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Editorial

Information Management and Business Review (IMBR) provides a digital forum for researchers to share their knowledge and publish research work in the fields of information management, business, management and related disciplines. The work submitted for publication consideration in IMBR should address empirical and theoretical developments in the subjects related to the scope of the journal in particular and allied theories and practices in general. Author(s) should declare that the work submitted to the journal is original, not under consideration for publication by another journal and that all listed authors approve its submission to IMBR. It is IMBR policy to welcome submissions for consideration that are original and not under consideration for publication by another journal at the same time. Author (s) can submit: Research Paper, Conceptual Paper, Case Studies and Book Review. The current issue of IMBR comprises papers of scholars from different universities of Malaysia, Sri Lanka, UK and Indonesia. Smartphone Purchase Behavior, Corporate Governance, Mobile Health Applications, Employee Motivation, Gamification in Digital Marketing, Impulse Buying Behavior, Islamic Wealth Management Services, Financial Decision-Making and Economic Well-Being, Human Capital and Digital Transformation, Artificial Intelligence and Consumer Purchase Behavior are some of the major practices and concepts examined in these studies. All the submitted papers were first assessed by the journal committee and then the external editorial team for relevance and originality of the work and then blindly peer-reviewed by external reviewers depending on the subject matter of the paper. After the rigorous peer-review process, the submitted papers were selected based on originality, significance and clarity of the purpose. The issue will, therefore, be a unique proposition, where scholars will be able to appreciate the latest results in their field of expertise and to acquire additional knowledge in other relevant fields.

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PAPERS

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Understanding Smartphone Purchase Behavior Through the Lens of Government Administrative Employees

Aziatul Asmidar Mohd Arif[1], *Lailatul Faizah Abu Hassan[1], Ratna Mulyany[2], Rozailin Abdul Rahman[3], Raja Nur Ashykin Raja Iskandar[4], Norlida Muda[5]
[1]Faculty of Business and Management, Universiti Teknologi MARA, Malaysia
[2]Faculty of Economics and Business, Universitas Syiah Kuala, Banda Aceh, Indonesia
[3]College of Business and Law, Coventry University, UK
[4]City University Malaysia (Cyberjaya Campus), Malaysia
[5]CIMB Bank Berhad, Shah Alam, Malaysia
Email: aziatul_asmidar@yahoo.com, *laila@uitm.edu.my, ummuhaziq@usk.ac.id, ae2366@coventry.ac.uk, nurashykin.iskandar@city.edu.my, norlida.ramze@gmail.com
Corresponding Author: Lailatul Faizah Abu Hassan

Abstract: This study examines sustainable consumer behavior among 200 Malaysian government administrative employees regarding smartphone acquisition and usage within the framework of Sustainable Development Goal 12 (SDG 12): Responsible Consumption and Production. Despite the public sector's role in advancing sustainability, a significant attitude-behavior gap persists, with consumers often prioritizing product performance and brand reputation over environmental considerations. This study investigates the influence of price sensitivity, brand image, product features, and social influence on smartphone purchasing behavior and replacement cycles. A quantitative approach was employed, using survey data collected from employees across several government entities. Data were analyzed through descriptive statistics and multiple regression analysis. The findings reveal that social influence is the only statistically significant predictor of smartphone purchasing behavior ($\beta = 0.384$, $p < 0.01$), highlighting the importance of peer recommendations, workplace social norms, and social conformity in shaping purchasing decisions. In contrast, price sensitivity, brand image, and product features demonstrate no statistically significant relationships with purchasing behavior. Despite respondents' awareness of smartphone costs, environmental considerations, particularly product longevity and energy efficiency, receive limited attention. These findings highlight the need to strengthen sustainable consumption awareness among public sector employees. Accordingly, this study recommends implementing green procurement nudges and internal behavioral awareness programs within government institutions. By encouraging longer product usage cycles and environmentally responsible purchasing decisions, the public workforce can contribute to promoting circular economy practices and advancing Malaysia's commitment to the 2030 Sustainable Development Goals.

Keywords: *Brand Image, Consumer Behavior, Price Sensitivity, Purchase Behavior, Social Influence*

1. Introduction

Smartphones have evolved from basic communication devices into essential digital tools that support professional activities, information access, social interaction, and service delivery. In the context of public administration, smartphones play an increasingly important role in facilitating communication, accessing digital government platforms, coordinating administrative tasks, and supporting the delivery of public services. Consequently, smartphone acquisition and usage among government employees are no longer solely matters of personal preference but are also influenced by occupational requirements, institutional expectations, socioeconomic circumstances, and the growing digitalization of government operations.

In Malaysia, the rapid expansion of smartphone adoption reflects the country's increasing dependence on digital technology. Smartphone users were projected to reach 33.46 million by 2025, demonstrating the growing significance of mobile devices in everyday activities. This widespread adoption highlights the importance of understanding consumer purchasing decisions, particularly among public sector employees who regularly rely on smartphones for both personal and work-related purposes. Previous research suggests that smartphone adoption and usage are influenced by perceived ease of use, social expectations, and social pressure (Harun et al., 2015). These factors may similarly shape purchasing decisions among government administrative employees, particularly in workplaces where technology usage and digital connectivity are increasingly expected.

The widespread adoption of smartphones also raises concerns about sustainable consumption, particularly regarding frequent device replacement, electronic waste, energy consumption, and the environmental impact of smartphone production and disposal. Although consumers may replace smartphones due to technological advancements, changing preferences, or social influence, these purchasing decisions may not necessarily reflect environmental awareness or responsible consumption practices. This situation highlights a potential gap between digital technology adoption and sustainable consumer behavior, particularly in relation to product durability, repairability, energy efficiency, and extending product life cycles.

The importance of this study is particularly relevant to Malaysia's public sector, given its significant role in supporting the national digitalization agenda and promoting sustainable development. According to the Department of Statistics Malaysia (DOSM, 2025), smartphone access among individuals reached 97.9% in 2024, while mobile phone usage increased to 99.5%. These figures demonstrate the extensive integration of mobile technology into Malaysian society. Furthermore, the government's Public Sector Digitalization Plan 2026–2030 reinforces the importance of digital transformation across government agencies.

2. Literature Review

This section covers the pertinent literature supporting the study approach, which looks at how consumer purchase behavior is impacted by brand worry, pricing concern, product attributes, and social influence. The analysis combines theoretical concepts with empirical data to find correlations between variables and research gaps.

Consumer Purchasing Behavior

Consumer behavior occurs in many different environments, from the earliest phases of product exploration to the later stages of decision-making (Schiffman and Kanuk, 2010). Also, it is essential to keep in mind that Blackwell et al. (2006) highlight that this behavior stems from a complicated interaction of environmental, social, cultural and individual factors. For example, societal factors include friends, family and wider cultural influences that shape consumer attitudes, whereas individual factors include psychological impacts and personal preferences. Cultural aspects, such as beliefs, rituals, and traditions, also contribute to consumer choices, illustrating how behavior often follows broader social trends and influences (Bouaddi et al., 2026).

People of all ages have become addicted to their cell phones because of constant access to the Internet. Mobile phones are becoming able to function as clocks, cameras, GPS, music players and alarms (De-Sola Gutiérrez et al., 2016). The smartphone addict is attracted to applications such as social networking, gaming and online shopping, while the non-addict will probably use his/her phone for email and texting, according to Peslak et al. (2011).

Consumer purchase behavior refers to the process by which consumers select, buy, use and review products or services. The classical consumer behavior theory states that purchasing decisions are influenced by psychological, social, cultural and economic factors. Consumer buying behavior is influenced by internal factors such as motivation, perception, and attitudes and external factors such as marketing and the social environment (Kotler and Keller, 2016). The Theory of Planned Behavior (TPB) (Ajzen, 1991) states that intention, attitudes and perceived control are important in purchase decisions.

Recent studies show that today's customers are value-conscious, technology-influenced and socially concerned, which makes purchase behavior complex and multidimensional. The final customer buying behavior is influenced by the interplay of these four elements. People may be at the “Messy Middle” of the buying process, looking at features and comparing prices, but social proof is often the last push to make the purchase (Barone et al., 2024). Malaysian administrative professionals make purchase judgments by balancing rational economic concerns (Price) and emotional needs to belong professionally (Social Influence). Previous studies on Malaysian customers have demonstrated that brand and social factors are usually more important than technical specifications and this trend is anticipated to continue in 2026 (Lay-Yee et al., 2013; Kabakus et al., 2025).

Brand Concern

Brand concern is the psychological worth that a consumer places on a manufacturer's reputation, equity, and dependability. In the smartphone industry, brand concern is an essential risk-reduction approach, particularly for professionals who anticipate consistent device performance. According to Al-Haddad and Al-Haddad (2021), a positive brand image boosts purchase intent by promoting "perceived quality," which serves as a heuristic for long-term reliability. Furthermore, Sembiring's (2023) research suggests that for present consumers, brand concern has evolved into "ecosystem loyalty," with the decision to purchase affected by the need to maintain smooth synchronization between the smartphone and other hardware or cloud-based professional tools.

Price Concern

Price concern represents a consumer's sensitivity toward the financial cost and perceived value of a device relative to their disposable income. For administrative staff in the Malaysian M40 and B40 categories, price concern often acts as a gatekeeper variable that filters out luxury models in favor of "value-for-money" alternatives. Hussain et al. (2023) observed that while absolute price remains a barrier, price sensitivity is increasingly mitigated by the "premiumization of financing," where Buy Now, Pay Later (BNPL) schemes and telco subsidies alter the consumer's perception of affordability. Additionally, Fahira and Alversia (2025) posit that strategic consumers now evaluate price through the lens of "Total Cost of Ownership," factoring in the device's future trade-in value when making an initial purchase.

Product Feature

Product features encompass the tangible and intangible attributes of a smartphone, ranging from hardware specifications like battery life and camera quality to software-driven capabilities like On-Device AI. As the smartphone becomes a central node for administrative work, features that enhance productivity are prioritized. Wong et al. (2023) highlighted that for the working class, "functional utility"—specifically battery longevity and rapid charging—remains the most significant hardware motivator. Furthermore, Mubarok et al. (2024) found that with the integration of generative AI into mobile operating systems, the ability of a device to perform real-time task automation and document processing has become a decisive feature for public sector employees seeking efficiency.

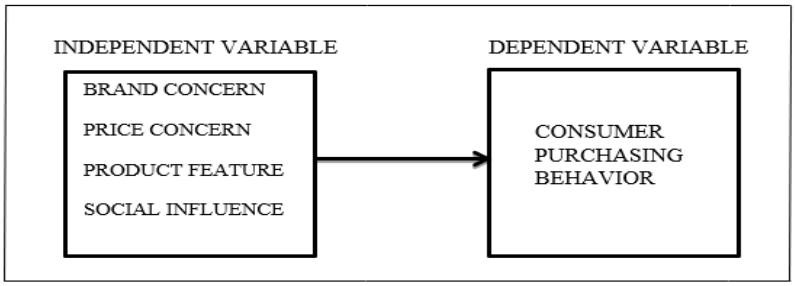
Social Influence

Smartphones have significantly affected personal routines, communication patterns, and productivity levels. The reliance on these devices is so strong that most people feel unwilling to leave the house without them, resulting in sleep disruptions, stress, and decreased performance (AlShare et. al, 2025; Samaha & Hawi, 2016). Individual traits, age, gender, social life, and work environments all contribute to excessive smartphone use (Csibi et al., 2021; Moqbel, 2020; Volungis et al., 2020; Wahla & Awan, 2014).

Social influence, often categorized as "Subjective Norms" within the Theory of Planned Behavior, refers to the impact of peers, family, and colleague recommendations on an individual's decision-making process. In collectivist cultures like Malaysia, social influence is frequently the most potent predictor of technology adoption. Gulabdin and Hassan (2025) established that for Malaysian civil servants, the "Workplace Social Proof" is critical, where the adoption of a specific brand by a department head or a tech-savvy colleague triggers a localized trend of acquisition. Moreover, Rana et al. (2022) demonstrated that social influence significantly mediates the relationship between brand awareness and actual purchasing behavior, as consumers seek to align their technology choices with the expectations and compatibility needs of their social and professional circles.

Based on all the literature, the following research model is developed to show the relationship between the variables as illustrated in Figure 1.

Figure 1: Research Framework (adapted from Lay-Yee, Kok-Siew, & Yin-Fah, 2013)



3. Methodology

This research examines the sustainable consumption behaviors of Malaysian government administrative employees on the acquisition and utilization of smartphones, framed within the context of SDG 12 (Responsible Consumption and Production). Consequently, the employed study strategy is correlational in nature. This illustrates the way the relationship between two variables is articulated. Sekaran and Bougie (2013) asserted that a correlational study is conducted when the researcher aims to illustrate the facets associated with the problem. Crossman & Crossman (2011) assert that the unit of analysis represents the fundamental entity under investigation. Sekaran and Bougie (2013) characterized the unit of analysis as the degree of data collection aggregation occurring in the subsequent stage of data analysis. The individual served as the unit of analysis for the research. This pertains to individuals who have smartphones. The personal replies of the participants were examined concerning the relevant parameters and confirmed the anticipated correlations in the research. The aggregate number of individuals involved in the survey was 300. The information was gathered by a questionnaire that was revised and adapted from previous research. The questionnaire was designed with regard to the research inquiries and the characteristics of the study. The researchers conducted the questionnaire in a face-to-face manner with each participant.

Target Population and Sampling Frame

This research focuses on federal government administrative personnel, including Administrative and Diplomatic Officers (PTD), administrative assistants, and executive officers, employed in federal ministries and statutory organizations within the Klang Valley (Putrajaya and Kuala Lumpur). Putrajaya functions as the federal administrative hub of Malaysia, accommodating the core apparatus of civil governance. The Public Service Department (JPA) reports that Malaysia's public service comprises 1.6 million employees, with numerous individuals located in administrative centers throughout the Klang Valley.

A purposive sampling method, not based on probability, was utilized alongside convenience sampling. Probability sampling was virtually impracticable owing to stringent security clearance mandates, bureaucratic limitations, and the lack of a unified internal employee database among ministries. To guarantee data pertinence, specific screening criteria were implemented: (1) participants needed to be full-time, permanent, or contracted government administrative staff, and (2) current smartphone users who have a direct impact on or make their own device acquisitions. Data gathering occurred within designated federal complexes in Putrajaya and Kuala Lumpur, encompassing the Ministry of Finance, Ministry of Economy, and central administrative service divisions.

Sample Size Determination, Distribution and Response Rate

Empirical heuristics and power calculations were used to figure out the goal sample size: According to Green (1991), the smallest sample numbers needed for multiple regression testing are 82 people for overall model fit ($N \geq 50+8k$) and 104 people for individual predictors ($N \geq 104+k$), where $k=4$ independent variables. • According to Hair et al. (2010), the best ratio of observations to independent variables is between 15 and 20:1. This means that for every four predictors, you need between 60 and 80 observations. Cohen (1988) talks about statistical power. With 200 samples, the sample size has statistical power above 0.95 when $\alpha=0.05$ and the expected effect size is $f2=0.15$.

A total of 300 self-administered questionnaires were hand-delivered in person using a drop-off and pick-up system to allow for possible forms that were not returned, were incomplete, or were not filled out properly. Two hundred completed and usable questionnaires from the surveys that were sent out were successfully retrieved, giving a response rate of 66.7%. The other 100 questionnaires, or 33.3%, were either not returned because of work obligations or were thrown away when the data were cleaned up because there were too many missing values or answers that were too similar. The survey was given directly on-site with clear reminders, which reduced non-response bias. The demographic distributions (Table 1) stayed true to the profiles of mid-level public sector administrative workers.

Instrumentation and Operationalization

There were two parts to the survey questionnaire. In Section A, information about age, gender, education, monthly income, smartphone brand, and length of ownership was collected. Section B used multi-item scales from existing empirical material to measure the five main latent constructs: • Brand Concern: This concept comes from Lay-Yee et al. (2013) and Al-Haddad & Al-Haddad (2021), and it is defined as how important people think a manufacturer's image, brand equity, and ecosystem reliability are. • Price Concern: Based on Lay-Yee et al. (2013), this is measured as how sensitive someone is to cost, how affordable they think something is, and how much value they get for their money compared to their income. • Product Features: Based on Lay-Yee et al. (2013) and Wong et al. (2023), these are broken down into hardware features, battery life, storage space, speed of operation, and usefulness in the office. • Social Influence: Based on Venkatesh et al. (2012) and Lay-Yee et al. (2013), this is defined as suggestions from coworkers, departmental norms, and personal social expectations. • Buying Behavior: Based on Schiffman & Kanuk (2010) and Lay-Yee et al. (2013), this is what people actually do when they decide what to buy and are committed to doing so.

All latent construct items were scored on a 5-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

Construct	Source / Reference	No. of Items	Sample Measurement Item	Scale Anchors
Brand Concern	Lay-Yee et al. (2013); Al-Haddad & Al-Haddad (2021)	4	"I prioritize well-known smartphone brands because they assure reliability in my daily work."	1 = Strongly Disagree to 5 = Strongly Agree
Price Concern	Lay-Yee et al. (2013)	4	"The retail price of a smartphone is a critical factor when deciding which device to purchase."	1 = Strongly Disagree to 5 = Strongly Agree
Product Feature	Lay-Yee et al. (2013); Wong et al. (2023)	5	"Battery capacity and processing speed are decisive factors in my smartphone selection."	1 = Strongly Disagree to 5 = Strongly Agree
Social Influence	Venkatesh et al. (2012); Lay-Yee et al. (2013)	4	"Recommendations from my workplace peers influence my choice of smartphone."	1 = Strongly Disagree to 5 = Strongly Agree
Purchasing Behavior	Lay-Yee et al. (2013) Schiffman & Kanuk (2010)	4	"I actively choose smartphone models that align with my daily administrative and personal needs."	1 = Strongly Disagree to 5 = Strongly Agree

Contextual Modification: Items were modified to explicitly reflect Malaysian civil service workplace dynamics (e.g., framing social influence around colleagues, departmental heads, and administrative productivity tools).
Pre-testing and Face Validity: Before field administration, the questionnaire was evaluated by two senior academic researchers in marketing and five civil servants to ensure clarity, content validity, and contextual relevance. Wording adjustments were made to eliminate ambiguity.

4. Results and discussion

Respondents' Profiles

A total of 300 questionnaires were distributed to Government Administrative Employees and 200 usable questionnaires were collected to be analyzed as shown in Table 1.

