. 2. Distribution of publications by research area

Distribution of Publication by Country

In this section, we highlight the geographical spread of published publications from a variety of countries.

Table 1. Distribution of publication by country

Country	Count	Total Share	Country	Count	Total Share
Korea	19	30.65%	France	1	1.61%
China	18	29.03%	India	1	1.61%
Taiwan	8	12.90%	Italia	1	1.61%
Germany	4	6.45%	Japan	1	1.61%
USA	3	4.84%	Spain	1	1.61%
Thailand	2	3.23%	Turkey	1	1.61%
Croatia	1	1.61%	UK	1	1.61%

Table 1 shows the global spread of research in AI-based patent analysis. Korean and Chinese contributions (30.65% and 29.03%) highlight their significant involvement, while Taiwan (12.90%) also plays a major role. Germany (6.45%) and the US (4.84%) are strong contenders too. Various other countries contribute, with France, India, Italy, Japan, Spain, Turkey, and the UK each at 1.61%. This international distribution of 62 papers reflects widespread global interest in AI methods for patent analysis. Asia, especially Korea, China, and Taiwan, dominates in utilizing AI for patent analysis, likely due to their strong AI research communities, innovation history, and significant roles in the global patent landscape, offering abundant data for AI tool development.

Top Cited Paper

The top-cited article [1], published in 2019 with 66 citations, focuses on engineering aspects in patent analysis. The second most cited paper, [53], links AI-driven patent analysis with computer science and technology forecasting. Additionally, three papers [17, 20, 60] each have 55 citations, covering various research areas within AI-driven patent analysis. Furthermore, three other papers [47, 55, 57], each with over 50 citations, delve into Technology and Innovation Management, exploring open innovation and

industry-specific technology trends. Lastly, article [23], with 44 citations, explores the commercial potential of healthcare innovations using advanced AI techniques. Table 2 presents these top-cited articles along with their respective citation counts and research areas. In summary, these top 10 most cited papers provide insights into the dynamic, multidisciplinary field of AI-driven patent analysis, spanning engineering, computer science, technology forecasting, and innovation management.

Table 2. Top cited paper

Paper	Cited Number	Research Area	Paper	Cited Number	Research Area
[1]	66	Engineering	[56]	54	Technology and Innovation Management
[54]	56	Computer Science	[58]	51	Technology and Innovation Management
[61]	55	Engineering	[47]	50	Technology and Innovation Management
[19]	55	Technology and Innovation Management	[4]	49	Engineering
[16]	55	Computer Science	[22]	44	Technology Forecasting and Social Change

4.2 Taxonomy Analysis Result

We will present a taxonomy categorizing advanced computational tools used in patent analysis, as observed in our literature review. As noted by Abbas, A. et al. [2], text mining and visualization techniques excel in patent analysis due to patents' technical complexity. Patents contain rich technical details and specialized terminology, making text mining crucial for extracting and comprehending their content. Visualization complements this by simplifying complex patent data into easily understandable visual representations, unveiling hidden patterns and trends. Our review underscores the need for intelligent integration of multiple techniques to effectively analyze patent data due to its structured and unstructured nature. For instance, while visualization excels in presenting patent information, it often collaborates with text mining to extract data. Additionally, various machine learning techniques are explored, with the chosen approach aligning with the model achieving the highest accuracy. The boundaries between these approaches can be flexible, sometimes blending together as these categories overlap, and articles can belong to multiple categories simultaneously.

Table 3. Taxonomy of method for patent analysis

Approach	Method	Article
Text Mining	Natural Language Processing (NLP)	[21, 25, 35, 42, 61, 63]
	Semantic based approach	[8, 19, 20, 22–24, 30, 31, 34, 36, 40, 41, 47, 50, 56, 58]
	Neural-network approach	[15–17, 51]
Visualization	Social Network Analysis	[1, 4, 9–14, 20, 25, 27, 46, 52, 57, 62]
	Association Map	[5, 32, 33, 53]
	Clustering	[5, 27, 45]
Segmentation	K-means	[5, 15, 28, 31, 36, 45, 47]
	Expectation-Maximization (EM)	[3]
	Density-based spatial clustering of applications with noise (DBSCAN)	[45]
	the Gaussian Mixture Models (GMM) cluster	[42]
Dimensionality reduction algorithm	Generative Topographic Mapping (GTM)	[18, 23, 27]
	Principal Component Analysis (PCA)	[4, 17, 39, 44, 59]
	Multidimensional scaling (MDS)	[41]
Instance-based algorithm	Self-Organizing Map (SOM)	[3, 44]
	Support Vector Machines (SVM)	[38, 44, 54]
Regression	Logistic regression	[38]
	Hierarchical regression analysis	[43, 56]
	Bayesian Regression	[29]
Ensemble Algorithm	Random Forest	[38, 54]
	Adaptive Boosting	[38]
	Extreme Gradient Boosting	[38]
Decision Tree Algorithm	Classification and Regression Tree (CART)	[38, 54, 55]

Text Mining

Text mining is a knowledge-driven methodology that applies analytical methods to extract relevant data from natural language written texts [2]. Text mining methods are commonly applied to extract valuable insights, trends, patterns, and associations from this type of information. This literature review will explore specific text mining techniques commonly applied in patent analysis, including NLP-based methods, rule-based techniques such as semantic analysis approaches, and neural network-based methodologies. Detailed explanations for each of these methods will be provided in the following sections. Table 3 provides a concise summary of patent analysis methods from the literature.

NLP: In patent analysis, NLP techniques transform complex technical information into understandable language structures by extracting grammatical structures from textual data and establishing structural relationships among components [2]. NLP applications are growing, enhancing research and decision-making efficiency. Various patent analysis systems, such as technology opportunity forecasting [26, 36, 60], technology term

extraction [62], high-quality patent recommendation [22], and technology convergence identification [42], use NLP techniques. Two NLP-based articles are discussed below. Wang and Chen (2016) introduced a unique patent mining technique to uncover telehealth technology potential, combining latent semantic analysis (LSA), an NLP method, with angle-based outlier identification (ABOD), a machine learning model. LSA extracts hidden word correlations, training ABOD to identify distinct patents. This revealed top IPCs (A61B, G06F, G06Q, A61N, G08B) in telehealth, representing prospective technologies. Kim, K. et al. [36] highlighted that keyword extraction struggles with technical terms, while SAO simplifies context and terminology challenges. SAOx analysis identifies Subject, Action, Object, and Others (SAOx) components and their relationships, providing a comprehensive understanding of technology's purpose and impact. Applied to human-machine interaction technologies, it unveiled promising components/fields and purposes/effects, aiding academia and businesses in innovation discovery.

Semantic Based Approach: The Semantic-based approach excels in patent analysis by revealing intricate relationships and contextual meanings, surpassing traditional keyword-based methods. Firstly, it enhances accuracy by considering text context, not just individual words. Secondly, it offers a comprehensive analysis, identifying a wider range of data patterns and trends. Lastly, it uncovers novel insights in the technology landscape, revealing patterns and trends that standard keyword-based methods may miss. Semantic-based systems serve various purposes, including technology convergence analysis [58], technology monitoring [30], technology opportunity forecasting and trend analysis [8, 19, 20, 22, 24, 34, 36, 40, 41, 47, 50], business opportunity identification [23], collaborative research planning [31], and open innovation impact analysis [56]. Few significant articles in this field are discussed. The study of Choi, D., Song, B [19] proposes a semantic-based approach to explore logistics technology trends using USPTO-filed patents. It uses LDA, a probabilistic model, to categorize words based on their co-occurrence in patent papers into subjects. The method involves gathering patent documents, preparing them for topic-modeling algorithm analysis, determining primary themes, and finally the selected themes are investigated in terms of patenting activity patterns and key assignees in each field in the fourth stage. Erzurumlu, S.S., Pachamanova, D [22] employ a methodology that combines topic modeling, survival analysis, and expert evaluations to predict potential healthcare technologies using patent data. They apply LDA to a distinct dataset comprising unstructured patent abstracts and claims, shedding light on commercial feasibility and fostering innovation discovery through the interpretation of the most representative terms generated by the topic model.

Neural Network-Based Approach: Neural networks in patent analysis mimic the structure and functioning of the human brain, comprising interconnected nodes and edges. They undergo training on extensive patent datasets to discern patterns, relationships, and trends within patent documents. These networks excel at scrutinizing patent papers, unveiling intricate connections, and identifying patterns and trends that elude conventional methods. Additionally, neural network-based approaches are employed in tandem with rule-based techniques in natural language processing [2]. Here, we introduce a text mining approach harnessing artificial neural networks. In a study by Chen, L. et al. [17], a neural network strategy is presented to extract semantic insights from patent documents, addressing challenges of limited automation and suboptimal extraction accuracy

in text-based patent analysis. The framework employs BiLSTM-CRF for entity identification and BiGRU-HAN for semantic relation extraction. Comparative analysis with the SAO technique and PCNNs model demonstrates superior automation, accuracy, and the ability to extract detailed and organized patent information.

Visualization

Visualization techniques have gained popularity in patent analysis due to their diverse applications, including clustering, social network analysis (SNA) and association maps. They provide a crucial advantage by simplifying complex patent data into easily understandable visual representations. These methods help analysts identify trends, patterns, and relationships within patent documents, which can be challenging to discern from raw data. Visualizations empower researchers to navigate the vast patent landscape effectively, enabling strategic decision-making, technology forecasting, and competitive intelligence.

SNA: SNA is crucial for analyzing connections and interactions within networks, involving data collection, network modeling, and graph representation. In patent analysis, SNA detects knowledge flow, technological trends [10, 12–15, 26, 28, 46, 56], technology interconnections [1, 4, 11], industry structures [51], and patent-related risks [61]. Noteworthy applications of SNA include Chang, S.-H.'s [12] study on 5G optical networks, which assessed node centrality using proximity, betweenness, and fragmentation centrality measures to identify key technologies. Chun, E. et al.'s [21] research used LDA text mining, criticality analysis, trend analysis, and SOM patent mapping to explore smart agricultural technologies and opportunities.

Association Rule and Association Map: Association rule mining uncovers meaningful relationships among dataset elements, represented visually via association maps. In patent analysis, this approach reveals innovation characteristics, technological trends, and influencers [5, 33, 52]. Kim, J.-H., Lee, Y.-G. [33], applied association rules and maps to pharmaceutical patent data from the U.S., Japan, and Europe. They assessed connections between IPC codes using support, confidence, and lift criteria, utilizing the R project and 'arules' packages. Findings highlighted a shift towards data-driven innovation in pharmaceuticals, fostering collaboration and knowledge transfer among firms.

Clustering and Segmentation Approach

Clustering and segmentation, which can be standalone visualization techniques or integrated into broader machine learning approaches, are popular in patent analysis due to their ability to simplify the complex patent landscape. They group similar characteristics based on technical aspects, aiding in trend identification, research prioritization, and competitive analysis. Common clustering and segmentation algorithms, including k-means, EM, DBSCAN, and GMM, will be discussed. Notable papers utilizing clustering methods will also be covered. Hwang, J. et al. [28] explores assistive devices for the visually impaired using GTM and SNA. GTM generates a patent map highlighting patent vacuums, while SNA links them to occupied areas. Altuntas, S. et al. [3] employed clustering techniques, including EM, SOM, and DBSCAN, to assess dental

implant technology's potential as an emerging candidate. The EM algorithm showed high efficacy in clustering patents in this emergent field.