Table 1: Respondent's Profile (n=200)

		Frequency	Percentage
Age	Male	124	62.0
	Female	76	38.0
Gender	20-29 years old	80	40.0
	30-39 years old	70	35.0
	40-49 years old	25	12.5
	50-59 years old	25	12.5
Education level	Certificate	110	55.0
	Diploma	50	25.0
	Degree	40	20.0
Income level	<RM1500	25	12.5
	RM1501 – RM2000	35	17.5
	RM2001 – RM2500	90	45.0
	>RM2501	50	25.0
Smartphone brand	Apple	40	20.0
	Samsung	70	35.0
	Asus	25	12.5
	Oppo	20	10.0
	Others	45	22.5
Duration of having a smartphone	< 1 year	25	12.5
	1-3 years	100	50.0
	4-6 years	50	25.0
	> 6 years	25	12.5

Normality analysis

Table 2: Normality results based on Skewness and Kurtosis values of each variable

	Skewness	Kurtosis
Independent Variable		
Brand Concern	-1.316	2.743
Price Concern	-0.423	-0.137
Product Feature	-0.164	-0.536
Social Influence	-0.158	0.494
Dependent Variable		
Purchasing Behaviour	-0.125	0.550

As shown in Table 2, Skewness and Kurtosis were the main metrics used to evaluate the data set's normality. The results show that the four independent variables—Brand Concern, Price Concern, Product Feature, and Social Influence—as well as the dependent variable, Purchasing Behavior, are within the appropriate ranges for a normal distribution.

The values for skewness across all variables ranged from -1.316 to -0.125, whereas Kurtosis values ranged from -0.536 to 2.743. Although Brand Concern had a higher Kurtosis (2.743), it still fell within the widely accepted range of +/- 3.0 for social science studies. As a result, the assumption of normality has been met, establishing a statistically solid foundation for the use of parametric tests in later phases of data analysis.

Construct Reliability and Validity

We checked the assessment tools' internal consistency reliability and convergent validity to make sure they consistently and reliably showed the goal constructs. The Cronbach's alpha (α) coefficients for each construct are shown in Table 3. With scores between 0.785 and 0.865, all factors were above the normal level of 0.70 (Hair et al., 2010), showing strong internal consistency.

An exploratory factor analysis (EFA) using principal component analysis with varimax rotation was used to check the construct validity. The sample adequacy score from the Kaiser-Meyer-Olkin (KMO) test was 0.814, which is higher than the minimum score of 0.60. Bartlett's Test of Sphericity also showed a statistically significant result ($\chi 2=1248.62$, $p<0.001$). All of the factor loadings were higher than the minimum level of 0.50, which shows that the items are validly related.

Table 3: Reliability & Validity Table Template

Construct	Number of Items	Factor Loadings Range	Cronbach's Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)	Status
Brand Concern	4	0.68 – 0.82	0.812	0.835	0.560	Reliable / Valid
Price Concern	4	0.65 – 0.79	0.785	0.810	0.525	Reliable / Valid
Product Feature	5	0.62 – 0.84	0.824	0.842	0.538	Reliable / Valid
Social Influence	4	0.71 – 0.88	0.865	0.871	0.628	Reliable / Valid
Purchasing Behavior	4	0.69 – 0.85	0.830	0.845	0.577	Reliable / Valid

(Note: If CR and AVE are not calculated, reporting Cronbach's Alpha and Factor Loadings is sufficient for SPSS-based multiple regression studies).

Descriptive analysis

Table 4 outlines the descriptive statistics (mean and standard deviation) for the independent variables. Among the studied factors, Price Concern recorded the highest mean score (M=3.79, SD=0.523), followed by Brand Concern (M=3.39, SD=0.748), Social Influence (M=3.12, SD=0.747), and Product Feature (M=3.11, SD=0.629).

Table 4: Descriptive Statistics

	Mean	Std. Deviation
Brand Concern	3.39	.74826
Price Concern	3.79	.52328
Product Feature	3.11	.62912
Social Influence	3.12	.74681

The elevated mean and low standard deviation for Price Concern indicate that administrative personnel exhibit a high descriptive consensus regarding budget awareness. However, descriptive agreement reflects general respondent attitude rather than statistical causality or predictive influence on actual purchasing behavior. As demonstrated in subsequent inferential analyses, descriptive agreement on price does not translate into statistical significance in explaining purchase decisions.

Correlation analysis

The relationship between brand concern and buying behavior among Malaysian administrative employees was analyzed by a Pearson Correlation assessment. The results indicated a mildly positive correlation between the two variables ($r = .200$). Nonetheless, at the 0.05 threshold, the correlation was not statistically significant ($p = .217$). These findings suggest that, while it may exert a minor influence, brand concern is not the primary or significant determinant affecting this specific group's smartphone purchasing preferences. Price Concern, previously identified as having a markedly elevated average score, is among the most potent factors that could eclipse the impact of brand.

The findings indicated a marginally positive correlation between Price Concern and Purchasing Behavior ($r = .202$). Nonetheless, at the 0.05 significance level, the study indicated that this correlation was not statistically significant ($p = .211$). The average score of 3.79 suggests that administrative personnel in Malaysia demonstrate considerable apprehension over smartphone costs; nevertheless, there is no notable linear relationship between this apprehension and their actual buying habits. This implies that price by itself might not significantly influence ultimate buying choices compared to other fundamental elements or a mix of factors.

The characteristics of product features and purchasing behavior showed minimal correlation (r = -.002). Furthermore, the correlation was not statistically significant (p = .989), indicating that the smartphone purchasing behavior of Malaysian administrative personnel is not much affected by product attributes. These findings align with the descriptive statistics, which indicated that Product Feature possessed the lowest average score among all independent factors. This suggests that administrative staff are likely to prioritize cost and brand reliability over premium features and technical specifications when making buying decisions.

Social Influence (SI) has a statistically significant correlation with Purchasing Behavior (PB), unlike the earlier categories (Brand, Price, and Product Features), which showed no statistical significance. The results indicated a statistically significant moderate positive correlation (r = .411) at the 0.01 significance level (p = .008). These findings indicate that social influence is an essential and statistically meaningful element in the participants' choices to purchase smartphones. Unlike other examined variables such as Price Concern or Product Features, Social Influence acts as a significant motivator, demonstrating that recommendations from family, colleagues, and societal trends greatly affect the purchasing behaviors of administrative professionals in this sector.

Multiple Linear Regression Analysis

To assess the simultaneous impact of the four independent variables on smartphone purchasing behavior and to control for inter-variable collinearity, standard multiple linear regression was conducted as illustrated in Table 5.

Multicollinearity Diagnostics: Before interpreting the regression coefficients, multicollinearity was assessed using Tolerance and the Variance Inflation Factor (VIF). All Tolerance values exceeded 0.20 (ranging from 0.685 to 0.892), and VIF values ranged from 1.121 to 1.460, well below the conservative threshold of 5.0 (Hair et al., 2010). Thus, multicollinearity did not threaten the validity of the regression model.

Model Fit: The overall regression model was statistically significant, $F(4,195) = 11.458$, $p<0.001$. The model yielded a coefficient of determination of $R2=0.190$ (Adjusted $R2=0.174$). This indicates that 19.0% of the variance in smartphone purchasing behavior among administrative staff is explained collectively by Brand Concern, Price Concern, Product Features, and Social Influence.

Evaluation:

- Social Influence was the only significant predictor of purchasing behavior ($\beta=0.384$, $t=5.216$, $p<0.001$). Therefore, H4 is supported.
- Brand Concern ($\beta=0.108$, $t=1.452$, $p=0.148$), Price Concern ($\beta=0.095$, $t=1.285$, $p=0.200$), and Product Feature ($\beta=-0.015$, $t=-0.210$, $p=0.834$) were not statistically significant predictors in the model. Hence, H1, H2, and H3 are rejected.

Table 5: Multiple Regression

Model Predictors	Unstandardized Coeff. (B)	Std. Error	Standardized Coeff. (β)	t-value	p-value	Collinearity Tolerance	Collinearity VIF	Decision
(Constant)	1.425	0.382	—	3.730	< 0.001	—	—	—
Brand Concern (H1)	0.108	0.074	0.108	1.452	0.148	0.784	1.275	Rejected
Price Concern (H2)	0.114	0.089	0.095	1.285	0.200	0.812	1.231	Rejected
Product Feature (H3)	-0.018	0.086	-0.015	-0.210	0.834	0.892	1.121	Rejected
Social Influence (H4)	0.385	0.074	0.384	5.216	**< 0.001**	0.685	1.460	**Accepted**

Note: Model Summary: $R=0.436$, $R2=0.190$, Adjusted $R2=0.174$, $F(4,195) = 11.458$, $p<0.001$. Dependent Variable: Purchasing Behavior.

5. Discussion and Theoretical Implications

The empirical findings offer a comprehensive insight into the behavioral dynamics of Malaysia's governmental administration. Descriptive findings reveal that administrative personnel have a robust cognitive understanding of device expenses (M=3.79), although price apprehension did not significantly predict buying behavior (β=0.095, p=0.200). Similarly, product characteristics and brand concerns were negligible. In contrast, Social Influence emerged as the sole statistically significant determinant affecting smartphone purchasing decisions (β=0.384, p<0.001).

Rather than undermining core economic theories, these findings demonstrate that in public sector entities characterized by collectivity and hierarchical awareness, consumer decisions reflect limited rationality. In organizational contexts, social conformity, trust among institutional colleagues, and personal benchmarks (Ajzen, 1991; Venkatesh et al., 2012) affect individual utility optimization (evaluating supplementary hardware features or direct retail prices). As civil employees rely on mobile phones for inter-agency communication, collaborative processes, and peer-suggested applications, procurement decisions evolve into socially endorsed behaviors. Peer endorsement serves as a mental heuristic that reduces the perceived risk associated with acquiring an inappropriate device.

Limitations of the Research and Future Directions

A multitude of methodological and conceptual limitations must be acknowledged: The research analyzed four principal variables extracted from consumer behavior studies. It neglected to incorporate specific structural elements of expected usefulness, total ownership costs, or recognized institutional procurement guidelines. Future investigations should integrate the Unified Theory of Acceptance and Use of Technology (UTAUT2) with economic utility indicators to comprehensively analyze these connections. The information employed a cross-sectional framework and was collected from administrative staff in Klang Valley. While sufficient for exploring association relationships, cross-sectional surveys cannot ascertain temporal causation. Future research should utilize longitudinal or experimental approaches to assess the evolution of purchasing preferences during whole replacement cycles. • Employing purposive and convenience sampling in federal administrative centers limits the broad applicability to state-level civil servants or private-sector personnel. Expanding the methodology to encompass more geographical areas and various organizational tiers will bolster the validity of these results.

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Corporate Governance under the MCCG 2021 Principles and Sustainability Reporting: Evidence from Malaysian Listed Companies

*Mohd Waliuddin Mohd Razali[1,2], Zaini Embong[1], Kamarul Baraini Keliwon[1], Romlah Jaffar[1], Sitti Syamsiar Muharram[3]
[1]Faculty of Economics & Management, Universiti Kebangsaan Malaysia (UKM), Malaysia
[2]Faculty of Economics & Business, Universiti Malaysia Sarawak (UNIMAS), Malaysia
[3]Faculty of Accountancy, Universiti Teknologi MARA, Cawangan Sabah, Kampus Kota Kinabalu, Malaysia
Email: *walirazali@yahoo.com
Corresponding Author: Mohd Waliuddin Mohd Razali

Abstract: Numerous prior studies have assessed corporate governance mainly through board attributes, overlooking the additional governance standards specified in the MCCG 2021. In addition, previous studies have largely focused on the MCCG 2012 and 2017, creating a need to examine whether the broader corporate governance improvements introduced by MCCG 2021 influence sustainability reporting among Malaysian listed companies. Therefore, this study aims to examine the relationship between corporate governance and sustainability reporting among Malaysian listed companies. Based on stakeholder theory, corporate governance can enhance sustainability reporting by encouraging companies to consider the interests and expectations of various stakeholders. The study uses an unbalanced panel dataset of 125 Malaysian publicly listed companies, comprising 366 observations across industries from 2022–2024. The study collected non-financial data from annual reports and financial data from the Eikon database; it excluded financial institutions and one SPAC because of their different regulations and unique characteristics. The regression findings reveal a positive, significant relationship between corporate governance and sustainability reporting, suggesting that stronger corporate governance increases sustainability disclosure. Enhanced corporate governance fosters openness, accountability and responsiveness to stakeholder expectations, hence promoting more sustainability reporting. The study has several implications. Regulators can strengthen the implementation of MCCG 2021 principles to promote sustainability reporting. For investors, corporate governance and sustainability reports offer crucial insights for evaluating business transparency and sustainability.

Keywords: *Board Effectiveness, stakeholder theory, corporate accountability, non-financial, sustainability*

1. Introduction

Bursa Malaysia issued Sustainability Reporting Guidelines in 2015, and in 2016, sustainability-related reporting became mandatory for all listed companies in Malaysia (Bursa Malaysia 2015). Sustainability reporting is defined as the disclosure of corporate information regarding economic, environmental, and social aspects within the annual report (Global Reporting Initiative 2011). Such reporting is not limited to a specific sustainability statement or a dedicated report; rather, it encompasses information presented across various sections of the annual report, including the management discussion and analysis, the chairman's statement, the statement on internal control, and others. Past studies indicate that sustainability reporting can yield various benefits for companies, including competitive advantage (Bursa Malaysia, 2015), enhanced corporate value (Park & Jang, 2021; Reddy & Gordon, 2010), and reduced external financing costs, such as the cost of equity (Roy et al., 2022).

Previous studies have identified corporate governance as a factor influencing sustainability reporting (Birindelli et al., 2018; Jamil et al., 2021; Lagasio & Cucari, 2019; Mahmood et al., 2018; Rathnayaka Mudiyanselage, 2018). Corporate governance refers to the structures and practices used to manage a company's business and affairs (Securities Commission Malaysia, 2021). Good corporate governance fosters business prosperity and corporate accountability. The objective of corporate governance is to realize long-term shareholder value while considering other stakeholders' interests (Securities Commission Malaysia, 2021). Within a company's corporate governance structure, the board of directors plays a significant role in determining sustainability reporting disclosure procedures and their implementation (Ong & Djajadikerta, 2020). Furthermore, effective corporate governance practices enable the board to understand company operations and assume greater responsibility for the impact of corporate activities on the environment and society (Manning et al., 2017). Sound corporate governance practices, such as managing audits, risks and

stakeholder relations, establish clear guidelines and standards for sharing corporate sustainability information (Boateng et al., 2022).

Empirical evidence demonstrates a relationship between corporate governance and voluntary information disclosure, such as financial information (Raithatha & Bapat, 2014), operational risk (Neifar & Jarboui, 2018), social responsibility practices (Abd Rahman & Ku Ismail, 2018; Velte & Stawinoga, 2020), and environmental information (Fischer et al., 2018; Orazalin, 2020). However, previous studies have produced inconsistent results on the relationship between corporate governance and sustainability reporting. Some studies indicate a positive relationship between sustainability reporting and factors such as female representation on the board of directors (Birindelli et al., 2018; Rathnayaka Mudiyanselage, 2018), the presence of independent directors (Cucari et al., 2018; Jamil et al., 2021; Mahmood et al., 2018; Rathnayaka Mudiyanselage, 2018), board size (Birindelli et al., 2018; Jamil et al., 2021; Mahmood et al., 2018; Rathnayaka Mudiyanselage, 2018), and the existence of a sustainability committee (Cucari et al., 2018; Jamil et al., 2021; Mahmood et al., 2018; Rathnayaka Mudiyanselage, 2018). Conversely, Cucari et al. (2018) and Husted & Sousa-Filho (2019) found a negative relationship between female representation on the board and sustainability reporting, while Birindelli et al. (2018) found a negative relationship between sustainability reporting and both independent directors and board size. Some studies found an insignificant relationship between board characteristics and sustainability reporting (Husted & Sousa-Filho, 2019), such as age (Birindelli et al., 2018; Cucari et al., 2018), ethnicity (Cucari et al., 2018), and board share ownership (Cucari et al., 2018).

Most prior studies examining the relationship between corporate governance and sustainability reporting have used board characteristics as a proxy for corporate governance (Birindelli et al., 2018; Cucari et al., 2018; Husted & Sousa-Filho, 2019). This is one of the elements recommended by the Malaysian Code on Corporate Governance (MCCG) 2021. Board characteristics are among the three corporate governance principles outlined in the Malaysian Code on Corporate Governance (2021). The other corporate governance principles include the effectiveness of audit and risk management, integrity in corporate reporting, and meaningful engagement with stakeholders. Corporate governance effectiveness does not rely on a single aspect alone; rather, all the principles logically complement one another.

Previous studies have also utilized the MCCG 2012 and 2017 editions (Abdalla et al., 2024; Hamad et al., 2020; Jamil et al., 2021; Zin et al., 2020). MCCG 2012 and 2017 possessed certain weaknesses that limited their effectiveness in promoting sustainability reporting. Both codes placed less emphasis on the board's skills and expertise in managing sustainability issues than on periodic board performance evaluations. This reduced accountability and effectiveness in corporate management. Second, the earlier codes lacked detailed guidelines on risk management, particularly internal control procedures, which could confuse efforts to identify, assess, and manage risks and increase a company's exposure to potential losses. Finally, the previous versions did not fully address the need for meaningful stakeholder engagement on sustainability issues, thereby diminishing the effectiveness of communication and corporate accountability in sustainability practices. The MCCG 2021 improved upon its predecessors, MCCG 2017 and MCCG 2012, by placing greater emphasis on board leadership, strengthening audit and risk management, enhancing corporate reporting and stakeholder relationships, and aligning corporate governance practices with global standards. These improvements may strengthen corporate accountability, transparency, and stakeholder engagement, thereby facilitating sustainability reporting. This raises an important research question: to what extent do the changes introduced by the MCCG 2021 influence sustainability reporting among Malaysian listed companies?

By using the MCCG 2021 principles, this study makes significant contributions compared with previous research that relied on the MCCG 2012 and 2017. First, regarding board leadership, the MCCG 2021 emphasizes superior and responsible leadership, aligning with current global requirements. Second, the MCCG 2021 principles place greater focus on audit and risk management, ensuring that companies have robust mechanisms to address potential uncertainties and risks. Third, the code improves corporate reporting and enhances stakeholder engagement, thereby ensuring greater transparency and accountability. The MCCG 2021 principles are also distinguished by their alignment with and adoption of global standards, rendering them more relevant and competitive on the international stage. Using the MCCG 2021 principles, this study provides a more comprehensive and relevant analysis that reflects current corporate governance best practices.