Other Machine Learning

Other machine learning techniques are crucial in patent analysis, including dimensionality reduction algorithms like PCA, GTM, and MDS, which simplify complex patent datasets. For instance, RO used PCA and correlation analysis to assess technological prospect risk in high-tech projects, creating technology prospect risk maps. Similarly, Lee, M.-T., Su, W.-N [41] employed patent count-based methods, forward-citation analysis, and text mining, visualizing technology trends with MDS. In study of Kwon, U., Geum, Y. [38], machine learning methods were applied to predict innovative discoveries based on patent data. Quality knowledge accumulation was a significant input variable. Six machine learning approaches were evaluated using a dataset of 363,620 G06F patents, revealing the importance of knowledge acquisition quality. The XGBoost model performed best, offering potential for more efficient long-term technical planning. San Kim, T., Sohn, S.Y. [54] used multiple machine learning algorithm, including Artificial Neural Networks, Support Vector Machine, Decision Tree, and Random Forest, to analyze convergence trends in motor vehicles and telecommunications. Textual patent information was considered, and the Random Forest model proved most effective in forecasting convergence trends. Liu, B. *et al.* [44] introduced the SOM-KPCA-SVM model for classifying and predicting patent quality in the biomedical sector. This model used SOM for data grouping, KPCA for noise reduction, and SVM for classification, achieving an 84.13% accuracy rate. It significantly reduced labor and research time, making it a valuable tool for biomedical patent analysis and innovation prediction.

5 Conclusion

Patents play a vital role in evaluating industry R&D performance, providing in-depth insights into inventive activity, technology utilization, and knowledge diffusion through market transactions. In today's rapidly advancing technological landscape, patent analysis is increasingly vital for shaping business strategies and informed decision-making in our fast-evolving tech-driven world. The literature review discusses the use of advanced computational Tools for analyzing patent data. It highlights the need for the intelligent integration of multiple techniques due to the vast volume of structured and unstructured data in patents. For example, visualization and clustering methods often integrate with specific text mining approaches, while machine learning techniques are explored simultaneously to achieve the highest accuracy rate. Our goal has been to present a comprehensive overview of patent analytics research, catering to the needs of both research scholars and industry professionals. In anticipation of future endeavors, it is essential for forthcoming research to devote emphasis towards the meticulous enhancement of current methodologies, as well as the exploration of new aspects within the realm of patent analysis, and addressing emerging challenges to ensure the continued advancement of this field in both research and industrial applications.

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A Conceptual Framework to Improve Export Performance via E-Management and Commercial Diplomacy

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Abstract. This study proposes a conceptual framework that integrates e-management and commercial diplomacy to improve a business's export performance in the Saudi organizational context. The framework draws on the theoretical foundations of e-management, which provides businesses with the tools and techniques to manage their operations more efficiently and effectively, and commercial diplomacy, which enables businesses to build and maintain strong relationships with foreign governments and other key stakeholders. The conceptual framework provides businesses with a comprehensive approach to enhance their export performance, increase their competitiveness, and maximize their profitability in the global marketplace. This study lays the groundwork for further empirical research to assess the effectiveness of the framework and identify areas for improvement. Such research could involve case studies of businesses that have implemented similar frameworks or businesses that have not yet done so, to identify the potential benefits and challenges of implementing the framework. Overall, the proposed framework has the potential to revolutionize the way businesses approach international trade and achieve sustainable growth in the global marketplace.

Keywords: Electronic Management · Commercial Diplomacy · Export Performance

1 Introduction

Nowadays, technological development has contributed to creating a new pattern of management called electronic management, which assists the organization in improving its procedures [1]. Another study claimed that electronic management is a new trend that restructures the relationship between clients and institutions by transforming it into virtual communication, which improves the performance of organizations [2]. One of the important sectors that are impacted by technological development is exports, which play a vital role in the economic development and sustainability of any country worldwide. Increasing the value of exports leads to a growth in the demand for production, which indirectly also spurs the economic growth of a country [10]. Some researchers approved

that there is a positive relationship between using information technology to communicate with partners and export performance [3]. Furthermore, one of the ways to develop exports is by using intelligent systems for foreign market information [4]. This paper is organized as follows: in this first section, a brief introduction is presented. After the introduction, a detailed literature review showed the underpinning theories and hypotheses. After establishing the conceptual framework, the research methodology is presented in Sect. 3. Finally, the paper ends with a brief discussion and conclusion.

2 Literature Review

In this study, electronic management is defined as a high-performance and updated technology-based system to achieve the organization's goals with fewer errors, save time, and overcome the obstacles of geographical distance and timing. Many organizations around the world have now begun to use electronic management in their day-to-day operations by publishing their information on the Internet and using internal communication through the Intranet, hence allowing smooth networking within the organization with its personnel, as well as its clients and customers outside, to communicate conveniently and efficiently without any complex bureaucratic procedures [11].

The study also utilized commercial diplomacy as a mediator. Commercial diplomacy frequently covers two different types of activities: policy-making and business support [6, 12]. The concept of the umbrella of development or improvement of commercial diplomacy appeared as a government service to the business community, which targets the development of socially beneficial international business ventures [6, 7]. Scholars view commercial diplomacy as the labor of a network of public and private players who manage commercial relations using diplomatic channels and processes [5, 6]. According to [13] and [12], there are three benefits of commercial diplomacy: The first profit is political [14, 15], and the second one is economical [16–18], and finally is nation branding [19, 20].

Exporting is the first step in the internationalization of firms and is the most used method for international operations. Businesses regard exportation as a tool for improving corporate growth and financial performance and for strengthening competitiveness and company survival [21, 22]. Export performance is a multidimensional concept, and there is a need to explore its various dimensions that were classified into subjective Measurements, which are obtained from samples and data collection through questionnaires or interviews, that are divided into economic and non-economic performance. In contrast, objective measurements refer to objective data about export sales and growth, which are obtained from statistics reports and divided into economic (financial aspect) and non-economic (non-financial aspect) [20].

2.1 Underpinning Theories

According to research fundamentals, theory formulation is the phase that attempts to combine all the evidence logically so that the components responsible for the problem may be theorized and tested. This research will use Resource-Based View and Contingency theories to formulate the conceptual model [23].

2.1.1 Resource-Based View Theory

The competitiveness in international markets is more than in national markets. Thus, it needs more efforts to find new sources of competitive advantage to penetrate new foreign markets [24]. For that, Resource-Based View (RBV) theory is one of the influential theoretical methodologies in the field of international business [25]. Referring to scholars who adopt the RBV theory, firms with rare and immobile resources can gain a competitive advantage in the market [26]. In addition, the export setting fits the fundamental influences of RBV. Dependably, utilizing RBV in international business studies, particularly in export-related studies, was observed [27].

2.1.2 Contingency Theory

The fundamental method of leadership that is appropriate based on environmental circumstances was established by Fiedler in 1964 and is known as the contingency theory of leadership [28]. The contingency technique is an excellent way to put EP into context. The most relevant measure of performance for each firm, according to this viewpoint, is the one that is most suited to the firm's specific needs [29, 30]. The use of the contingency technique for measuring EP is consistent with the [31] finding that the method used to measure EP is dependent on contextual factors. This suggests that the contingency approach should be taken in the selection of individual EP measures to meet the uniqueness of the circumstances at hand [32].

2.2 Research Variables

The conceptual framework is adopted based on a resource-based (RBV) view and contingency theory with export performance. This model consists of independent internal (electronic management) factors, which are two dimensions; the first is e-management elements: hardware, software, networks, and knowledge maker; the detail for those elements are as follows: Computer Hardware: refers to computers, hardware systems, networks, and accessories; while the software is a set of programs used to operate the automatic computer and utilize its various capabilities. The software can be referred to as the mental part of the systems and computer networks, such as email programs, databases, and so on, and networks are defined as the links that span a communication fabric to the Internet, the Extranet, and the Intranet, representing the value network of the organization and its various management; and for the last element; knowledge makers (knowledge workers) are the most crucial elements in the EM system. They include digital leaders, managers, analysts, knowledge resources, and the intellectual capital of an organization [2, 44, 45]. While for the second dimension is e-management functions, which include e-planning, e-organization, e-leadership, and e-control, and they are in detail as follows: E-Planning which focuses mainly on using new knowledge systems such as decision support systems, systems experts, and artificial neural network systems. It also depends on strategic planning and the pursuit of goals; the strategy in terms of simplification of work systems and procedures, which under traditional management are very complex, as they are being replaced with quick and decisive systems and procedures that depend primarily on electronic communication networks. Therefore, e-planning is entirely different from traditional planning, and e-organizing: It is the loose framework

for a wide distribution of power, tasks, and horizontal networking that achieves coordination in real-time and everywhere to achieve the common goal of the parties to the organization. It deals with managers and electronic workers within the organization and electronic customers and suppliers outside the organization. It relies on email and a shared database or repository in the management of employee relations on a network basis within the company and the management of customer relations related to electronic customers; in addition, e-control (monitoring) is one modern means of solving problems caused by recent technological developments in detecting job abuse and data leakage. Electronic control uses modern electronic means to monitor activities and transactions within the organization to achieve economy in the field effort, time, and cost, to achieve the desired results with the least possible risk.

The electronic control is more able to know the variables related to the implementation in real-time by monitoring the deviations during the implementation and informing the administration of it, thus enabling it to identify the deficiencies before and during the implementation. Therefore, administrators can take the appropriate corrective measures, as the internal network, which acts as a real-time means of transmitting information in real-time, contributes to overcoming the expected performance gap. This gives a knowing eye on the implementation process and should the direction of an activity steer out of control, administrators can simultaneously take necessary corrective measures; also e-leadership can be seen as a process of social impact, punctuated by a collaborative relationship between technologies and procedures to bring about change at the level of each of attitude, feeling, thinking, behavior, individual or group performance, and even on the level of the organization as a whole. Also, e-leadership refers to challenging traditional obstacles and creating new ways to motivate employees [46], while e-leadership was defined as a concept of leadership that employs advanced information technologies to exercise social influence on impact feelings, attitudes, behaviors, thinking, and ultimately performance [47].

In addition, independent external factors include government policy, international relations, and competitiveness; and the specific explanation is as follows: Government Policy is represented as one of the essential factors that influence export performance in small and medium-sized enterprises. [48–51]; also, international trade relations combined with international relations and international business are the main pillars of commercial diplomacy, which link the functions and interests of both public organizations and private sectors [35, 40]. The bilateral trade percentage is more significant when the percentage of production factor is similar [52]; in addition, competitiveness factors were noticed by [51] are essential determinants of Export Performance which provide more growth within the private sector that support the government's vision to develop its economy. While commercial diplomacy came into the model as a moderate factor, and the export performance as the final dependent output.

2.3 Research Hypotheses

This paper introduces a conceptual framework based on the following hypothesizes:

Hypothesis 1 (H1): Electronic Management has a positive effect on export performance in export organizations.

Numerous studies have explored the relationship between electronic management and business performance, including export performance. For instance, in a study conducted by [33], the authors found that the adoption of electronic management had a positive impact on the export performance of Croatian exporting companies. The authors argue that the usage of electronic management tools drives export performance and increases the efficiency and effectiveness of business processes, leading to improved export performance. There is some evidence to suggest that electronic management is becoming increasingly important for organizations looking to improve their organizational performance. For instance, a study conducted by a researcher [34] found that the implementation of electronic business affects the performance of enterprises in terms of efficiency, and sales performance.

In conclusion, the hypothesis that “Electronic Management has a positive effect on export performance in Saudi Export organizations” is supported by a growing body of research. Electronic management can enhance the efficiency and effectiveness of business processes, leading to improved enterprise performance. As such, organizations in Saudi Arabia looking to improve their export performance may benefit from the adoption and implementation of electronic management.