2. Literature Review

This section discusses stakeholder theory and the relationship between corporate governance and sustainability reporting. It also discusses the three principles of MCCG 2021 and the findings of previous studies.

Stakeholder Theory

Stakeholders are defined as "groups that are affected by the actions of a company" (Freeman & Reed, 1983). In 1984, Freeman revisited stakeholder theory, defining stakeholders as individuals or groups who can influence, or be influenced by, a company's actions, decisions, and policies (Freeman, 1984). Subsequently, in 2007, stakeholders were defined as "any individual or group who can influence or be influenced by the actions, decisions, policies, practices, or goals of an organization" (Freeman et al., 2007). Stakeholders can be identified by the legitimacy of their claims, as evidenced by the exchange relationship between them and the company. Stakeholders comprise shareholders, creditors, managers, employees, customers, suppliers, the local community, and the general public. Stakeholder theory suggests that companies respond to the concerns and expectations of influential stakeholders and translate these into strategic disclosures (Foran, 2001). The theory also provides a broad perspective on the factors driving corporate management behavior regarding social and environmental disclosure practices.

Stakeholders are interested in the content of a company's sustainability reporting for several reasons. First, sustainability reporting helps stakeholders identify and assess potential sustainability risks associated with the company's operations. By reviewing sustainability reports, stakeholders can make informed decisions regarding their engagement with or investment in the company (Gunningham et al., 2004). Sustainability reporting provides a mechanism for companies to communicate their sustainability initiatives, progress, and challenges, thereby demonstrating their commitment to being responsible corporate entities (Domingues et al., 2017; Unerman & Bennett, 2004). Stakeholders, including employees, customers, and investors, are more likely to trust and engage with companies that are transparent about their sustainability performance and committed to addressing sustainability concerns, such as social and environmental issues (Fombrun et al., 2000).

Companies that take these stakeholders' expectations into account ensure that their corporate governance practices align with sustainability principles. In terms of reporting, sustainability reporting is a means for companies to communicate their sustainability performance to stakeholders, covering environmental, social, and corporate governance (ESG) aspects. Sustainability reporting fosters transparency and accountability, enabling stakeholders to evaluate a company's commitment to sustainable practices. The link between corporate governance and sustainability reporting lies in their shared objective of promoting sustainable development and responsible business practices (Domingues et al., 2017). By integrating stakeholder interests into their corporate governance structures, companies can develop strategies and policies that address social, environmental, and economic sustainability. These efforts can, in turn, be effectively communicated through sustainability reporting, which provides stakeholders with a comprehensive overview of the company's sustainability performance. Therefore, understanding and implementing this connection is crucial for companies striving to enhance their sustainability practices and maintain positive stakeholder relationships.

Stakeholder theory has emerged as a crucial framework for enhancing transparency and accountability in sustainability reporting. According to Fernandez-Feijoo et al. (2014), stakeholder theory emphasizes the importance of considering the interests and expectations of various stakeholders during the decision-making process. By acknowledging the diverse stakeholders affected by a company's activities, the theory encourages open and honest communication, thereby fostering greater transparency in sustainability reporting. It suggests that companies should actively involve stakeholders in the reporting process to ensure their concerns and perspectives are adequately addressed. Consequently, sustainability reporting becomes more comprehensive and accurate, reflecting the social and environmental impacts of the company's operations. By integrating stakeholder theory into their reporting practices, companies can cultivate greater accountability by demonstrating a commitment to stakeholder engagement and responsiveness. This approach encourages companies to be proactive in addressing sustainability challenges and aligning their actions with stakeholder expectations, ultimately enhancing their reputation and long-term sustainability performance.

Stakeholder Theory provides a theoretical foundation for explaining how the three principles of the Malaysian Code on Corporate Governance (MCCG) 2021 may influence corporate sustainability reporting. First, board leadership and effectiveness foster accountability to stakeholders by ensuring the board's composition, independence, and oversight align with decisions that reflect stakeholders' expectations and informational needs regarding sustainability. Evidence from Malaysia shows that board activity and independence are linked to materiality disclosure (Ngu & Amran, 2021). Second, effective audit and risk management can improve the trustworthiness and reliability of sustainability reporting by strengthening monitoring, internal controls, and oversight of sustainability-related risks. The research by Al-Hajaya et al. (2025) supports this claim, showing that larger and more independent audit committees are linked to higher-quality standalone sustainability reporting, underscoring the critical role of competent audit oversight in sustainability disclosures. Third, integrity in corporate reporting and meaningful stakeholder relationships underscore the importance of openness, accountability, and stakeholder engagement, helping companies articulate critical sustainability impacts and meet the informational demands of shareholders and other stakeholders. Dewi et al. (2023) analyzed the relationship between materiality disclosure, stakeholder engagement, and corporate governance in the context of sustainability reporting quality, while Khatri et al. (2025) revealed that stakeholder engagement practices were linked to reduced levels of abnormal non-financial disclosure, implying a potential contribution to the enhancement of reporting quality. Together, these mechanisms show how the three MCCG 2021 principles can support sustainability reporting from a stakeholder-oriented perspective. Nevertheless, the strength of these relationships may vary across governance mechanisms and institutional contexts, and the empirical findings do not establish that every governance practice necessarily improves reporting quality.

Corporate Governance and Sustainability Reporting

Corporate governance encompasses the processes and structures designed to guide and manage a company's operations and affairs, to foster business prosperity and uphold corporate accountability. Its primary objective is to deliver long-term value to shareholders while also considering the interests of other stakeholders, as outlined in the Malaysian Code on Corporate Governance (2021). By acknowledging their responsibility to a wide range of stakeholders beyond just shareholders, companies adopt transparent and responsible corporate governance practices that take into account the interests of all relevant parties (Domingues et al., 2017). In this context, sustainability reporting serves as a channel for communicating a company's commitment to social and environmental responsibility and for fostering trust and accountability among stakeholders.

The Malaysian Code on Corporate Governance (2021) encompasses three key principles: (A) board leadership, (B) effective audit and risk management, alongside integrity in corporate reporting, and (C) meaningful relationships with stakeholders. These principles are outlined to enhance corporate governance in Malaysia. First, board leadership and effectiveness play a pivotal role in shaping sustainability reporting. Effective corporate governance structures, such as the inclusion of independent directors and robust accountability mechanisms, can stimulate sustainability reporting by encouraging companies to disclose information regarding their environmental and social performance (López-Arceiz et al., 2018). Board diversity in terms of gender and educational background also improves the quality of sustainability reporting by bringing in varied perspectives and expertise (Kwarteng et al., 2023).

Furthermore, the presence of management committees and frequent board meetings contributes to better oversight and timely updates on sustainability practices (Ikpor et al., 2024). Meanwhile, key elements of effective corporate governance, such as clearly defined roles and responsibilities, ethical conduct, and risk management, also advance sustainability reporting by fostering a culture of transparency and accountability within the company. Such corporate governance-driven transparency and accountability strengthen sustainability reporting by building trust and credibility, providing stakeholders with accurate, reliable information, and ultimately ensuring informed decision-making and promoting long-term sustainability practices. Previous studies have shown a positive relationship between corporate governance and sustainability reporting (Jamil et al., 2021; Lagasio & Cucari, 2019; Mahmood et al., 2018; Rathnayaka Mudiyanselage, 2018).

However, good corporate governance structures or practices do not guarantee that a company will engage in sustainability reporting. Empirical evidence indicates that corporate governance practices or structures may have a negative or insignificant relationship with sustainability reporting (Husted & Sousa-Filho, 2019). For

instance, larger board sizes have been found to present communication challenges and conflicts of interest regarding sustainability (Akram et al., 2019). Furthermore, a board's sustainability will not effectively contribute to improved reporting practices (Emmanuel et al., 2018).

Other studies have found that corporate governance practices do not significantly impact sustainability reporting (Birindelli et al., 2018). Company managers choose not to engage in sustainability reporting if they believe it will not yield personal benefits (Moses et al., 2020). This may be attributed to several factors, including their perception of shareholder interests and demands, a lack of personal or professional incentives to engage in sustainability reporting, or the view that such reporting does not significantly enhance the company's reputation or long-term sustainability.

Secondly, effective audit and risk management significantly influence sustainability reporting by ensuring the transparency, accountability, and reliability of disclosed information (Tamimi, 2021). Robust internal audit and comprehensive risk management frameworks help companies identify and mitigate potential risks, leading to more accurate and reliable sustainability reports. For instance, the integration of performance assessment approaches within banks has been shown to support sustainability development by enhancing the reliability of sustainability disclosures.

Third, integrity in corporate reporting and meaningful stakeholder engagement are essential for enhancing the credibility and completeness of sustainability reporting. Stakeholder engagement involves consulting key stakeholders on matters of importance to both them and the company, ensuring that reports reflect a balanced view of the company's sustainability efforts (Villiers et al., 2019). Recent studies emphasize that strong stakeholder relationships significantly influence the sustainability reporting process by promoting transparency and accountability, thereby improving the alignment between corporate actions and stakeholder expectations (Fusco et al. 2024).

The Malaysian Code on Corporate Governance (2021) emphasizes three key principles: board leadership and effectiveness, the effectiveness of audit and risk management, and integrity in corporate reporting, all of which are designed to enhance corporate governance in Malaysia. These principles can strengthen the positive relationship between corporate governance and sustainability reporting. By prioritizing transparency, accountability, and stakeholder engagement, sound corporate governance encourages companies to report comprehensive and accurate sustainability information. Substantial empirical evidence indicates that effective corporate governance, such as robust board oversight and strong audit practices, generally fosters a culture of responsibility and sustainability. Therefore, this study anticipates a positive relationship between corporate governance and sustainability reporting.
Hypothesis: Corporate governance has a positive relationship with sustainability reporting

3. Methodology

This section consists of research design, sample, and data collection; variable measurement; and data analysis/model specification. It explains how the study was conducted, how the variables were measured and how the relationships between the variables were tested.

Data and sample design

The study uses an unbalanced panel dataset of Malaysian publicly listed companies covering the period 2022–2024. The initial sample comprised 260 companies as stated in Table X. However, companies with incomplete data were excluded from the analysis, resulting in a final sample of 125 companies and 366 company-year observations across various industries. Keller and Warrack (2005) argued that the observations of at least 30 companies from the population represent the population. A sample of 30 or more observations also provides a reasonable basis for estimating population characteristics and enables statistical methods to produce more reliable results. All non-financial data were collected from the companies' annual reports, while financial data were obtained from the Eikon database. The study excludes 29 financial institutions, such as banks, because they are subject to different regulations from non-financial institutions. Financial institutions are required to comply with guidelines issued by Bank Negara Malaysia, and their corporate governance structures also differ, including requirements for Shariah committees, fund managers, and actuaries (Bank Negara Malaysia, 2019;

Economic Planning Unit, 1991). In addition, one Special Purpose Acquisition Company (SPAC) is excluded due to its unique characteristics and distinct structure and operations.

Table X: Sample Selection Process

Sample selection criteria	Number of companies
Initial sample of Malaysian publicly listed companies	260
Less: Companies excluded due to incomplete data	(135)
Final sample of companies	125
Observation period	2022–2024
Total firm-year observations	366

Measurement of Variables

The study measures sustainability reporting (SR) and corporate governance (CG) as the main variables, while company size, leverage, research and development (R&D), and industry are included as control variables.

Sustainability Reporting (SR)

This study employs a sustainability disclosure index developed by Jamil et al. (2021) based on the Global Reporting Initiative (GRI) guidelines, encompassing three key dimensions: economic, environmental, and social performance. This index was selected due to its comprehensiveness and suitability for measuring corporate sustainability reporting in the Malaysian context, as well as its application in previous studies (Hanapi et al., 2026; Mohd Yusof et al., 2026). An unweighted scoring approach is adopted to measure sustainability disclosure (Haniffa & Cooke, 2002; Rouf, 2011; Saleh et al., 2010). The index comprises 48 disclosure items covering the three sustainability dimensions. All companies are assessed using the same set of 48 sustainability disclosure items to ensure consistency and comparability across companies. A score of 1 is given when a company discloses information about a certain item in its annual report, whereas a score of 0 is allocated if the item is not disclosed. This binary scoring approach captures the presence or absence of sustainability disclosure rather than its quality, depth, or completeness. Consequently, the index evaluates the degree of sustainability reporting but does not examine the precision, reliability, or substantive integrity of the disclosed information. Accordingly, the index measures the extent of sustainability disclosure but does not assess the accuracy, credibility, or substantive quality of the information reported. The scores for all 48 items are subsequently aggregated for each company to obtain its total sustainability disclosure score. The highest achievable score is 48, signifying that all 48 items have been disclosed. Consequently, this research formulates the subsequent equation for assessing sustainability disclosure:

$$SR_i = \sum X_i$$

Where;—

n_i = expected number of items for company i, ni ≤ 48

X_i = 1 if the item is disclosed, whereas 0 if the item is not disclosed.
Such that 0 ≤ SR ≤ 48.

Corporate Governance (CG) Measurement

The corporate governance disclosure index was developed based on the underlying principles of the Malaysian Code on Corporate Governance (MCCG) 2021, with measurement items informed by previous empirical studies. The MCCG 2021 provides a relevant framework for assessing corporate governance practices in Malaysian companies through its emphasis on board leadership and effectiveness, audit and risk management, and integrity in corporate reporting and meaningful relationships with stakeholders (Securities Commission Malaysia, 2021). However, the index was not adopted directly from the Code because the objective of the study was to operationalize selected corporate governance practices into measurable indicators suitable for empirical analysis. Accordingly, relevant indicators were selected and adapted from previous studies that provided practical guidance for translating broad governance principles into observable criteria (Nsour & Al-Rjoub, 2022; Agustina et al., 2021; Musallam, 2018; Dilling & Caykoylu, 2019). This approach is consistent with the need to consider measurement choices and methodological issues when conducting corporate governance

research in the Malaysian context (Khatib et al., 2022). The final index comprises 31 indicators grouped into three dimensions: board effectiveness, audit and risk management, and integrity in corporate reporting. Each indicator is evaluated using a binary scoring system, assigning a score of one when the specified criterion is satisfied or disclosed in the relevant corporate report and zero otherwise. The index assesses the existence or disclosure of certain corporate governance procedures rather than full adherence to the MCCG 2021 or the genuine efficacy of each practice. To promote transparency and content authenticity, document the source and rationale for each indication, and apply the coding standards consistently across all company-year observations.

The corporate governance index items were adapted from Nsour and Al-Rjoub (2022), with several additions. Items concerning risk management were drawn from Gulati et al. (2020), covering the existence of a risk management committee and a Chief Risk Officer, committee size and meeting frequency, and the appointment of a non-executive director as chairperson. Additionally, the presence of at least one female director was included, as this can contribute to more diverse perspectives and enhance social responsibility and sustainability reporting (Agustina et al., 2021; Musallam, 2018; Dilling & Caykoylu, 2019).

Each CG item is assigned a score of 1 if the company reports the item and 0 if no information is reported, based on the elements of MCCG 2021 Sections A, B, and C. Section A comprises 7 items, Section B has 11 items, and Section C contains 13 items, as stated in Table 1. The scores across all sections are aggregated, covering up to 31 items, and a percentage is calculated to assess the company's corporate governance structure and practices. Based on the foregoing, this study derives the following equation:

$$CG_i = \sum \frac{X_i}{n_i}$$

Where;-

n_i = the number of items expected for company i, $n_i \leq 31$

X_i = 1 if the item is disclosed, and 0 if the item is not disclosed. Such that $0 \leq CG \leq 1$.

Table 1: Corporate Governance Measurement

Dimension	No.	Measurement Item
A. Board Effectiveness	1	The board of directors consists of at least 50% independent directors.
	2	The board of directors consists of between 3 and 13 members.
	3	The board of directors has at least one female director.
	4	The company has nomination and remuneration committees.
	5	The board of directors conducts a performance evaluation of executive management.
	6	The nomination and remuneration committees are chaired by independent directors.
	7	The company has a remuneration policy for executive directors.
B. Audit and Risk Management	1	The audit committee is chaired by a non-executive or independent director.
	2	The audit committee consists of independent directors.
	3	The number of audit committee members is disclosed.
	4	The company discloses information on audit and internal control procedures.
	5	The audit committee holds at least four meetings per year.
	6	The company has an internal audit function.
	7	The company has a risk management committee.
	8	The company has appointed a Chief Risk Officer.
	9	The company discloses the size of the risk management committee.
	10	The company discloses the number of meetings held by the risk management committee.
	11	The risk management committee is chaired by a non-executive director.

C. Integrity in Corporate Reporting	1	All shareholders can access ownership records and documents maintained by the company.
	2	Shareholders have access to the minutes of general meetings.
	3	Shareholders have the right to take legal action or use alternative dispute resolution mechanisms against the board of directors or senior management if their actions put the company at risk.
	4	Major shareholders holding 10% or more of the shares can request an extraordinary general meeting.
	5	Existing shareholders have pre-emptive rights to subscribe to new share issues.
	6	Shareholders receive dividends within 45 days from the date of approval by the general meeting.
	7	Shareholders participate in and are informed about major corporate decisions.
	8	Shareholders can participate and vote at general meetings.
	9	The company's ownership and control structure is transparent and can change according to shareholders' needs or demands.
	10	Shareholders within the same class are treated equally.
	11	The company has an insider trading policy.
	12	The company does not provide loans to directors or has a policy restricting such loans.
	13	The company has an investor relations officer or department.

Company Size (Size)

Previous studies indicate that company size can influence voluntary reporting, such as CSR, as larger companies possess greater financial resources to implement comprehensive sustainability reporting practices (Gantyowati, 2017). Company size can be measured by the number of employees, total revenue, or total assets. According to Fodio et al. (2013), a company's total assets serve as a measure of its size. In this study, company size is measured based on the logarithm of the company's total assets (Gantyowati, 2017). A natural logarithm is applied to the formula to minimize the magnitude of total asset values that run into thousands or millions.

$$Size = Log_{10}$$

Leverage

Leverage refers to a company's total debt relative to its total equity. Total debt encompasses both long-term and short-term liabilities. Previous studies indicate a negative relationship between leverage and sustainability reporting (Becchetti et al., 2011; Cho et al., 2010; Dhaliwal et al., 2011; Jo & Harjoto, 2011; Leftwich et al., 1981). High levels of debt constrain a company's ability to invest in sustainability reporting, as debt increases financial costs (Najah & Anis, 2013). However, some researchers note that creditors act as monitors of borrowing companies and thus require extensive disclosure of information to protect their claims (Becchetti et al., 2011; Cho et al., 2010; Dhaliwal et al., 2011; Jo & Harjoto, 2011; Leftwich et al., 1981).