Hypothesis 2(H2): Commercial Diplomacy will positively moderate the relationship between electronic management and export performance

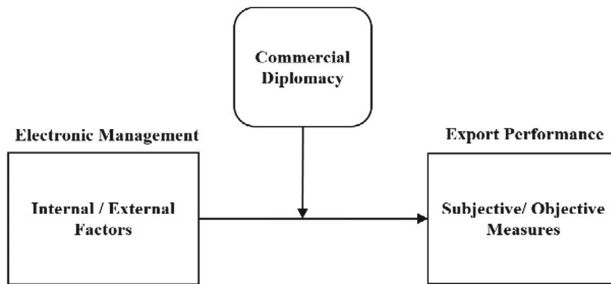


Fig. 1. Conceptual Framework

Numerous studies have explored the relationship between commercial diplomacy and business performance, including export performance. For instance, in a study conducted by [35], the authors found that the use of commercial diplomacy increases export performance. Furthermore, it was proved that the commercial diplomacy model which used in Poland helps firms to improve the government-business relationship and increase the efficiency of trade (export and import) in the first steps to be made in foreign markets (good price/quality ratio), and offers a general and specific knowledge about the target market to the Saudi Arabian context, there is some evidence to suggest that the use of commercial diplomacy is becoming increasingly important for organizations looking to improve their export performance [6]. For instance, in a study conducted by [36], the author found a positive relation between the use of commercial diplomacy and the export performance in Saudi SMEs. In addition, the author suggested that commercial

diplomacy can help firms navigate the cultural and institutional differences between their home market and foreign markets, leading to improved export outcomes [36]. Combining these two concepts, the hypothesis that commercial diplomacy will positively moderate the relationship between electronic management and export performance suggests that the use of commercial diplomacy can enhance the benefits of electronic management for export performance outcomes. While there is limited research directly addressing these hypotheses, this paper suggests that commercial diplomacy moderates the relationship between electronic management and export performance outcomes as shown in Fig. 1.

3 Methodology

This review paper was prepared by analyzing the available printed and online resources from reputable journals and books. A conceptual framework built on a resource-based (RBV) perspective and contingency theories is introduced. Electronic management was adopted from [37–39]. In the same way, commercial diplomacy was adopted from [13, 40]. The export performance items were implemented by [41–43]. Furthermore, export performance was classified as subjective measurements that were obtained from samples and data collection through questionnaires or interviews. Subjective performance measurement items can be further divided into economic performance (export sales growth, export sales growth compared with competitors, and export profitability) and non-economic performance (image obtained, competencies acquired, knowledge about competitors, knowledge about new distribution channels, and access to new markets); and objective measurements which refer to objective data about export sales and growth obtained from statistics reports [43].

4 Discussion

The concept of improving export performance through the formation of a conceptual framework that utilizes e-management and commercial diplomacy is a crucial area of focus for businesses today. With globalization and the rapid advancement of technology, companies must adapt to the changing landscape and adopt digital strategies to succeed in the international market. E-management provides businesses with the tools and techniques to manage their operations more efficiently and effectively, while commercial diplomacy enables companies to build and maintain strong relationships with foreign governments and other key stakeholders. By integrating these two concepts, businesses can create a comprehensive framework that enhances their export performance, increases their competitiveness, and maximizes their profitability. Such a framework would require a deep understanding of global markets, a strong digital infrastructure, and skilled personnel capable of navigating complex international networks. Overall, the formation of a conceptual framework that incorporates e-management and commercial diplomacy has the potential to revolutionize the way businesses approach international trade and achieve sustainable growth in the global marketplace.

5 Limitations and Future Research

The literature review on which the study was based is not too thick and is limited to a small pool. Therefore, a more systematic literature review is needed to generalize the results. This research has drawn a conceptual framework that still needs to be empirically tested. Future researchers should test the proposed framework in multiple settings to gain more fruitful results.

6 Conclusion

In conclusion, the formation of a conceptual framework that utilizes e-management and commercial diplomacy has the potential to significantly improve a business's export performance in the global marketplace. While the theoretical foundations of such a framework are sound, the effectiveness of its implementation would ultimately depend on a range of factors specific to each business, such as its industry, size, and location. Therefore, empirical research that examines the real-world impact of such a framework would be invaluable in assessing its effectiveness and identifying areas for improvement. This research could involve case studies of businesses that have implemented similar frameworks or surveys of businesses that have not yet done so, to identify the potential benefits and challenges of implementing such a framework. By gathering empirical evidence, businesses can make informed decisions about the most effective strategies to improve their export performance and remain competitive in the global market.

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Enhancing SMEs Resilience: The Role of Sharia Fintech Service and Knowledge Sharing

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Abstract. To achieve optimal performance in Sharia-compliant fintech for small and medium-sized enterprises (SMEs), disruptions caused by technological changes have led to an imbalance between supply and demand. This has harmed SMEs, necessitating a thorough performance examination for long-term viability, especially post-COVID-19. Sharia-compliant fintech is a promising alternative avenue to traditional banking, with this study aiming to evaluate its impact on SME sustainability. This research employs a quantitative survey method with purposive sampling, distributed questionnaires to 500 respondents in 11 districts of Padang, with valid responses from 486 individuals. Findings suggest that digital leadership, customer orientation, knowledge sharing, and social media usage influence SME sustainability, while Sharia fintech services do not. The study recommends that SME management in Padang, Indonesia, should embrace Sharia-compliant fintech to support business sustainability. This research contributes significantly to marketing, entrepreneurship, and sustainable marketing strategy fields, enriching existing literature and theories.

Keywords: Small and medium-sized enterprises (SMEs) · Quantitative survey · Sustainability performance · Entrepreneurship

1 Background

Digital leadership enhances employee creativity, promoting sustainable organizational performance. Green product innovation mediates innovation capabilities, green process innovation, and overall sustainability performance. Digital leadership integrates digital culture and competencies for innovation (Sarfraz et al. 2022). Shariah fintech online aids Small and Medium Enterprises (SMEs) in Indonesia, despite challenges during the COVID-19 pandemic. SMEs encounter obstacles, including lifestyle shifts towards social media due to government restrictions. While SME-supporting mobile apps exist, knowledge sharing remains a challenge. Diverse digital infrastructures and government-backed Shariah funding initiatives foster Sharia fintech growth (M. S. Rizqon et al. 2020; Warsito et al. 2022). Sharia-compliant fintech fills gaps in conventional banking, catering to SMEs and aligning with ethical and Sharia principles. SMEs face challenges, including revenue decline due to technological shifts, necessitating digital leadership

(Li et al. 2016). Digital-savvy leaders are crucial for SME growth. The COVID-19 pandemic accentuates the need for data-driven studies to understand SME intricacies and devise long-term sustainability strategies (Bruce et al. 2022). Enhancing SME performance requires leveraging Sharia fintech, addressing revenue decline, nurturing digital leadership, and conducting comprehensive studies to grasp the impact of events like the COVID-19 recovery (Borah et al. 2022). These measures pave the way for SMEs to thrive in a dynamic business environment (Hu and Wang 2021). Previous research has examined factors like social media use, knowledge sharing, Shariah fintech services, and customer service orientation (Dantas et al. 2022; Mahmoud et al. 2022; Zhao 2022).

2 Hypothesis Development

2.1 Sustainability Performance

Sustainability is of increasing concern, especially due to the COVID-19 pandemic and beyond, as indicated by various recent studies (Bruce et al. 2022; Lee et al. 2021; Lopes et al. 2023; Montesano et al. 2023; Pinkse and Bohnsack 2021; Waqas et al. 2022). SMEs in developing nations, like Indonesia, face significant challenges, which necessitate sustainable practices (Borah et al. 2022; Lee et al. 2021; Network for Business Sustainability 2013; Rezai et al. 2016; Waqas et al. 2022; Xia and Ha 2021). Entrepreneurs recognize the importance of sustainability for long-term viability (Aziz et al. 2022; Bruce et al. 2022; OECD 2021; Waqas et al. 2022), and these factors play a vital role in enhancing SME performance (Singh et al. 2021; W. A. D. K. E. Weeramanthri et al. 2023). While SME performance has been extensively studied, research on their sustainability practices, especially within the context of Sharia fintech, is limited (Bruce et al. 2022; Lopes et al. 2023; Oktariswan et al. 2022; Zaitul and Ilona 2022). The COVID-19 pandemic has reshaped SMEs, emphasizing the need for a comprehensive analysis from both consumer and SME perspectives (Freixanet et al. 2021; Tsou and Chen 2021). Given the pandemic's adverse impact on SMEs, this research is essential for understanding performance sustainability. Previous studies have explored sustainable performance using the Green HRM model, which responds to environmental pressures by driving organizational transformations and innovations for survival (Flores and Jansson 2022; C. Chen and Li 2022; Granig and Hilgarter 2022).

H1: Digital leadership has significant effect through Sustainability performance on fintech sharia

3 Digital Leadership

Digital leadership, rooted in extensive technological expertise, spans multiple organizational areas, encompassing management, logistics, production, and design (Chatterjee et al. 2023). It utilizes digital knowledge to expand networks, including social media platforms (Borah et al. 2022; Dantas et al. 2022). This knowledge empowers organizations and SMEs by facilitating their operations and addressing digital requirements, such as improving social media outreach and assessing SME performance (Borah et al. 2022; Chatterjee et al. 2023). Research on digital leadership yields mixed results, highlighting

its impact on performance or investigating it as a moderating factor, often influenced by organizational commitment (Chatterjee et al. 2023; Sarfraz et al. 2021). Its role in SME performance remains relatively unexplored, particularly as a moderator during the COVID-19 pandemic (Borah et al. 2022).

3.1 Social Media Usage

Social media has transformed from a networking tool into a global platform connecting people, businesses, and communities (Dantas et al. 2022; Lau 2017). It plays a crucial role in linking companies with consumers, facilitating information sharing (Akcem 2020; Usanti et al. 2019). For businesses, it's a strategic asset for direct customer engagement, feedback collection, and prompt responses, leading to increased satisfaction, trust, and loyalty (Lau 2017). Various studies across sectors, such as fashion, hotels, and B2B, highlight the positive impact of social media on SMEs (Alalawneh et al. 2022; Bruce et al. 2022). Addressing ethical concerns, the integration of artificial intelligence (AI) into social media analytics and chatbots promises improved user experiences and streamlined communication (Suciningtias et al. 2022). In conclusion, social media is now a vital business strategy in today's interconnected world, offering both opportunities and challenges for companies navigating this dynamic landscape (Dantas et al. 2022; Elidjen et al. 2019; Zhang and Li 2022).

H2: Social media usage has significant effect through Sustainability performance on fintech sharia

3.2 Shariah Fintech Services

Shariah fintech, rooted in Islamic principles, primarily serves Indonesian SMEs, making up 60% of its operations with positive effects (Maksum et al. 2022). In Indonesia and similar developing nations, sharia fintech enhances the SME Performance Program and the digital economy (Chaudhuri et al. 2023). The COVID-19 pandemic underscores its vital role for SMEs (Singh et al. 2021), recognized by the government for boosting SME resilience. Indonesia, with the world's largest Muslim population, is a prime ground for sharia fintech growth (Games 2020; Mat et al. 2016). Sharia fintech emphasizes ethical and equitable financial transactions, resonating with a significant portion of Indonesia's population. Focusing on SMEs contributes to economic growth and reduces income inequality, given their substantial role in the Indonesian economy (Borah et al. 2022; S. Hu and Wang 2021; Shihadeh et al. 2019).