The measurement of leverage, based on previous studies (Orazalin & Mahmood, 2020), is as follows:

$$Leverage = \frac{Total\ Liabilities}{Total\ Equities}$$

Research and Development (R&D)

Companies that invest in innovation and research and development (R&D) can enhance both profitability and sustainability reporting (Xie et al., 2022; Xu et al., 2021). Innovation in product design, production processes, and business models can lead to cost reductions, new revenue streams, and improved environmental and social performance.

The measurement of R&D based on previous studies (Binh & Tung, 2020) is as follows:

$$R\&D = Log_{10} R\&D\ expenditures$$

Industry

The impact of industry type on corporate sustainability reporting practices has been extensively discussed in prior studies (Lee et al., 2016; Pranugrahaning et al., 2020; Tsalis et al., 2020). According to Tsalis et al. (2020), industries differ in their commitment to sustainability reporting due to their unique characteristics and operational practices. For instance, industries heavily reliant on natural resources, such as mining or agriculture, face specific challenges in measuring and reporting their environmental impacts. These industries often struggle to quantify emissions, waste generation, and water use due to the complexity of their operations. Technology and energy companies tend to place greater emphasis on sustainability reporting due to the importance of innovation, environmental and social responsibility, and pressure from investors and stakeholders (Girón et al., 2021). Conversely, service-oriented industries such as finance and consulting may struggle to identify and measure non-financial impacts because their operational effects are less tangible. Therefore, industry type plays a significant role in shaping corporate sustainability reporting practices.

This study employs a binary measure to classify the sample companies within the industries of interest. This approach assigns a score of 1 if a company belongs to the target.

$$1 = Target\ industry\ for\ the\ technology\ or\ energy\ industry\ and\ 0\ for\ vice\ versa$$

Study Model

Multiple regression analysis is used to examine the relationship between corporate governance and sustainability reporting, while controlling other relevant firm characteristics. Accordingly, the equation can be estimated based on the following model:

$$SR_{it} = \alpha_{it} + \beta_1 CG_{it} + \sum b_2 Control_variables_{it} + \varepsilon_{it} \qquad \text{Equation1}$$

Test: H_1

Where:

SR	= Sustainability Reporting
CG	= Corporate governance
Control variables	= Control variables

Control variables are:-

Size	= Company Size
Leverage	= Leverage
R&D	= Research and development
Industry	= Industry

4. Results and Discussion

This section presents descriptive statistics and fixed-effects regression results, providing an overview of the study variables and examining the relationships between corporate governance, sustainability reporting and control variables.

Descriptive Statistics

Based on the descriptive statistics in Table 2, this study includes 366 observations per variable. The mean value represents the average obtained for each variable within the study sample. At the same time, the standard deviation indicates the degree of variation or dispersion of the observed values around that average. Corporate Governance (CG) is measured using the MCCG 2021 index; the mean value is 0.247, with a standard deviation of 0.432. This indicates that the average corporate governance score for the companies studied is 24.7%, with relatively limited variation in scores around that average.

Table 2: Descriptive Statistics

Variables	N	Mean	SD
Sustainability Reporting (SR)	366	22.406	9.099
Corporate governance (CG)	366	0.247	0.432
Size	366	8.997	0.767
Leverage	366	0.724	2.687
R&D	366	0.211	1.144
Industry (IND)	366	0.118	0.323

In sustainability reporting (SR), assessed using the unweighted disclosure approach, the average number of item disclosures is 22.406, with a standard deviation of 9.099. The elevated standard deviation suggests that sustainability reporting exhibits greater variability among the companies in the research sample.

Regarding the control variables, company size (Size), measured as the logarithm of total assets, has a mean of 8.997 and a standard deviation of 0.767. This suggests that the mean company size in the sample corresponds to a logarithmic total asset value of 8.997, with minimal variation in size across observations. Leverage, quantified as the ratio of total debt to equity, exhibits a mean value of 0.724 and a standard deviation of 2.687. The elevated standard deviation relative to the mean indicates considerable disparity in leverage ratios among the companies analyzed.

Meanwhile, the logarithmic measure of research and development expenditures showed a mean of 0.211 and a standard deviation of 1.144. This indicates that the extent of R&D expenditure varies among the companies in the sample. In summary, the industry variable (IND), in the energy and technology sectors, has a mean of 0.118 and a standard deviation of 0.323. As the industry variable is categorical and as a dummy variable, a mean of 0.118 implies that nearly 11.8% of the sample observations are from companies in the energy and technology sectors, with the remaining observations belonging to other industry classifications.

Regression Results

Based on a series of model selection tests, including the Breusch-Pagan Lagrange Multiplier (LM) test and the Hausman test, the fixed-effects model was selected as the most appropriate estimation method for this study. Therefore, the fixed-effects regression model was employed to examine the relationship between corporate governance and sustainability reporting.

Table 3: Fixed-Effects Regression Results

Dependent Variable (DV): SR

Variables	Coefficient	Robust Standard Error	z	p-value	95% Confidence Interval: Lower	95% Confidence Interval: Upper
Constant	-31.6400***	9.605	-3.29	0.001	-50.465	-12.814
CG	0.3779***	0.1203	3.14	0.002	0.1421	0.6136
Size	5.0020***	1.0649	4.7	0	2.9148	7.0892
Leverage	0.2028***	0.0438	4.63	0	0.117	0.2886
R&D	0.1545	0.3537	0.44	0.662	-0.5387	0.8476
IND	-1.2401	1.7427	-0.71	0.477	-4.6556	2.1755
Number of observations (N)	366					
Number of groups (ID)	125					
Within R^2	0.476					
F-statistic	22.51					
F-test p-value	<0.001					
rho	0.7636					

Note: Robust standard errors are adjusted for 125 clusters (ID). ***p < 0.01.

Table 3 presents the results of the fixed-effects regression examining the relationship between corporate governance (CG) and sustainability reporting (SR), with SR as the dependent variable. The results indicate a positive and statistically significant relationship between corporate governance and sustainability reporting ($\beta = 0.3779$, $p = 0.002$). This suggests that a one-unit increase in the CG index is related to a 0.3779-unit increase in SR, holding other variables constant, where applicable. In substantive terms, the positive coefficient indicates that stronger corporate governance is related to higher SR. The 95% confidence interval ranges from 0.1421 to 0.6136, suggesting a positive association across the estimated interval. This positive coefficient aligns with Hypothesis 1, which posits that corporate governance is positively associated with sustainability reporting. Therefore, Hypothesis 1 is supported. These findings are consistent with previous studies that reported a positive relationship between corporate governance and sustainability reporting. Specifically, the positive and significant relationship found in this study supports the findings of Yondrichs et al. (2021), Karaman et al. (2020), and Buallay (2022), who suggested that stronger corporate governance is associated with more comprehensive and transparent sustainability reporting. This relationship can be explained by the fact that effective corporate governance strengthens transparency, accountability, and stakeholder engagement, thereby encouraging companies to disclose more sustainability-related information. In particular, companies with stronger corporate governance mechanisms are more likely to establish effective monitoring and reporting processes, improve the reliability of sustainability information, and respond to stakeholders' increasing demand for transparency. Therefore, the positive and significant finding suggests that stronger corporate governance provides an effective mechanism for enhancing the quality and extent of sustainability reporting.

The finding aligns with Stakeholder Theory, which emphasizes addressing stakeholders' interests and expectations through transparency and accountability. Companies with stronger corporate governance procedures typically disclose more sustainability-related data, as indicated by the positive and significant relationship between corporate governance and sustainability reporting. Board supervision, accountability, and transparency governance processes in the Malaysian Code on Corporate Governance (MCCG) 2021 offer a framework for businesses to take stakeholders' information demands and expectations into account. Because transparent reporting helps stakeholders better understand a company's environmental, social, and governance (ESG) practices and performance, these procedures are pertinent to sustainability disclosure. The positive relationship between the corporate governance index and sustainability reporting is consistent with the theoretical expectation that governance arrangements matter for corporate transparency and disclosure, even though this study did not directly measure stakeholder interests and engagement. As a result, the results align with Stakeholder Theory, which postulates that increased sustainability reporting, which informs stakeholders of the company's environmental, social, and corporate governance performance, is linked to stronger corporate governance.

Among the control variables, company size (Size) and Leverage also exhibit a positive and significant relationship with sustainability reporting (SR) ($\beta = 5.0020$, $p < 0.001$; $\beta = 0.2028$, $p < 0.001$, respectively). This is because larger companies possess greater funds to implement comprehensive sustainability reporting practices (Gantyowati, 2017). Several researchers state that creditors monitor borrowing firms and, consequently, require extensive disclosure to protect their claims (Becchetti et al., 2011; Cho et al., 2010; Dhaliwal et al., 2011; Jo & Harjoto, 2011; Leftwich et al., 1981).

Conversely, research and development (R&D) expenditure shows no statistically significant relationship with sustainability reporting ($\beta = 0.1545$, $p = 0.662$), and the industry factor (IND) is also not statistically significant ($\beta = -1.2401$, $p = 0.477$). Equation 1 is statistically significant overall, with an F-statistic of 22.51 ($p < 0.001$) and a within-R^2 value of 0.476, indicating that the model explains approximately 47.6% of the within-firm variation in sustainability reporting. This analysis is based on 366 observations across 125 firm-level clusters, using robust standard errors clustered at the company level.

5. Conclusion

The regression results of this study show that corporate governance is positively and significantly associated with sustainability reporting, indicating that stronger corporate governance has a positive relationship with sustainability disclosure. This is because effective corporate governance enhances transparency,

accountability, and responsiveness to stakeholders. Company size and leverage are also positively and significantly associated with sustainability reporting, as larger and more highly leveraged companies face greater pressure and have more resources to provide more extensive disclosure. In contrast, R&D expenditure and industry are not significantly related to sustainability reporting.

The findings have important implications for regulators and policymakers, particularly the Securities Commission Malaysia and Bursa Malaysia. The positive and significant relationship between corporate governance and sustainability reporting suggests that stronger governance mechanisms under the MCCG 2021 principles may positively affect sustainability disclosure. Therefore, regulators must continue to bolster and promote adherence to the MCCG 2021, notably its emphasis on board leadership, audit and risk management, the accuracy of corporate reporting, and stakeholder engagement. The important association between corporate size and leverage implies that regulatory policies should reflect the differing disclosure requirements imposed on organizations of various sizes and financial structures.

The findings imply that corporate governance can be a crucial benchmark for investors when analyzing a company's sustainability and transparency. Stronger governance is linked to more thorough sustainability reporting, which can offer valuable information for evaluating corporate accountability, sustainability performance, and possible long-term risks. As a result, investors may focus more on companies with stronger governance practices. This information can help investors develop more informed investment strategies and identify companies that demonstrate a stronger commitment to ethical and sustainable business practices.

From a scholarly perspective, the findings empirically support the assertion that corporate governance is a crucial factor in sustainability reporting among Malaysian listed enterprises. This investigation contributes to prior governance research on the MCCG 2021, rather than merely emphasizing individual board traits. This conclusion also reinforces stakeholder theory, as effective governance may promote greater transparency and accountability for stakeholders. Meanwhile, the limited influence of R&D investment and sector suggests future research could examine additional determinants that may explain differences in sustainability reporting.

Limitations and Future Research

This study has several shortcomings despite its merits. First, the results may be less applicable to other nations and institutional contexts because the sample comprises Malaysian listed companies. Second, the three-year study period might not have adequately captured how corporate governance and sustainability reporting have evolved. Third, the number of observations varies across companies because the study uses an unbalanced panel. Fourth, the coding procedure for the sustainability reporting index may entail subjective judgment because it is based on content analysis of corporate disclosures. Fifth, it is impossible to rule out endogeneity issues such as reverse causality and omitted-variable bias. Lastly, combining the many aspects of the Malaysian Code on Corporate Governance (MCCG) 2021 into a single corporate governance (CG) index may obscure the distinct contributions of particular governance systems to sustainability reporting.

To improve the generalizability of the results, future research could overcome these limitations by broadening the sample to include companies from various industries, nations, or institutional settings. Additionally, extending the study period would help capture changes over time in sustainability reporting and corporate governance standards. By using a well-defined coding process and conducting appropriate reliability checks, researchers could further improve the reliability of disclosure measurement. Future research could also examine each MCCG 2021 dimension independently to determine which governance mechanisms are most strongly related to sustainability reporting. To address possible endogeneity issues and increase the findings' robustness, appropriate empirical techniques might also be taken into consideration.

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Understanding National-Level Factors Behind Skilled Migration: A Comprehensive Literature Review

*Vayanthi Vishmika Kumari Senevirathne[1], Amila Suranjeewa Withanaarachchi[2], Thilini V. Mahanama[2]
[1]Department of Industrial Management, Faculty of Graduate Studies, University of Kelaniya, Sri Lanka
[2]Department of Industrial Management, Faculty of Science, University of Kelaniya, Sri Lanka
Email: *vishuvksenevirathne@gmail.com, amilaw@kln.ac.lk, thilinim@kln.ac.lk
Corresponding Author: Vayanthi Vishmika Kumari Senevirathne

Abstract: This systematic review examines macro-level factors shaping skilled professionals' migration intentions between 2010 and 2025. Using PRISMA-2020 guidelines, searches across six databases generated 557 records, of which 28 high-quality studies met the inclusion criteria. Findings synthesized through the TCCM framework reveal six clusters of macro-level drivers: political, economic, sociocultural, technological and infrastructural, legal and policy, and environmental. Wage differentials are the most consistently reported driver, followed by limited domestic employment, poor economic conditions, corruption, insecurity and weak health-system infrastructure. National corruption, fiscal austerity, regional housing prices, city type and pandemic shocks condition these effects, and institutional trust is the only macro-level mediator identified; no study tested interaction or mediation formally. The review contributes an operational definition of macro-level factors and an evidence-derived framework separating direct, conditioning and transmitting pathways. Since the evidence is cross-sectional, perception-based and health sector-dominated, the framework is offered as testable propositions rather than a general model. In general, pay reform alone is unlikely to retain skilled professionals unless it improves the governance, security and public infrastructure.

Keywords: *Brain-Drain, Macro-Level Factors, Migration Intention, Skilled Migration, Systematic Review*

1. Introduction

International mobility of skilled professionals has become an important feature of current socio-economic transformation, influencing labor markets, national competitiveness, and long-term developments. By 2024, global migrants reached 304 million (3.7% of the world's population), up from 275 million in 2020, a 10.4% increase that outpaced the world's 3.5% population growth over the same period (Paez-deggeller, 2025). Among them, 167.7 million were educated and working-age workers, accounting for 4.7% of the global labor force in 2022 (ILO, 2024). These trends reflect how human capital mobility influences economic structures, innovation, and demographic patterns in both origin and destination countries.

Macroeconomic theories such as neoclassical migration theory frame migration as a rational response to wage differentials, labor-demand disparities, and economic opportunity structures (de Haas, 2021). Similarly, structuralist and world-systems perspectives emphasize the role of global economic hierarchies, uneven development, and market integration pushing skilled workers toward advanced economies (Castles et al., 2005; Sassen, 2014). Empirical studies further show that governance quality, economic stability, public sector efficiency, corruption, political climate, and institutional trust strongly affect individuals' expectations about their future in their home country (Anvarovich & Mekhmonkulovich, 2020; Sassen, 2014). Likewise, global economic integration, technological infrastructure, immigration regulations, and talent-attraction initiatives significantly affect the attractiveness of destination countries (Chaloff & Lemaître, 2009; OECD, 2022). This theoretical and empirical evidence highlights the importance of macro-level forces in shaping skilled migration intentions.

Despite these insights, the literature shows several gaps. Foremost, evidence remains limited on which national-level factors matter most across different regions and professions (Czaika & Parsons, 2017). Second, many studies examine macro determinants in isolation rather than considering how structural push-pull forces interact (De Haas, 2010). Third, there is a lack of studies on which moderators condition the impact of macro-determinants on migration intention. Finally, the mediating mechanisms linking macro forces to migration intention remain underexplored (Drazanova, Gonnot, Heidland, & Kruger, 2023). These gaps indicate the need for systematic synthesis of macro-level drivers influencing the migration intention of skilled professionals.

Addressing these gaps is essential for both theory and practice. For developing countries, understanding the

root causes of skilled migration is critical in designing effective retention strategies and mitigating brain drain (Docquier & Rapoport, 2012). For destination countries, identifying the macro-level drivers influencing skilled workers' intentions helps strengthen migration and integration policies (OECD, 2022). Thus, the objectives of this systematic literature review are:

- To identify the theoretical perspectives underpinning national-level determinants of skilled professionals' migration intention.
- To examine the professional and geographical contexts in which macro-level determinants of skilled migration intention have been studied.
- To identify the direct factors, moderators, and mediators shaping skilled professionals' migration intention at the macro level.
- To evaluate the methodological approaches used in existing research on macro-level determinants of skilled migration.
- To identify the existing gaps in the macro-level migration intention literature and provide future research directions.

By synthesizing this evidence, the review proposes an integrated framework of direct, conditioning and transmitting macro-level forces

The remainder of the paper is organized as follows. Section 2 reviews the theoretical background and sets out the operational definition of macro-level factors. Section 3 describes the review protocol. Section 4 presents and discusses the findings, research gaps and derives the framework. Section 5 provides the study conclusion.

2. Literature Review

Theoretical perspectives on macro determinants of skilled migration

Macro-level explanations share the premise that people respond to structural conditions they cannot change individually. The push–pull model explains migration through adverse conditions at origin, attractive conditions at destination and intervening obstacles such as distance and immigration law (Lee, 1966). Neoclassical theory narrows these conditions to wage and employment differentials (Harris & Todaro, 1970), while structural perspectives locate them in uneven development and global economic hierarchy (Castles et al., 2005; Sassen, 2014). Institutional perspectives add that when citizens cannot improve institutions through voice, exit becomes more attractive (Hirschman, 2004) and the aspirations–capabilities framework separates the wish to leave from the means of doing so (de Haas, 2021). These perspectives explain why national conditions matter but say little about which conditions strengthen or weaken one another, or through which channels they reach individuals. This review therefore uses them to classify direct, conditioning and transmitting macro-level effects.

Operational definition of macro-level factors

A factor is treated as macro-level when (a) its referent is a structural property of a country, region or city, or of a national institution governing a profession, such as the public health system or a licensing regime, rather than of a person, household or employer; (b) it applies in common to professionals in that unit; and (c) no individual or single employer can change it in the short term. Perceptions are included only when their object is in such a condition, for example, perceived national corruption, because most studies measure national conditions through respondents' assessments. Sub-national conditions such as regional housing prices are included because they are set by markets and public policy rather than by individuals.