H3: Shariah Fintech Services has significant effect through Sustainability performance on fintech sharia

3.3 Knowledge Sharing

Knowledge sharing is vital in fintech sharia, operating at the crossroads of finance, technology, and Islamic principles (Dandis et al. 2021; Mubasher 2017). It involves exchanging information, expertise, and insights among individuals and entities in the fintech sharia ecosystem, fostering collaboration, mentorship, research, and best practice

dissemination. This knowledge sharing propels the development of fintech sharia solutions, acting as a linchpin connecting ethical sustainability with the evolving financial technology landscape (Trimulato 2019). Its significance lies in shaping the industry's growth, ensuring fintech sharia remains ethically grounded while providing innovative financial solutions for tech-savvy, ethically conscious consumers.

H4: Knowledge Sharing has significant effect through Sustainability performance on fintech sharia

3.4 Customer Service Orientation

Customer service orientation is an essential quality, indicating an individual or organization's inherent willingness and ability to effectively serve and satisfy the needs of others, particularly customers (Gonu et al. 2023; Yeo et al. 2019). It emphasizes the importance of understanding and addressing customer requirements actively (Lee et al. 2021; Widelska and Krot 2021). This orientation involves actively identifying, comprehending, and meeting customer needs, based on the belief that customer satisfaction and loyalty depend on a business's ability to serve its clientele effectively. Despite extensive research, there are still unexplored aspects of the relationship between customer service orientation and SME performance (Li Sa et al. 2020; Xia and Ha 2021), offering opportunities for further investigation.

H5: Customer Service Orientation has significant effect through Sustainability performance on fintech sharia

4 Research Method and Results

4.1 Data Collection and Measurement Items

To ensure research credibility (Smith et al. 2020), we used a systematic data collection approach involving questionnaire distribution by a designated representative (Anderson 2019) and purposive sampling (Williams and Jones 2017). Respondents could choose paper-based surveys or access the survey online via a provided URL (Davis and White 2021). We aimed to distribute 500 questionnaires to SMEs in Padang City, obtaining a valid sample of 486 for statistical significance and representativeness (Brown and Smith 2019). Data analysis was conducted using SmartPLS, recognized for its flexibility in testing models with moderation effects (Garcia and Martinez 2020), allowing exploration of nuanced relationships and interactions among variables (Johnson and Garcia 2022) (See Fig. 1).

4.2 Empirical Estimation and Result

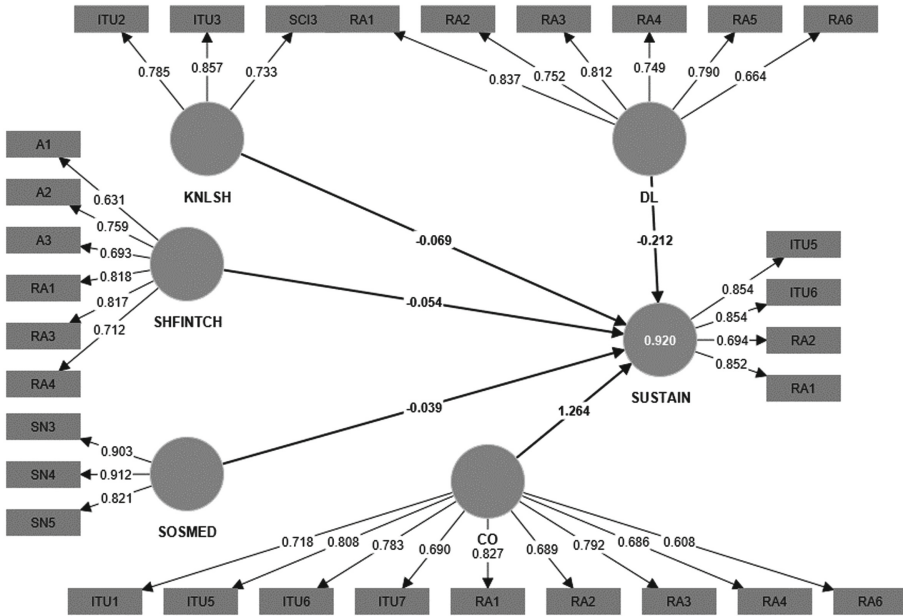


Fig. 1. PLS-SEM Model

Table 1. Measurement model

Variable	Composite reliability	Average variance extracted (AVE)
Digital Leadership	0,888	0,851
Knowledge Sharing	0,886	0,662
Service Fintech	0,909	0,589
Customer Orientation	0,909	0,588
Sustainability Performance	0,904	0,575
Social Media Usage	0,892	0,623

In Partial Least Squares Structural Equation Modeling (PLS-SEM), Composite reliability should exceed 0.7, and AVE should be above 0.5 (Hair et al. 2014). Table 1 shows good results.

Table 2. Model Measurement

Variables	Items	Loading
Customers Orientation (CA = 0,894;C CR = 0,914; AVE = 0,543)	CO 1	0,718
	CO 2	0,808
	CO 3	0,783
	CO 4	0,690
	CO 5	0,827
	CO 6	0,689
	CO 7	0,792
	CO 8	0,686
	CO 9	0,608
Digital Leadership (CA = 0,862; CR = 0,896; AVE = 0,592)	DL 1	0,837
	DL 2	0,752
	DL 3	0,812
	DL 4	0,749
	DL 5	0,790
	DL 6	0,664
Knowledge sharing (CA = 0,705; CR = 0,835; AVE = 0,629)	KS 1	0,785
	KS 2	0,857
	KS 3	0,733
Sharia fintech service (CA = 0,836; CR = 0,879; AVE = 0,550)	SF 1	0,631
	SF 2	0,759
	SF 3	0,693
	SF 4	0,818
	SF 5	0,817
	SF 6	0,712
Social Media Usage (CA = 0,855; CR = 0,911; AVE = 0,774)	SM 1	0,903
	SM 2	0,912
	SM 3	0,821
Sustainability Performance (CA = 0,830; CR = 0,888; AVE = 0,666)	SP 1	0,854
	SP 2	0,854
	SP 3	0,852
	SP 4	0,694

In quantitative research, key criteria such as Cronbach's alpha (α) (Cronbach 1951), composite reliability (CR) (Dijkstra and Henseler 2015), average variance extracted (AVE) (Fornell & Larcker, 1981a), and loading values (Hair et al. 2018) assess measurement item and construct quality and reliability. Table 2 shows acceptable results.