Accordingly, political factors qualify because they describe the state and its institutions; economic factors because they describe national or regional labor markets, wages and economic performance; sociocultural factors because they describe society-wide norms, protection and exclusion; infrastructural factors because they describe public systems; legal and policy factors because they are set by legislation and international agreements; and environmental factors because they affect whole populations. Variables referring to the individual or the workplace were treated as micro- or meso-level and excluded.

3. Methodology

As migration research spans several disciplines and contexts, this SLR adopted PRISMA-2020 guidelines to establish a structured and standardized method for identifying, screening, and selecting studies (Page et al., 2021).

Article Eligibility Criteria: The inclusion criteria for articles in this study were carefully designed to guarantee the choice of relevant and top-quality sources for a thorough analysis. Table 1 presents the study eligibility criteria that were formulated prior to the search process.

Indexing in SJR (any quartile) or ABDC (A*, A or B) served as a verifiable peer-review threshold, not as a proxy for quality. All SJR quartiles were admitted so that credible evidence from lower-ranked journals, which more often publish studies from under-represented countries, was not excluded on prestige grounds; journals indexed in neither list (n=6) were excluded because their review standards could not be verified. Quality was judged per article instead.

Table 1: Inclusion Criteria

Characteristic	Inclusion Criteria
Type of publication	Peer-reviewed articles published in top-tier journals (A*/A/B Australian Business Deans Council (ABDC) Journal Quality, Q1-Q4 SCImago Journal Rank (SJR))
Language	English
Time period	Between 2010–2025
Research design	Empirical studies that employed quantitative, qualitative, or mixed-method approaches
Content	Studies with the primary/secondary focus on professionals, employees, skilled professionals, or skilled employees with at least one macro-level factor examined or reported
Database Source	Emerald Insight, IEEE Xplore, Sage Journals, ScienceDirect, Springer Nature, and Web of Science

Source: Author's Work

Information Sources and Search Strategy: A thorough search was conducted across six databases (Table 1) to capture a wide interdisciplinary range of studies relevant to skilled migration. Search terms combined the outcome concept (migration intention) with the population concept (professionals, skilled professionals, employees and skilled employees) using Boolean operators. The database-specific search strings are reported in Appendix A. The search initially identified 557 records.

Selection Process (Figure 1)**:** Study selection followed the PRISMA-2020 stages shown in Figure 1. Before manual screening, automated filters removed non-English articles, pre-2010 publications, non-journal materials, and restricted-access papers. Then 15 duplicates were removed in Mendeley, leaving 405 articles for screening. Next, the screening was conducted in two phases. In the first phase, titles and abstracts were reviewed and then in the second phase, full texts of articles were examined. A total of 103 reports were excluded: review papers (n=11), conference papers (n=2), non-indexed journals (n=6), irrelevant populations (n=51), data collected before 2010 (n=3), and no macro-level factor or migration-intention outcome (n=30). Finally, 33 studies were included.

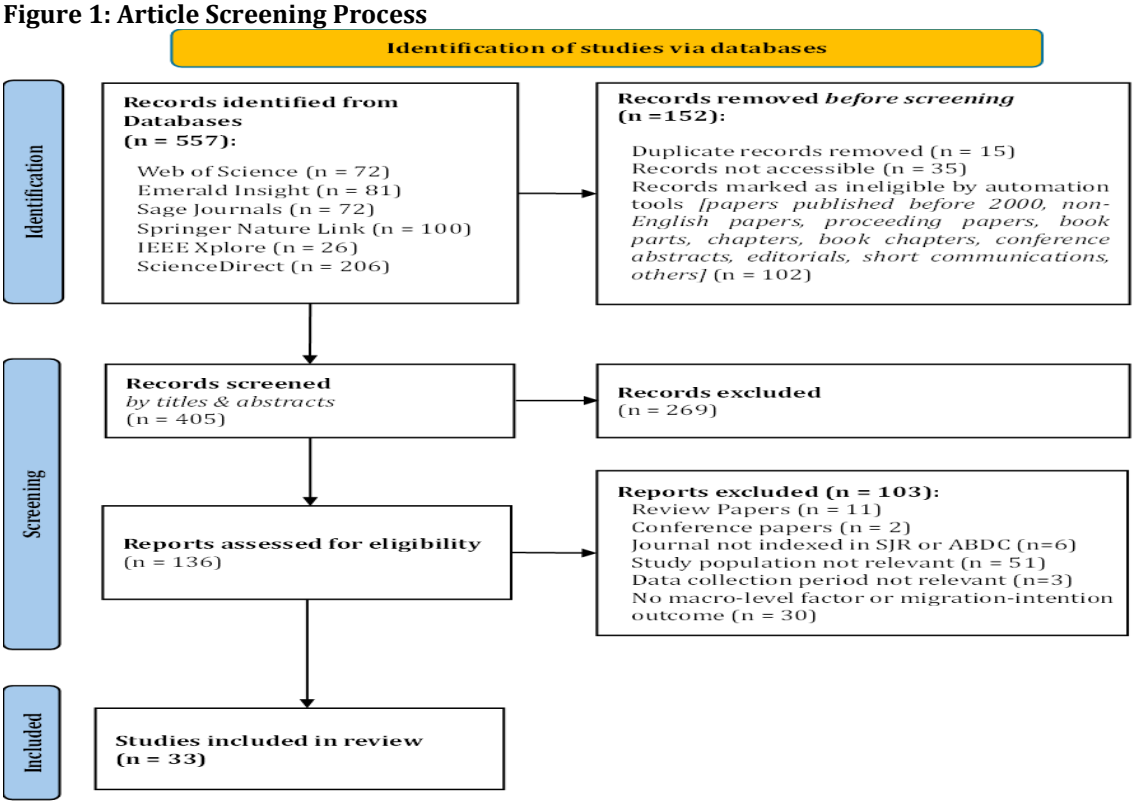
Data Items: Data extraction was conducted using a structured Excel sheet to systematically record information from the 33 included studies, covering study characteristics, theory, methodology, population characteristics, geographical context, and the macro-level antecedents, moderators and mediators of migration intention, together with the direction and statistical significance of each reported relationship.

Quality appraisal (Appendix B)**:** The quality of 33 studies was assessed with the Mixed Methods Appraisal Tool (MMAT, 2018 version), which covers qualitative, quantitative and mixed methods designs (Hong et al., 2018). Each study was first checked against the two screening questions and then rated against the five criteria for its design category as 'Yes', 'No' or 'Can't tell'. Studies were rated high (four/ five criteria met), moderate (three) or low (<= 2): 15 were high, 13 moderate and five low. As the MMAT discourages exclusion by overall

score, no study was removed; instead, findings resting only on low-rated studies were treated as tentative.

Study Synthesis Method: The study data were synthesized using the TCCM (Theory–Context–Characteristics–Methodology) framework (Paul & Rosado-Serrano, 2019). For Characteristics, each factor was coded into one of six macro-level domains, tabulated by direction (push/pull), evidence type and significance, and, since the designs and measures were too heterogeneous for meta-analysis, synthesized narratively by comparing frequency, direction and strength and by examining conflicting results across countries, professions and study designs.

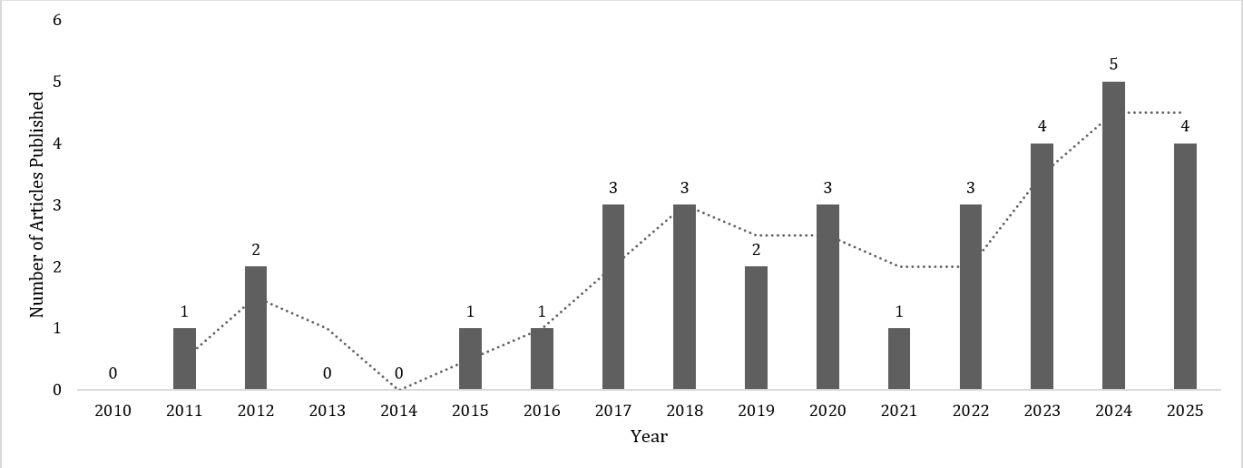
Figure 1: Article Screening Process



Source: Author's Work

4. Results and Discussion

Figure 2: Publication Trend (2010-2025)



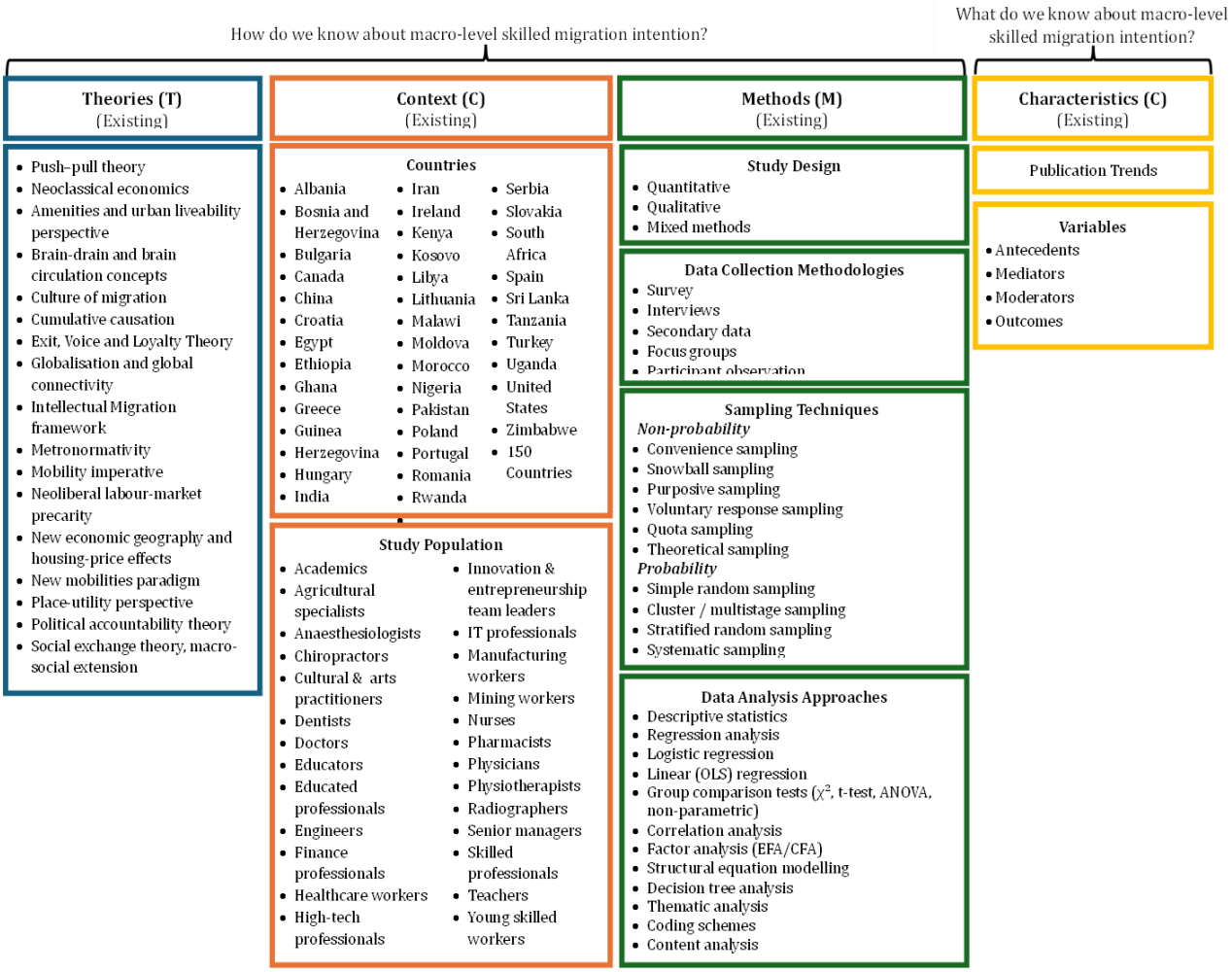
Source: Author's Work

Publication Trends: Figure 2 shows the number of included studies published each year from 2010 to 2025. Output was sparse until 2015 (four studies), rose to 12 studies in 2016–2020 and reached 17 in 2021–2025. The 2017 studies were conducted in European countries affected by post-2008 austerity (Humphries et al., 2017; Ramos & Alves, 2017; Suciu et al., 2017), and several post-2020 studies were conducted during the COVID-19 pandemic or subsequent economic crises (Amarathunga et al., 2025; Pszczółkowska et al., 2024; Wutor et al., 2024). Research attention thus tends to follow national economic and health-system shocks. Overall, the trend shows a clear rise in scholarly attention to this topic over the past decade, particularly after 2022, reflecting growing global concern over skilled migration and workforce mobility.

TCCM Framework Discussion

This section discusses the findings using the TCCM framework, structured around the four objectives of this review. Figure 3 summarizes the theories, contexts, characteristics and methods identified across the 33 studies.

Figure 3: Overview of TCCM Framework of Skilled Migration Intention



Source: Author's Work

Theories (T)

Thirty of the 33 studies used at least one macro-level perspective, giving 45 theory applications (Table 2). The most adopted approach is the push–pull framework (23 applications, 51%; used in 70% of studies) and it grew from three studies in 2010–2015 to 14 in 2021–2025, followed by neoclassical economics (11%). Push–pull mostly served as a device for listing origin and destination conditions rather than for generating testable relationships, which partly explains why moderating and mediating mechanisms remain under-examined.

More explanatory perspectives were rare: exit-voice and political accountability theory linked corruption to emigration (Helms, 2024); amenity, liveability and new economic geography perspectives explained regional conditions (He et al., 2022; Lu et al., 2023; Shen et al., 2023); the culture of migration explained normalized medical emigration (Humphries et al., 2017); and metro-normativity explained pressures on rural professionals (Terman, 2020). Even though the Push–Pull Theory remains the leading framework in this area, the recent rise of these additional perspectives points to a growing and more varied theoretical understanding of what drives skilled migration at the national level.

Table 2: Macro-level Theories Applied in Reviewed Studies

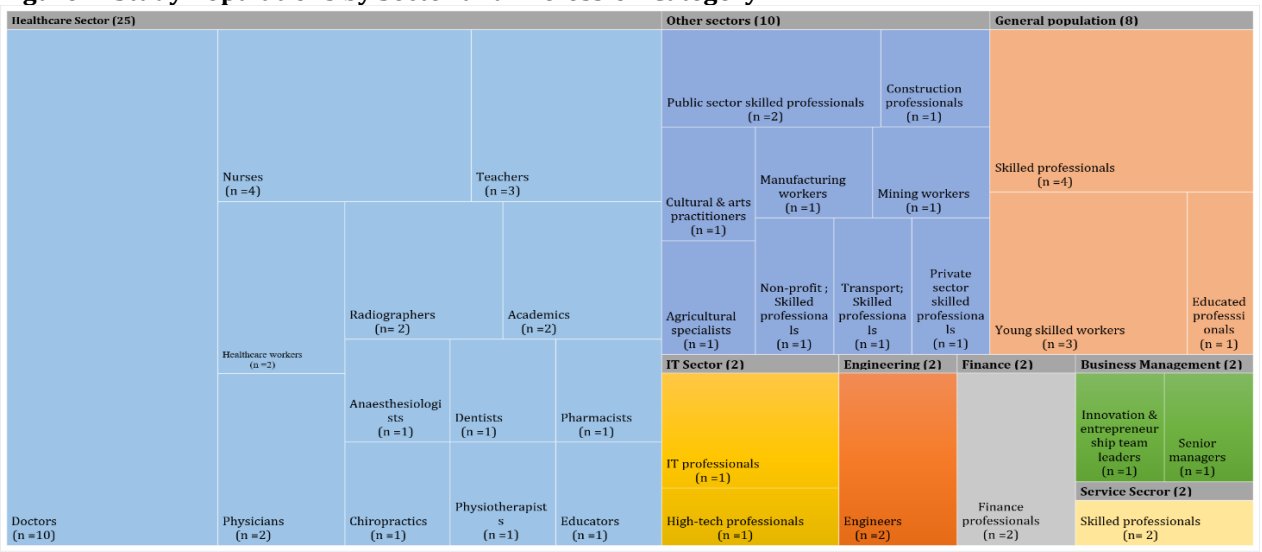
Theory/Perspectives	2010-2015	2016-2020	2021-2025	Total	Contribution
Push–pull theory/framework	3	6	14	23	51%
Neoclassical economics		3	2	5	11%
Amenities and urban liveability perspective			2	2	4%
Brain drains and brain circulation concepts			2	2	4%
Culture of migration		1		1	2%
Cumulative causation		1		1	2%
Exit, Voice and Loyalty Theory			1	1	2%
Globalization and global connectivity		1		1	2%
Intellectual Migration framework			1	1	2%
Metronormativity		1		1	2%
Mobility imperative		1		1	2%
Neoliberal labor-market precarity			1	1	2%
New economic geography and housing-price effects			1	1	2%
New mobilities paradigm		1		1	2%
Place-utility perspective		1		1	2%
Political accountability theory			1	1	2%
Social exchange theory, macro-social extension		1		1	2%

Source: Author's Work

Context(C)

The Context dimension of the TCCM framework was examined through the professional sectors and geographical settings covered by the reviewed studies.

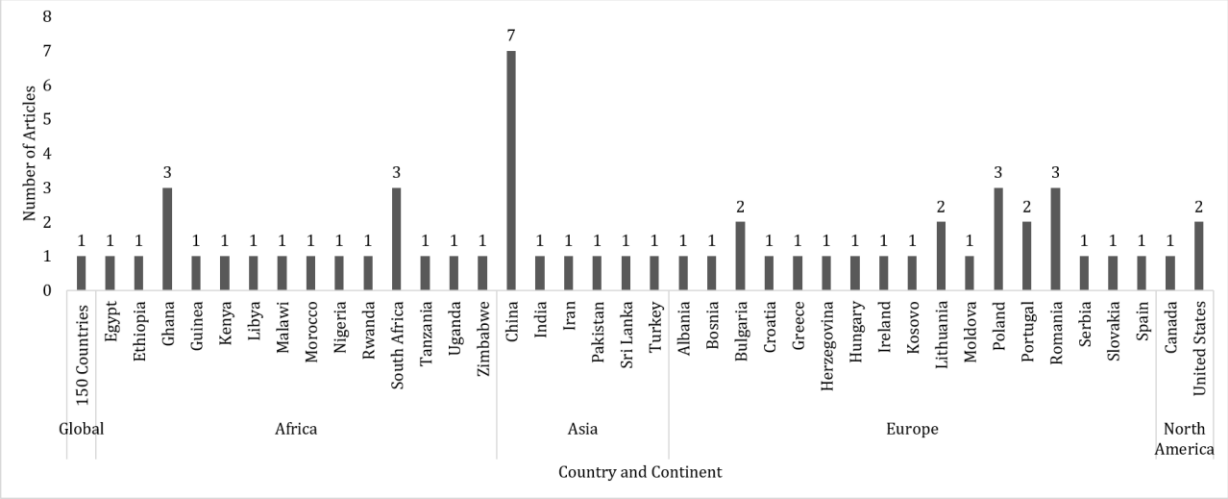
Figure 4: Study Populations by Sector and Profession Category



Source: Author's Work

As shown in Figure 4, the healthcare sector accounted for 25 of 53 profession counts (multi-profession studies are counted under each), led by doctors and physicians (12) and nurses (4). Only nine studies focused exclusively on non-health groups, such as academics, agricultural specialists and public- and private-sector employees, while engineering, IT and finance each appear in no more than two studies. The evidence is therefore weighted towards professions with international transferable licenses and active international recruitment.

Figure 5: Geographical Setting



Source: Author's Work

In terms of geographical context (Figure 5), studies were conducted across 38 countries spanning Africa, Asia, Europe, and North America, along with one large-scale study covering 135 countries (Helms, 2024). China was the most studied country (seven studies), followed by Ghana, Poland, Romania, and South Africa, each represented by three studies. Most other countries were represented by one or two studies. Asia and Europe together accounted for the largest share of the reviewed literature, whereas African countries, although numerous, were each represented by a small number of studies, reflecting a broad but thinly spread coverage of the continent. Regions such as Latin America and Oceania were absent from the reviewed studies altogether. This uneven geographical spread suggests that national-level migration intention research is concentrated in countries facing acute skilled-worker shortages or active emigration debates, such as China and parts of Eastern Europe and Africa, while other regions with comparable migration pressures remain largely unstudied.

Characteristics (C)

Antecedents (Appendix C). *Political factors.* Corruption is the most consistently tested political factor. Perceived corruption increased emigration intention across 135 countries (Helms, 2024), in Romania (Crisan et al., 2019) and in the Western Balkans (Kacani et al., 2025), and was widely endorsed by African health professionals (Fletcher-Nkile et al., 2022; Ismail & Coetzee, 2024; Ohene-Botwe et al., 2024, 2025). However, it did not distinguish between intending and non-intending Bulgarian agricultural specialists because almost all perceived it as high (Traikova et al., 2018): a condition shared by a whole population can motivate emigration yet explain little variation within a single country, so cross-national designs are needed to detect it. Evidence on political stability is mixed. Perceived instability raised migration attitudes among Turkish nurses (Sheikh et al., 2012; Wutor et al., 2024) and leadership approval lowered intention worldwide (Helms, 2024), whereas negative political perceptions were linked to lower intention among Sri Lankan young professionals (Amarathunga et al., 2025), and Ghanaian and Pakistani doctors rated political reasons below economic ones (Sheikh et al., 2012; Wutor et al., 2024). Consistent with exit-voice theory (Hirschman, 2004), political dissatisfaction may prompt voice rather than exit unless combined with economic hardship. Weak governance (Lu et al., 2018; Soltanizadeh et al., 2025), a hostile socio-political climate (Pszczółkowska et al., 2024) and crime (Fletcher-Nkile et al., 2022) add push pressure, while effective governance and security abroad pull (Ohene-Botwe et al., 2024).

Economic factors provide the most consistent evidence. A poor national economy was the strongest predictor among Sri Lankans (Amarathunga et al., 2025) and raised emigration intention worldwide (Helms, 2024), and economic instability and currency devaluation were leading push factors among Turkish, Iranian and African health professionals (Ohene-Botwe et al., 2024; Öncü et al., 2023; Soltanizadeh et al., 2025; Wutor et al., 2024). Wage differentials were the most frequently reported factor (18 studies). Higher wages abroad predicted intention among Indian pharmacists (Kunnumbrath & Kodali, 2023), Bulgarian agricultural specialists (Traikova et al., 2018) and Western Balkan nurses (Kacani et al., 2025), and low domestic wages were the strongest predictor in China (Iqbal et al., 2020, 2021). However, earnings were not significant among Polish junior doctors once socio-political conditions were considered (Pszczółkowska et al., 2024), and Romanian forensic specialists paid above the national medical average showed little interest in migrating (Covaliu et al., 2015), suggesting that wage effects are relative to national reference levels. Labor-market effects are similarly context-dependent: domestic job opportunities lowered intention in the Western Balkans (Kacani et al., 2025), opportunities abroad predicted it among Indian pharmacists, and job shortages pushed Canadian nursing and Romanian medical professionals (Freeman et al., 2012; Suciu et al., 2017), yet job-finding difficulty was not significant among Chinese young professionals (Cui et al., 2016), and job opportunities mattered only for mining workers with mismatched skills (He et al., 2022). Austerity and public pay cuts formed the background in Ireland, Portugal and Romania (Humphries et al., 2017; Ramos & Alves, 2017), a local economic shock pushed rural young professionals in Ohio (Wolfe et al., 2020), and regional housing pressure shaped intention to leave Chinese cities (Cui et al., 2016; Shen et al., 2023). Living conditions acted as push and pull factors elsewhere (Janulyte et al., 2011; Suciu et al., 2017).

Sociocultural factors appeared mainly in health-sector studies. Discrimination was significant among Iranian medical professionals (Soltanizadeh et al., 2025), and hate speech and the treatment of LGBTQ people formed part of the strongest predictors among Polish junior doctors (Pszczółkowska et al., 2024). Structural racism and heterosexism pushed minority skilled professionals from rural West Virginia (Terman, 2020), and race-related policy pushed South African anesthetists (Fletcher-Nkile et al., 2022). A pessimistic national outlook was also significant in Iran (Soltanizadeh et al., 2025). Evidence on social protection is inconsistent: inadequate social security predicted intention in Iran, social benefits abroad were not significant in Bulgaria (Traikova et al., 2018), and the Chinese evidence produced counter-intuitive signs (Iqbal et al., 2020, 2021). Colonial connections (Ohene-Botwe et al., 2024), a shared language (Humphries et al., 2017) and border proximity (Freeman et al., 2012) lowered the cost of moving to particular destinations.

Technological and infrastructural factors centered on public infrastructure and health-system capacity. Unreliable utilities and roads (Fletcher-Nkile et al., 2022) and poor health infrastructure (Ismail & Coetzee, 2024; Ohene-Botwe et al., 2024, 2025) pushed African health professionals, and health-system organization predicted intention in Poland and Romania (Pszczółkowska et al., 2024; Suciu et al., 2017). Better infrastructure abroad attracted Polish physiotherapists (Kostrzewa et al., 2022) but raised intention only in China's low-housing-price region (Shen et al., 2023), and improved public transport, but not public facilities, lowered intention in Chinese resource-based cities (He et al., 2022), indicating that effects depend on which services are locally deficient.

Legal and policy factors mainly change the costs and opportunities of moving. EU free movement and recognition of qualifications facilitated migration intention in Central and Eastern Europe (Janulyte et al., 2011; Kostrzewa et al., 2022; Suciu et al., 2017), and destination immigration policies, bilateral agreements and easier licensing attracted Pakistani, African and Canadian professionals (Freeman et al., 2012; Ohene-Botwe et al., 2025; Sheikh et al., 2012). Unfair employment laws (Soltanizadeh et al., 2025), the tightening of abortion law (Pszczółkowska et al., 2024) and uncertainty over health insurance reform (Ismail & Coetzee, 2024) added push pressure. Easier household registration (hukou) lowered intention to leave Chinese cities (Shen et al., 2023), and scholarships, talent policies and salary rises were reported to retain professionals (Domagała & Dubas-Jakóbczyk, 2019; Lu et al., 2018; Terman, 2020), although none was evaluated quantitatively.

Environmental factors were rarely examined. Perceived health risks from smog increased skilled workers' intention to leave the Beijing–Tianjin–Hebei region, while confidence in government pollution control reduced it (Lu et al., 2018). The COVID-19 pandemic lost significance once other push factors were included (Pszczółkowska et al., 2024), suggesting that it acted as a trigger rather than an independent cause.

Moderators (Appendix D)**.** Five macro-level conditions altered other effects, though none was tested with an interaction term. National corruption determined whether turnover intention became emigration rather than a domestic job change (Crisan et al., 2019); fiscal austerity turned temporary medical emigration into likely permanent emigration (Humphries et al., 2017); regional housing-price level changed which factors predicted intention, with social integration mattering in high-price and destination infrastructure in low-price cities (Shen et al., 2023); city type distinguished onward intention between academic gateways (Lu et al., 2023); and the COVID-19 pandemic amplified existing grievances among Polish junior doctors (Pszczółkowska et al., 2024). Economic conditions thus condition most often, but based on split samples, descriptive contrasts and qualitative accounts.

Mediators (Appendix E)**.** Declining confidence in honest elections reduced but did not remove the corruption effect (Helms, 2024), suggesting partial mediation through institutional trust, although this was not formally tested. The two formal mediation tests used individual attitudes and beliefs as mediators (Cui et al., 2016; Traikova et al., 2018), suggesting that macro-level conditions operate largely by shaping individual evaluations, a cross-level pathway the literature has not yet specified.

Methods (M)

Table 3: Research Methodology

Research Methodology		**N**	**%**
Research Design	Quantitative	21	64%
	Qualitative	2	6%
	Mixed method	10	30%
Sampling Techniques	***Non-probability sampling***		
	Convenience sampling	13	39%
	Snowball sampling	7	21%
	Purposive sampling	6	18%
	Voluntary response sampling	3	9%
	Quota sampling	1	3%
	Theoretical sampling	1	3%
	Probability sampling		
	Simple random sampling	5	15%
	Cluster / multistage sampling	3	9%
	Stratified random sampling	2	6%
	Systematic sampling	1	3%
	Total population (census)	6	18%
Data Collection	Survey	29	88%
	Interviews	10	30%
	Secondary data	5	15%
	Focus groups	2	6%
	Participant observation	1	3%
Data Analysis Approach	Descriptive statistics	26	79%
	Regression analysis	20	61%
	Logistic regression	18	55%
	Linear (OLS) regression	4	12%
	Group comparison tests (χ^2, t-test, ANOVA, non-parametric)	15	46%
	Correlation analysis	11	33%
	Factor analysis (EFA/CFA)	4	12%
	Structural equation modelling	2	6%
	Decision tree analysis	1	3%
	Thematic analysis	5	15%
	Coding schemes	3	9%
	Content analysis	1	3%
	Qualitative analysis (not specified)	1	3%

Source: Author's Work

Table 3 outlines the research methodology adopted across the reviewed studies. Accordingly, quantitative approaches were the most common study design used (64%), followed by mixed-method designs (30%) and qualitative designs in only two studies (6%). This shows that most research on country-level migration intention favors structured, numerical measurement over in-depth exploration of individual experiences. Studies relied on quantitative surveys to test relationships between macro-level push and pull factors and migration intention (Amarathunga et al., 2025; Wutor et al., 2024), while a smaller group of studies combined survey data with interviews to capture both statistical patterns and personal context (He et al., 2022; Lu et al., 2023). The limited use of purely qualitative designs suggests that the lived experiences and reasoning behind migration intentions at the national level remain comparatively less investigated.

All studies are cross-sectional; Suciu et al. (2017) surveyed three cohorts and Helms (2024) pooled Gallup waves for 2009–2015. Some studies covered several countries (Covaliu et al., 2015; Kacani et al., 2025; Ohene-Botwe et al., 2025), but only Helms (2024) linked an external country-level indicator to individual responses.

Non-probability sampling was adopted frequently, especially convenience (39%), snowball (21%) and purposive sampling (18%); probability techniques were used 11 times. Recruitment through social media or professional messaging groups (Kostrzewa et al., 2022; Wutor et al., 2024) favors respondents already interested in migration. Surveys were the main data source (88%), so macro-level conditions were mostly measured as perceptions on author-developed items rather than through validated scales or national indicators.

Most studies applied regression analysis, followed by descriptive statistics and correlation analysis. More advanced techniques, such as structural equation modelling and decision tree analysis, appeared far less frequently. Only 15 studies tested a macro-level factor inferentially, which limits comparison of effect sizes.

Outcomes

Effect patterns. Three patterns emerge from the inferential studies. First, economic conditions generally had the largest effects where domains were compared: a weak economy was the strongest predictor among Sri Lankans (Amarathunga et al., 2025), and economic and occupational push outweighed sociocultural push among Iranians (Soltanizadeh et al., 2025). Second, political effects were smaller but robust: perceived corruption stayed significant across specifications in Romania (Crisan et al., 2019) and across 135 countries (Helms, 2024). Third, infrastructural and environmental effects were selective: the mental-health risk of smog outweighed its physical risk (Lu et al., 2018), and only improved public transport, not facilities or safety, reduced intention in China's resource-based cities (He et al., 2022).

Contradictory findings. Several results contradict push–pull expectations. Negative political perceptions lowered intention among Sri Lankan young professionals (Amarathunga et al., 2025), and Ghanaian doctors rated instability as neutral and rejected crime as a reason to leave (Wutor et al., 2024), whereas insecurity was a leading push for South African anesthetists and chiropractors (Fletcher-Nkile et al., 2022; Ismail & Coetzee, 2024). Experienced bribery predicted one-year but not five-year intention (Crisan et al., 2019), and some coefficients ran opposite to the authors' interpretation (Iqbal et al., 2020, 2021). Romanian legal-medicine specialists showed little interest in leaving despite low pay because their earnings exceeded the national medical average (Covaliu et al., 2015). Political grievance can thus produce voice as well as exit, and wage effects depend on relative rather than absolute pay.

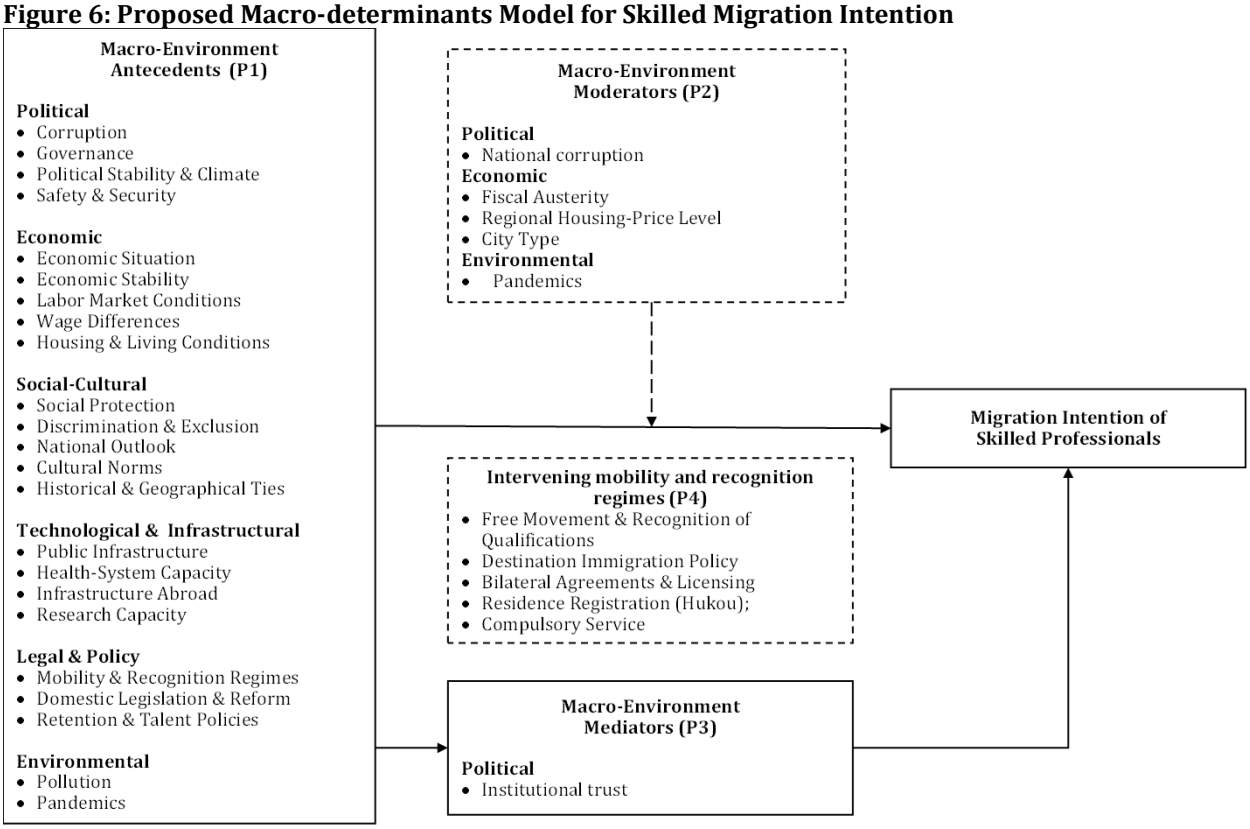
Contextual differences. Domain weights vary with context. In EU accession countries, wage gaps combine with free movement and recognition of qualifications, so economic pull takes over (Goštautaitė et al., 2018; Janulyte et al., 2011; Suciu et al., 2017). In sub-Saharan Africa, economic push is compounded by devaluation, taxation, corruption and insecurity (Ohene-Botwe et al., 2024, 2025). In high-income settings the triggers are cyclical or local, such as austerity in Ireland and Portugal (Humphries et al., 2017; Ramos & Alves, 2017) and rural industrial decline in the United States (Wolfe et al., 2020). Chinese skilled professionals, mostly of internal mobility, stress housing, pollution and hukou rules (Lu et al., 2018; Shen et al., 2023), and health workers respond to health-system and licensing conditions irrelevant to most other groups.