The Fornell-Larcker criterion confirms discriminant validity when a construct's AVE exceeds its correlations with other constructs. Results in Table 3 indicates it explains more variance than it shares with others (Fornell and Larcker 1981).

Table 3. Discriminant validity – Fornell Larcker Criterion

Variables	Customer Orientation	Digital Leadership	Knowledge Sharing	Sharia Fintech Services	Social Media Usage	Sustainability Performance
Customer orientation	0,737					
Digital leadership	0,934	0,769				
Knowledge Sharing	0,749	0,668	0,793			
Sharia Fintech Services	0,910	0,893	0,707	0,741		
Social Media Usage	0,317	0,309	0,381	0,386	0,880	
Sustainability Performance	0,953	0,862	0,683	0,843	0,248	0,816

5 Structural Model: Hypotheses Testing

The hypotheses are significant than if t values 1.65 and $p < 0.01$ is supported (Hair et al. 2014). The hypotheses in a research study are considered more significant if the t-values are 1.65 or greater and the associated p-value is less than 0.01. This indicates strong statistical evidence supporting the hypotheses (Table 4). To gain a deeper understanding and context, you would to the specific content in Hair et al. (2014) or other relevant sources that discuss.

Table 4. Hypothesis testing and statistical significance in research.

Hypothesis	(O)	(STDEV)	T statistic (O/STDEV)	P (P values)
Customer Orientation -> Sustainability performance	1,264	0,054	23,231	0,000
Digital Leadership -> Sustainability performance	-0,212	0,054	3,922	0,000
Knowledge Sharing -> Sustainability performance	-0,069	0,026	2,710	0,007
Sharia Fintech Services -> Sustainability performance	-0,054	0,044	1,214	0,225
Social Media Usage -> Sustainability performance	-0,039	0,017	2,350	0,019

6 Empirical Discussion

This study employs bootstrapping, enhances research reliability (Efron and Tibshirani 1993). It estimates standard errors and confidence intervals for path coefficients within the structural model (Davison and Hinkley 1997). It repeatedly and randomly resamples observed data, often with replacement, creating multiple resampled datasets (Hair et al. 2016). These resamples calculate path coefficients and their standard errors, enabling the derivation of confidence intervals (Davison and Hinkley 1997). By generating a distribution of path coefficient values, bootstrapping provides a better understanding of variability and uncertainty in estimates (Efron and Tibshirani 1993). This technique is especially valuable for complex models or limited sample sizes, offering more dependable assessments of parameter significance (Hair et al. 2016). Researchers frequently use bootstrapping to validate structural models, thus enhancing research trustworthiness. In the context of structural analysis, all variables support previous studies and demonstrate positive significance, except for 'Sharia Fintech Services,' which doesn't significantly contribute to SMEs' sustainability performance. This suggests a complex relationship (Yuspita et al. 2019). Factors underlying this lack of support must be considered. First, assessing SMEs' full integration of Sharia-compliant fintech services into their operations and strategies is crucial (Solarz and Swacha-Lech 2021). If not effectively incorporated, their potential to enhance sustainability performance remains untapped (Z. Hu et al. 2019). Aligning objectives is also essential. Sharia Fintech Services' goals may not inherently match SMEs' sustainability objectives (Fasano and Cappa 2022). Awareness and adoption rates among SMEs significantly impact sustainability outcomes (H. Li et al. 2023). Limited awareness or adoption could limit their influence.

Context-specific factors and empirical evidence are vital. The relationship between these services and sustainability may vary by industry, region, and regulatory environment (Greg Gannon and Carola Hieker 2022). Methodological aspects, like data quality, sample size, and research design, can influence research findings (Greg Gannon and Carola Hieker 2022; H. Li et al. 2023). The statement that COVID-19 recovery improved SME sustainability, except for 'Sharia Fintech Services,' suggests a complex relationship that requires exploration (H. Li et al. 2023). To understand this, we must assess SMEs' integration of Sharia-compliant fintech services (Gabrielsson and Pelkonen 2008; Shavarini et al. 2013). Ineffective integration could limit sustainability gains (Rehman et al. 2022; Waqas et al. 2022). We should evaluate if SMEs optimally utilize these services. Alignment of objectives is crucial; Sharia Fintech Services may not prioritize SME sustainability (Dhanalakshmi and Jwalapuram 2023). Assess if their goals align with SME sustainability. Awareness and adoption levels matter; they impact sustainability (Shihadeh et al. 2019; Zaitul and Ilona 2022). Low awareness or adoption hinders benefits. Contextual factors like industry, region, and regulations also affect this relationship (Borah et al. 2022; Ngamkroekjoti et al. 2005; W. A. D. K. E. Weeramanthri et al. 2023). Methodological aspects, including data quality and sample size, influence findings (Fasano and Cappa 2022; S. Hu and Wang 2021; Waqas et al. 2022). Rigorous research methods ensure accurate conclusions about Sharia Fintech Services' impact on SME sustainability (Ganapathy and Deepak 2023; More 2023).

7 Conclusion

In conclusion, comprehending the complex interplay among COVID-19 recovery, SME sustainability, and the nuanced impact of ‘Sharia Fintech Services’ necessitates a comprehensive exploration. This multifaceted challenge involves crucial dimensions: assessing seamless integration of Sharia-compliant fintech into SME operations, ensuring alignment of objectives, considering awareness and adoption levels, accounting for contextual variations, and emphasizing methodological rigor in empirical studies. Adopting a holistic approach is vital in untangling the intricate dynamics governing SME sustainability, the post-pandemic recovery, and the role of Sharia Fintech Services. Addressing these facets and further research efforts will enhance our understanding and facilitate the development of more effective strategies to fortify SME sustainability in this ever-evolving landscape.

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