Theoretical implications. First, push–pull classification cannot explain the contradictory political results;

exit–voice reasoning (Hirschman, 2004) explains why grievance leads some to stay and seek change, and the aspirations–capabilities view (de Haas, 2021) explains why conditions can raise the wish to leave without producing plans. Second, the dominance of wage gaps supports neoclassical arguments (Harris & Todaro, 1970), but their conditioning by austerity, corruption and housing markets shows that wage effects are institutionally embedded. Third, mobility and recognition regimes act as Lee's (1966) intervening obstacles, lowering or raising the cost of acting on intention.

Proposed Framework

Figure 6: Proposed Macro-determinants Model for Skilled Migration Intention



Source: Author's Work

Drawing on these findings in Appendices C–E, a macro-level conceptual framework was developed (Figure 6) as a basis for future research on skilled professionals' migration intentions. Accordingly, four propositions follow: (P1) macro-level antecedents directly shape migration intention, economic conditions most strongly; (P2) national corruption, austerity, regional housing prices, city type and crisis shocks moderate these effects; (P3) perceived corruption raises intention partly by lowering institutional trust; and (P4) mobility and recognition regimes condition how far antecedent pressures become intention.

Unlike the push–pull approach (Lee, 1966), this framework separates direct, conditioning and transmitting paths and specifies which conditions occupy each; unlike neoclassical models, it treats wages as one domain whose effect depends on institutions; and unlike multi-level frameworks, it is restricted to factors meeting an explicit macro-level definition, so macro-level effects can be tested without confounding them with individual attitudes. As the moderating and mediating paths rest on few, mostly untested studies, Figure 6 presents propositions rather than a validated model.

Generalization. The framework should be applied cautiously. Most of the studies examined only health professionals; 29 countries appear once, Latin America and Oceania are absent, and six studies concern internal migration. Wage, employment, economic and corruption effects also appear in non-health studies

(Amarathunga et al., 2025; Crisan et al., 2019; Traikova et al., 2018) and may extend to other skilled groups, but health-system and licensing factors are profession-specific. Applying the framework to engineers, IT professionals or unrepresented regions requires new empirical testing.

Research Gap

The TCCM analysis identifies several important gaps in the existing literature on macro-level determinants of skilled migration intentions.

Theories. Push–pull accounts for 51% of theory applications but is mostly descriptive. Migration systems theory (De Haas, 2010), dual labor market theory (Piore, 1979), mobility transition theory (Zelinsky, 1993), network and social capital theory (Portes, 1998) and the aspirations–capabilities framework (de Haas, 2021) remain unapplied**. Context.** Latin America and Oceania are absent, most countries appear in one study, 73% of studies involve health professionals; and knowledge-intensive sectors such as engineering, IT and finance are underexplored. **Characteristics.** Macro-level moderators and mediators have not been formally tested; technological and legal factors appear only as direct antecedents; climate change, digital connectivity and remote work are unexamined; retention policies have not been evaluated quantitatively; and no study formally tested whether macro-level effects differ by profession or geographical context; **Methods.** All studies are cross-sectional, most use non-probability, single-country samples, and longitudinal, multilevel and administrative-data designs are absent.

Future Implications

Future research should test the framework among underexplored skilled groups that are important to national innovation, such as engineers, IT professionals, logistics and supply chain professionals in renewable energy and sustainability sectors, financial technology specialists, educators in STEM fields, creative and knowledge-intensive professionals, and skilled technical workers in advanced manufacturing and Industry 4.0 environments, using multi-sector samples that test interactions between profession and macro-level factors. Comparative studies covering Latin America, Oceania and under-represented African and Asian economies are needed to establish whether wage, economic and governance effects hold across institutional settings.

Forthcoming studies should move beyond push–pull listing by using exit-voice, aspirations–capabilities and migration systems perspectives to test moderation (P2), mediation through institutional trust (P3) and intervening obstacles (P4). Methodologically, multilevel and longitudinal designs that link objective country or regional indicators, such as corruption indices, wage gaps and housing prices, to individual survey data would allow macro-level effects to be estimated directly rather than inferred from perceptions. Formal interaction and mediation tests, probability sampling and qualitative work on how professionals interpret national conditions would further strengthen the evidence. Climate pressures, diaspora networks and remote-work infrastructure also deserve attention as macro-level antecedents.

For policy, the evidence suggests that origin countries seeking to retain skilled professionals should combine pay reforms with measures that address corruption, governance, public infrastructure and legal certainty, because wage increases alone may not offset socio-political push factors. Destination countries can use these findings to design ethical recruitment and integration policies that consider the effects of active recruitment on origin countries' health systems.

5. Conclusion

This SLR examined the national-level (macro) factors shaping skilled professionals' migration intention, synthesizing evidence from 33 peer-reviewed studies over the 15 years (2010–2025). Using PRISMA-2020 and the TCCM framework, the review achieved five objectives: identifying the underlying theories, examining the contexts studied, identifying the direct factors, moderators, and mediators of migration intention, evaluating the methodological approaches used, and identifying gaps for future research.

As per the findings, wage differentials, limited domestic employment and poor economic conditions are the most consistently reported drivers, followed by corruption, weak governance, insecurity and poor health-system infrastructure. National corruption, austerity, regional housing prices, city type and crisis shocks

condition these effects, and perceived corruption appears to work partly through declining institutional trust. These conclusions are bounded by the evidence: the studies are cross-sectional, perception-based and concentrated on health professionals in Europe, Africa and China. Although some drivers recur among academics, agricultural specialists and other skilled workers, the framework should be tested in other sectors and regions before it is applied to skilled professionals generally. The review is also limited to English-language articles in SJR- or ABDC-indexed journals from six databases.

Overall, this review offers an integrated, evidence-based understanding of the macro-level forces driving skilled migration intention, along with a framework that can guide future research and policy. For developing countries, the findings highlight the importance of strengthening governance, economic stability, infrastructure, and legal protections to retain skilled talent; for destination countries, they offer a basis for shaping migration and integration policy. Addressing these macro-level conditions is essential for the sustainable retention of skilled professionals and for supporting long-term labor-market and socio-economic stability, particularly in developing and emerging economies.

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Appendices

Appendix A: Database-specific search strategy

Database	Search string
Web of Science	“migration intention*" AND (professional* OR "skilled professional*" OR employee* OR "skilled employee*")
ScienceDirect	"migration intention" AND (professionals OR "skilled professionals" OR employees OR "skilled employees")
Springer Nature Link	"migration intentions" AND (professional* OR "skilled professionals" OR employee* OR "skilled employees")
Emerald Insight	"migration intentions" AND (professional* OR "skilled professionals" OR employee* OR "skilled employees")
Sage Journals	"migration intentions" AND (professional* OR "skilled professionals" OR employee* OR "skilled employees")
IEEE Xplore	“migration intention*" AND (professional* OR "skilled professional*" OR employee* OR "skilled employee*")

Source: Author's work

Appendix B: Methodological Quality Appraisal (MMAT 2018)
MMAT Criteria Applied

Category	Item	Criterion
Screening	S1	Are there clear research questions?
	S2	Do the collected data allow the research questions to be addressed?
Qualitative	1.1	Is the qualitative approach appropriate to answer the research question?
	1.2	Are the qualitative data collection methods adequate to address the research question?
	1.3	Are the findings adequately derived from the data?
	1.4	Is the interpretation of results sufficiently substantiated by data?
	1.5	Is there coherence between qualitative data sources, collection, analysis and interpretation?
Quantitative descriptive	4.1	Is the sampling strategy relevant to address the research question?
	4.2	Is the sample representative of the target population?
	4.3	Are the measurements appropriate?
	4.4	Is the risk of nonresponse bias low?
	4.5	Is the statistical analysis appropriate to answer the research question?
Mixed methods	5.1	Is there an adequate rationale for using a mixed-methods design to address the research question?
	5.2	Are the different components of the study effectively integrated to answer the research question?

5.3 Are the outputs of the integration of qualitative and quantitative components adequately interpreted?
5.4 Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?
5.5 Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

Note: Categories 2 and 3 (randomized and non-randomized) were not applied, as no study used those designs.

Source: Hong et al. (2018)

Quality Appraisal of Included Studies Using the MMAT

ID	Authors	Category	S1	S2	C1	C2	C3	C4	C5	Criteria met	Quality
S1	Amarathunga et al. (2025)	Quantitative	Y	Y	Y	N	Y	CT	Y	3/5 (60%)	Moderate
S2	Covaliu et al. (2015)	Quantitative	Y	Y	CT	CT	CT	Y	N	1/5 (20%)	Low
S3	Crisan et al. (2019)	Quantitative	Y	Y	Y	Y	Y	Y	Y	5/5 (100%)	High
S4	Cui et al. (2016)	Mixed method	Y	Y	Y	Y	Y	CT	Y	4/5 (80%)	High
S5	Domagała & Dubas-Jakóbczyk (2019)	Quantitative	Y	Y	Y	CT	Y	N	Y	3/5 (60%)	Moderate
S6	Fletcher-Nkile et al. (2022)	Qualitative	Y	Y	Y	Y	Y	Y	Y	5/5 (100%)	High
S7	Freeman et al. (2012)	Mixed method	Y	Y	Y	Y	Y	CT	CT	3/5 (60%)	Moderate
S8	Goštautaitė et al. (2018)	Quantitative	Y	Y	Y	CT	Y	CT	Y	3/5 (60%)	Moderate
S9	He et al. (2022)	Mixed method	Y	Y	Y	Y	Y	CT	N	3/5 (60%)	Moderate
S10	Helms (2024)	Quantitative	Y	Y	Y	Y	Y	Y	Y	5/5 (100%)	High
S11	Humphries et al. (2017)	Mixed method	Y	Y	Y	Y	Y	CT	Y	4/5 (80%)	High
S12	Iqbal et al. (2020)	Quantitative	Y	Y	Y	CT	CT	CT	N	1/5 (20%)	Low
S13	Iqbal et al. (2021)	Quantitative	Y	Y	Y	N	CT	CT	N	1/5 (20%)	Low
S14	Ismail & Coetzee (2024)	Quantitative	Y	Y	Y	Y	Y	CT	Y	4/5 (80%)	High
S15	Janulyte et al. (2011)	Quantitative	Y	Y	Y	Y	CT	Y	Y	4/5 (80%)	High
S16	Kacani et al. (2025)	Mixed method	Y	Y	CT	N	N	CT	Y	1/5 (20%)	Low
S17	Kostrzewa et al. (2022)	Quantitative	Y	Y	Y	N	CT	CT	Y	2/5 (40%)	Low
S18	Kunnumbrath & Kodali (2023)	Mixed method	Y	Y	Y	Y	Y	Y	Y	5/5 (100%)	High
S19	Lu et al. (2018)	Mixed method	Y	Y	Y	Y	Y	CT	CT	3/5 (60%)	Moderate
S20	Lu et al. (2023)	Mixed method	Y	Y	Y	Y	Y	CT	N	3/5 (60%)	Moderate
S21	Ohene-Botwe et al. (2024)	Quantitative	Y	Y	Y	N	Y	N	Y	3/5 (60%)	Moderate
S22	Ohene-Botwe et al. (2025)	Quantitative	Y	Y	Y	N	Y	CT	Y	3/5 (60%)	Moderate
S23	Öncü et al. (2023)	Quantitative	Y	Y	Y	Y	Y	Y	CT	4/5 (80%)	High
S24	Pszczółkowska et al. (2024)	Mixed method	Y	Y	Y	Y	Y	Y	N	4/5 (80%)	High
S25	Ramos & Alves (2017)	Quantitative	Y	Y	Y	CT	Y	N	Y	3/5 (60%)	Moderate
S26	Sheikh et al. (2012)	Quantitative	Y	Y	Y	N	CT	Y	Y	3/5 (60%)	Moderate
S27	Shen et al. (2023)	Quantitative	Y	Y	Y	CT	Y	CT	Y	3/5 (60%)	Moderate
S28	Soltanizadeh et al. (2025)	Quantitative	Y	Y	Y	CT	Y	Y	Y	4/5 (80%)	High
S29	Suciu et al. (2017)	Quantitative	Y	Y	Y	Y	CT	Y	Y	4/5 (80%)	High
S30	Terman (2020)	Qualitative	Y	Y	Y	Y	Y	Y	Y	5/5 (100%)	High
S31	Traikova et al. (2018)	Quantitative	Y	Y	Y	Y	Y	Y	Y	5/5 (100%)	High
S32	Wolfe et al. (2020)	Mixed method	Y	Y	Y	Y	Y	Y	CT	4/5 (80%)	High
S33	Wutor et al. (2024)	Quantitative	Y	Y	Y	N	Y	CT	Y	3/5 (60%)	Moderate

Source: Author's Work

Appendix C: Macro-Level Antecedents

Domain	Antecedents	Studies (IDs)
Political	**Corruption**	
	Perceived national corruption (push)	S3*, S6, S10*, S14, S16*, S21, S22, S31**
	Experienced bribery (push)	S3*
	Favoritism and lack of meritocracy (push)	S26, S28*
	Governance	
	Government mismanagement, weak policymaker support, bureaucracy (push)	S6, S21, S22, S28*

	Low confidence in government capacity to control pollution (push)	S19*
	Effective government management abroad (pull)	S14, S21, S22
	Access to welfare and citizenship services abroad (pull)	S28*
	Political Stability and Climate	
	Political instability or uncertainty (push)	S6, S16*, S23*, S26, S33
	Negative political perceptions (inverse association)	S1*
	Approval of national leadership (retention)	S10*
	Hostile socio-political climate (push)	S24*
	Smooth political transitions abroad (pull)	S21, S22
	Safety and Security	
	Crime, terrorism and personal safety (push)	S6, S14, S21, S22, S26, S33
	Security abroad (pull)	S6, S21
Economic	**Macroeconomic Conditions**	
	Poor, worsening or unstable national economy (push)	S1*, S6, S10*, S14, S23*, S28*, S33
	Currency devaluation (push)	S6, S21, S22
	Post-crisis austerity and public pay cuts (push)	S11, S25, S29
	Local or regional economic decline (push)	S9*, S30, S32
	Development level of home region	S4*
	Economic stability and development abroad (pull)	S6, S14, S21, S22
	Labor Market Conditions	
	Limited domestic employment opportunities (push)	S4**, S7, S9**, S16*, S18, S26, S29*, S30, S31*, S32
	Graduate oversupply and precarious public employment (push)	S23
	Employment opportunities and labor demand abroad (pull)	S11, S12*, S13*, S18*, S21, S26
	Active international recruitment (pull)	S21, S25
	Wage Differentials	
	Low national wages (push)	S2, S5, S12*, S13*, S17, S18, S21, S22, S28*, S29
	Higher wages abroad (pull)	S5, S12*, S13*, S15, S16*, S17, S18*, S21, S22, S23, S24**, S26, S27, S29*, S31*, S33
	High taxation (push)	S6, S21, S22
	Housing and Living Conditions	
	Regional housing-price pressure and unaffordability (push)	S4*, S20, S27*
	Cost of living (push)	S19**, S20
	Poor living conditions at home (push)	S21, S22
	Better living conditions and quality of life abroad (pull)	S2, S15, S16*, S17, S21, S22, S23, S26, S29*, S33
Socio-cultural	**Social Protection**	
	Inadequate social security (push)	S12*, S13*, S28*
	Social guarantees, benefits and insurance abroad (pull)	S15, S21, S31**
	Discrimination and Exclusion	
	Social discrimination, hate speech and racism (push)	S6, S24*, S28*, S30
	Racially accepting destination societies (pull)	S6
	National Outlook and Cultural Norms	
	Disappointing future and national backwardness (push)	S14, S23, S28*
	Religious rules and lifestyle restrictions (push)	S28*
	Metro-normative ideology (push from rural areas)	S30
	Cultural amenities and academic freedom abroad (pull)	S20
	Historical and Geographical Ties	
	Colonial connections and shared language (pull)	S11, S21, S22
	Geographical proximity to destination (pull)	S7*
Technological & Infrastructural	**Public Infrastructure**	
	Poor national infrastructure and utilities (push)	S6, S14
	Public transport improvements (retention)	S9*
	Public facilities	S9**
	Health-System Capacity	

	Poor health infrastructure, equipment and system organization (push)	S5, S6, S14, S17, S21, S22, S24*, S29*
	Quality of health services abroad (pull)	S2, S14
	Infrastructure Abroad and Research Capacity	
	Better infrastructure abroad (pull)	S17, S18**, S21, S22, S27*
	Research funding and university networks (pull to return)	S20
Legal & Policy	**Mobility and Recognition Regimes**	
	EU free movement and recognition of qualifications (facilitating)	S5, S8, S15, S17, S29
	Destination immigration policy, bilateral agreements and licensing (pull)	S6, S7, S21, S22, S26, S33
	Internal residence registration (hukou) (retention)	S27*
	Compulsory service and degree-release fees (barrier)	S28
	Domestic Legislation and Reform	
	Unfair employment laws and unworkable legislation (push)	S14, S28*
	Restrictive abortion law (push)	S24*
	Uncertainty over national health insurance reform (push)	S6, S14
	Weak professional regulation (push)	S18
	Retention and Talent Policies	
	Scholarships, talent, salary and resettlement incentives (retention)	S5, S20, S30, S32
Environmental	**Environmental and Public-Health Conditions**	
	Health risk from air pollution (push)	S19*
	COVID-19 pandemic (trigger)	S24**

Note: * significant in an inferential test; ** tested, not significant; unmarked = descriptive or qualitative evidence. Push = origin; pull = destination.

Source: Author's Work

Appendix D: Macro-Level Moderators

Domain	Moderator	Relationship conditioned	Study	Evidence
Political	National corruption	Turnover intention → migration rather than domestic job change	S3	Split-sample
Economic	Fiscal austerity	Culture of medical migration → permanent migration intention	S11	Qualitative
	Regional housing-price level	Housing, integration, hukou and infrastructure → migration intention	S27	Split-sample
	City type (emerging vs. established gateway)	Urban amenities and careers → onward migration intention	S20	Descriptive
Environmental	COVID-19 pandemic	Health-system and socio-political grievances → migration intention	S24	Qualitative

Note: No study tested a formal interaction term.

Source: Author's Work

Appendix E: Macro-Level Mediators

Domain	Mediator	Pathway	Study	Evidence
Political	Institutional trust (confidence in honest elections)	Perceived corruption → institutional trust → migration intention	S10	Partial; not formally tested

Source: Author's Work

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Mobile Health Applications Continuance Intention Theories and Outcomes: A Scoping Review

*Farah Syazreena Azmi, Melissa Shahrom, Norshima Humaidi, Ramita Abdul Rahim
Faculty of Business and Management, Universiti Teknologi MARA, Puncak Alam Campus, Selangor, Malaysia
Email: *farah2070@uitm.edu.my, melissa@uitm.edu.my, norshima958@uitm.edu.my, ramita@uitm.edu.my
Corresponding Author: Farah Syazreena Azmi

Abstract: The global adoption of mobile health (mHealth) accelerated significantly following the COVID-19 pandemic. However, sustaining long-term user engagement remained impeded by persistent barriers, including limited digital literacy, substandard technological infrastructure, and systemic socioeconomic disparities. While existing literature documented these challenges, much of the evidence base relied on narrative reviews that lacked rigorous, standardized methodologies. To address this methodological gap, this study conducted a scoping review in accordance with PRISMA-ScR guidelines and structured via the PICo framework. Using a systematic search strategy, 15 peer-reviewed articles were selected and analyzed across five critical dimensions: publication timeline, sampling methodologies, target populations, analytical approaches, and underlying theoretical frameworks. Because the synthesized findings focused on general mHealth app users, they revealed critical baseline gaps in long-term continuance intention and overall app adoption. Ultimately, this review established a rigorous methodological benchmark for evaluating mHealth continuance, offering empirical insights to guide future research toward designing sustainable mHealth interventions and optimizing digital health strategies for general users.

Keywords: *Continuous Intention, mHealth, Scoping Review*

1. Introduction and Background

Mobile Health

The utilization of mobile health (mHealth) applications represents a significant field of study. mHealth applications are programs designed to run on mobile devices, such as smartphones, tablets, and wearables. (Jembai et al., 2022). These applications are utilized to monitor and manage various aspects of health and well-being, including physical fitness and nutrition, medication administration, and the treatment of chronic diseases, as well as to facilitate communication with healthcare providers (Jembai et al., 2022). MHealth applications are already leveraging mobile technology to deliver a range of health-related activities and services, and they are gaining popularity. They give people the ability to take an active role in their medical treatment, which in turn helps them achieve better health outcomes and improves their overall quality of life.

Various obstacles hinder the uptake of mHealth applications, such as technical challenges (for instance, insufficient existing technology), apprehensions regarding the regulation and effectiveness of applications, issues related to security and privacy, and the ease of use (Zakerabasali et al., 2021). Sociotechnical elements, such as difficulties faced by patients in utilizing mobile applications, inadequate health literacy, a deficiency in empowerment, and a legacy of mistrust towards the healthcare system, create significant barriers to the acceptance of mHealth applications (Zakerabasali et al., 2021). Furthermore, a study by Leigh et al. (2020) identified and weighed barriers to and drivers of health app use among healthcare professionals (HCPs), including lack of time, lack of trust in the app, and lack of awareness of the app. To summarize the findings, the following are the barriers to mHealth application adoption (Murray et al., 2015; Rosenfeld, 2019; Swain et al., 2023; Zhou et al., 2019).

Limited studies have been carried out on assessing users' ongoing intention to utilize mHealth applications. In this context, since most applications are available for free (up to 74.78%) (Xu & Liu, 2015), the reasons users continue to use mHealth remain poorly understood. The research conducted by Liu et al. (2022) examines the elements that affect patients' willingness to utilize AI service robots in outpatient environments. The results indicate that patients are more inclined to continue using the service robot when they perceive it as advantageous, easy to use, and enjoyable. Additionally, a research study conducted by J. Liu and colleagues in 2022 explored the impact of health-related stress on users' views of the effectiveness and satisfaction they derive from mHealth applications. The results demonstrated a positive correlation between health stress and the perceived effectiveness and satisfaction with mHealth apps. This study proposes that mHealth applications

can effectively mitigate health-related stress beyond structural access; user psychology plays a critical role in the efficacy of digital health. The determinants of mHealth service success from the user perspective were found to align with the hypothesis of Birkmeyer et al. (2021), who evaluated these determinants. Four critical internal dimensions, namely user attitude, satisfaction, continuous intention to use, and word-of-mouth advocacy, were identified as essential to successful implementation and sustained functionality. Understanding these factors can assist organizations in utilizing their resources more effectively. Numerous studies exist regarding the intention to utilize mHealth. Numerous studies have been carried out in the past, resulting in a wealth of articles and references. Even though several related initiatives have been undertaken, a more systematic approach is required, as highlighted in the research by N. A. Ahmad et al. (2022) and Voth et al. (2022). However, their attention is on narrative reviews that lack a defined, transparent methodology. Without a systematic approach, grasping the ongoing interest in mHealth is unfeasible. Therefore, this can be achieved by conducting a scoping review.

A scoping review is a particular type of article suitable for writing when the topic or problem has not been extensively explored, is complex, or lacks consistency (Mays et al., n.d.). A scoping review serves to identify the key traits, trends, or elements of previous research results in the area, to pinpoint and evaluate areas lacking knowledge, and to offer a preliminary understanding before conducting a systematic literature review (SLR) (Munn et al., 2019; Sucharew & Macaluso, 2019). Furthermore, the scoping review encompasses various study designs and methodologies. It is also less complex than a systematic literature review since it concentrates on a descriptive overview of studies without assessing or critically synthesizing prior research (Munn et al., 2019). In line with the research questions, the main objective of this scoping review is to investigate existing interest in mHealth. Thus, this article seeks to answer the following questions: This scoping review aims to (1) determine the theories and trends used in current studies of continuous intention towards mHealth and (2) determine which outcomes are assessed in studies that have implemented and evaluated these mobile application platforms.

2. Methodology

In conducting this scoping review, we utilized the PRISMA extension specifically for scoping reviews (PRISMA-ScR). The choice of PRISMA-ScR was made because it effectively assists researchers in formulating research questions and establishing criteria for selecting appropriate reference materials to support a systematic search (Peters et al., 2022)

During the first stage of the scoping review, it is essential for researchers to establish a research question. Given that the primary goal of this article is to create a scoping review focused on the ongoing intention to use mHealth, the subsequent research question has been developed: (1) What theories and trends are being utilized in contemporary research on ongoing commitment to mHealth, and (2) What results are measured in studies that have put these mobile application platforms into practice and assessed them?

To conduct an extensive identification process, researchers have established specific keywords for the study. Keywords such as continuous intention, mobile applications, and IS Continuance were selected. The meanings of these terms are defined in accordance with the formulated research questions. Building on earlier research and expert opinions, investigators examined synonyms, associated terms, and different forms of the chosen keywords. To prevent retrieval bias, researchers utilized three databases: Scopus, ScienceDirect, and Google Scholar.

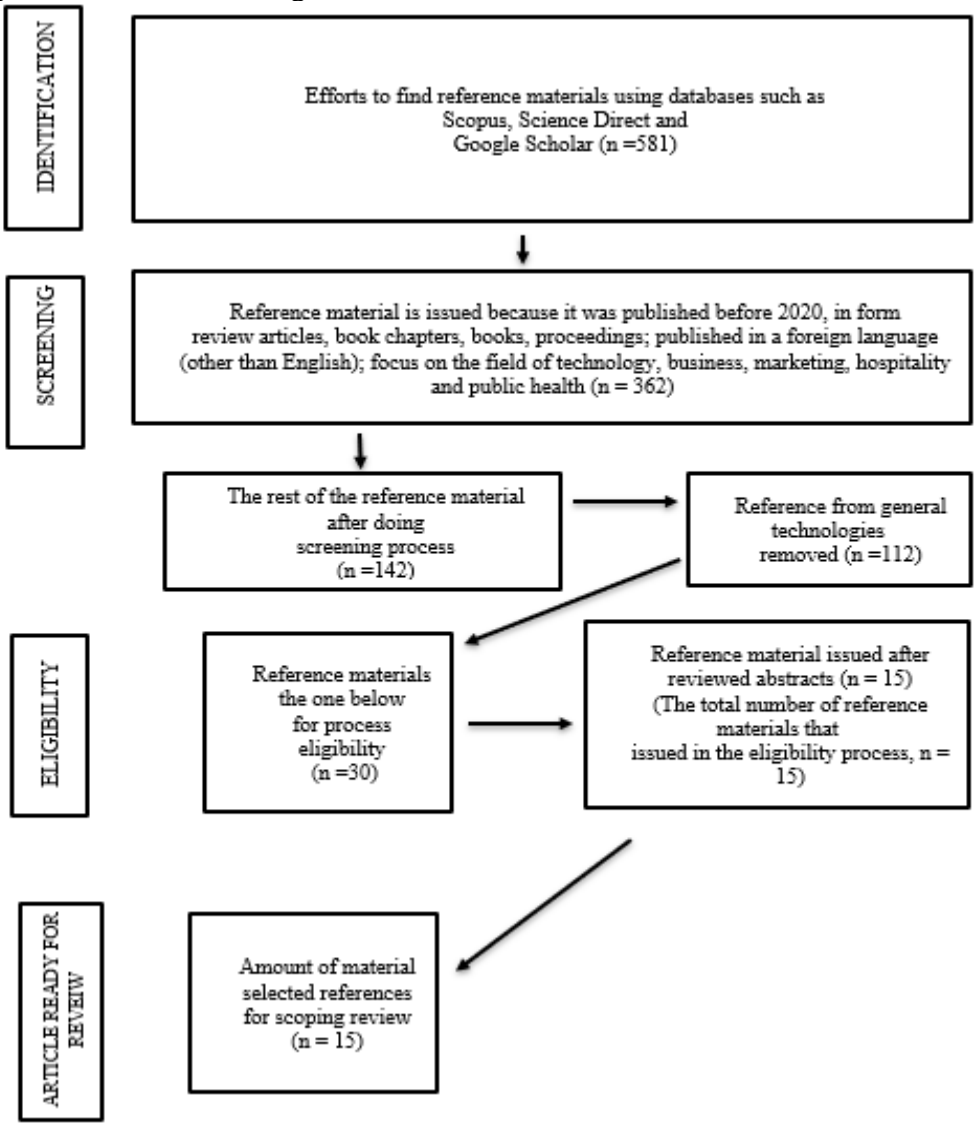
To enhance the likelihood of acquiring more relevant reference materials, scholars have employed two search methods: manual and advanced. For the manual search, researchers used techniques such as handpicking, snowballing, and backward tracking. On the other hand, in advanced searches on Scopus, researchers utilized basic functionalities like phrase searching, Boolean operators, field codes, truncation, and wildcards to construct a suitable search string. Throughout this process, researchers identified a total of 581 potential articles.

The screening process is the second phase in the organized search approach. This step allows researchers to pinpoint relevant articles for a scoping review. (Kitchenham & Charters, 2007) emphasize that researchers

should select only the criteria that address the research question. Given that the intention to continue using mobile applications is an emerging topic, with adoption no longer the primary concern and the field now in the post-adoption stage, the articles chosen were published between 2020 and 2023. According to Linares-Espinós et al. (2018), the selection was limited to English-language articles to reduce confusion, lower costs, and save time. As a result of this process, several articles that did not fulfil the criteria were eliminated, leaving a total of 362 articles retained for ranking in the subsequent selection.

The third process completed is eligibility. In this stage, to confirm the selected reference material's relevance, the researcher analyzed two primary components: the title and the abstract. During this phase, 219 articles were excluded because they addressed general mobile applications and other areas such as marketing and education, rather than focusing on specific health technology sectors. Following this step, only 142 articles were chosen for the subsequent process.

Figure 1: PRISMA Flow Diagram



In this scoping review, we developed a data chart that includes the authors' names, publication year, study context, and methods. Subsequently, in line with the established research questions, key information is extracted from the selected reference materials. Considering that this review emphasizes empirical data from earlier studies, the data extraction procedure was carried out in three stages: abstracts, research findings, and

research discussions. Information from a different section will also be examined if considered important. Analyzing themes can help identify, explore, organize, clarify, and present the themes that have been investigated (Braun & Clarke, 2006). In this scoping review, themes have been formulated based on the commonalities or significance of the information gathered. The analysis identified five main themes: publication year, sampling technique, demographic characteristics, analysis methods, and theoretical framework. The researchers have verified the themes' accuracy to confirm their relevance to the research question. Any differences of opinion among the researchers regarding the established themes have been addressed, and input from an external expert will be sought if the researchers cannot reach a consensus.

Parameter	Details / Specification
Database Searched	Scopus, ScienceDirect and Google Scholar
Search Date Range	2001 – 2023
Search Execution Date	Dec-23
Search Field / Query	TITLE-ABS-KEY (("continuance intention" OR "continued use") AND ("mHealth" OR "mobile health" OR "mobile application*"))
Inclusion Criteria	1. Peer-reviewed journal articles published in English (2001–2023). 2. Empirical studies focusing on mHealth continuance intention or long-term usage. 3. Quantitative, qualitative or mixed-methods empirical designs.
Exclusion Criteria	1. Non-peer-reviewed papers, book chapters, dissertations, and review articles. 2. Studies evaluating short-term initial adoption only. 3. Technologies without a mobile application interface (e.g., desktop/portal-only systems).

3. Results

In this scoping review, 40% of publications were published in 2020, with the remainder published between 2021 and 2023. Convenience sampling is the most frequently used method (80%), while the main population studied in previous studies is app users (73%). In addition to app users, patients, nurses, and undergraduate students are the focus of previous studies. Most of the previous studies (93%) were quantitative, and the rest were mixed methods (mixed methods) (7%). In past studies, the Expectation-Confirmation Model was utilized by most researchers, accounting for 27%, while the Technology Acceptance Model (TAM) was employed by 13%, and the remaining studies each comprised 7%.

Table 1: Data Chart of Previous Studies, including in the Scoping Review

Data	Frequency	Percentage
Publication Year		
2020	6	40
2021	3	20
2022	4	27
2023	2	13
Sampling Technique		
Simple Random	1	7
Convenience Sampling	12	80
Purposive Sampling	2	13
Population		
Apps User	11	73
Patients	1	7
Nurses	1	7
undergraduate students	2	13
Analysis		
Quantitative	14	93

Mixed Method	1	7
Theory		
Unified Technology of Acceptance and Use of Technology (UTAUT)	1	7
Unified Theory of Acceptance and Use of Technology (UTAUT) & DeLone & McLean models	1	7
Innovation Resistance Theory	1	7
Technology Acceptance Model (TAM)	2	13
Expectation Confirmation Model (ECM)	4	27
Technology Acceptance Model (TAM) & the Expectation-Confirmation Model (ECM)	1	7
Technology Adoption Model	1	7
Privacy Calculus Model	1	7
Technology Acceptance Model & Health Belief Model	1	7
Information Systems Continuance Model	1	7
Technology Acceptance Model (TAM) & Investment Model (IM)	1	7

4. Theories and Trends Used in Current Studies of Continuous Intention

According to Table 1, four out of the 15 studies utilized Expectation Confirmation Theory (ECM). For instance, the study by Bölen (2020) incorporated ECM alongside additional variables, including perceived aesthetics, individual mobility, and habit. Wu et al. (2022) combined ECM with IT mindfulness and IT identity. Dinari and Tjhin (2023) merged ECM with perceived privacy, perceived security, and trust. The ECM, as a core theory, incorporates additional variables pertaining to emotional factors (such as device annoyance and enjoyment) along with health and fitness elements (such as motivation for pursuing goals and self-quantification practices), and was finally utilised by Siepmann and Kowalczuk (2021). In addition to ECM, the Technology Acceptance Model (TAM) was the second most utilized theory in previous research. For example, studies examining user-adaptive behavior in telemedicine combined TAM with other aspects like convenience value and health-related stress. (Lu et al., 2023), while a study by Ahmad et al. (2020) merged TAM with social influence and enjoyment. Aside from that, the other ten (10) studies utilized various theories. For example, a particular research study utilized the Unified Technology Acceptance and Use of Technology (UTAUT) model, incorporating additional elements like risk perception and privacy concerns (Yaseen & Al Omoush, 2023) a comprehensive Unified Theory of Acceptance and Use of Technology (UTAUT) combined with the Delone & McLean frameworks (Chow & Legowo, 2023), Innovation Resistance Theory with trust as additional variable (Kautish et al., 2023), an integrated technology acceptance model (TAM) and the expectation-confirmation model (ECM) with additional variables which are trust, attitudes and fear of Covid (Gaber & Hassan, 2022).

Aside from that, research conducted by Liu et al. (2022) integrated the Technology Adoption Model with individual characteristics, specifically independent personality and trust in AI. Additional variables, such as willingness to disclose and expectations regarding data sharing, were applied by Bélanger et al. (2021) in their Privacy Calculus Theory. In addition, extra variables such as social factors (like subjective norms) and psychological influences (such as flow experience, health consciousness, and behavior change techniques) from other research were incorporated into an integrated Technology Acceptance Model (TAM), Health Belief Model (Birkmeyer et al., 2021) and Information Systems Continuance Model, in conjunction with an integration of the Technology Acceptance Model (TAM) and the Investment Model (IM)(Cho et al., 2020).

Outcomes Assessed

Four studies that utilised the Expectation-Confirmation Model (ECM) as their primary theoretical framework to evaluate long-term user engagement were reviewed. Across these investigations (Ahmad et al., 2020; Bölen, 2020; Dinari & Tjhin, 2023; Wu et al., 2022), core ECM constructs consistently predicted the continuous intention to use mHealth, with notable exceptions regarding perceived ease of use (PEOU) and perceived usefulness (PU). Beyond the baseline ECM framework, external extensions yielded mixed results. Bölen (2020) identified perceived aesthetics, personal mobility, and habitual behavior as significant determinants of continuous intention. In contrast, Dinari and Tjhin (2023) found that integrated variables, such as trust and

perceived privacy, showed no statistically significant relationship with user satisfaction. These discrepancies highlight a divergence from alternative theoretical integrations in the literature, such as the unified model proposed by Gaber and Hassan (2022). Their results, grounded in the technology acceptance model (TAM) and the expectation-confirmation model (ECM), uncovered that the intention to continue using is affected by satisfaction, perceived usefulness, perceived ease of use, and attitude. Research conducted by Yan et al. (2021) utilized the Information Systems Continuance Model as its main theoretical framework and discovered that perceived usefulness, ease of use, flow experience, and behavioral change techniques are crucial elements affecting continuous intention, with satisfaction acting as a mediator for these effects. Awareness of health improves the beneficial connection between perceived usefulness and satisfaction but weakens the positive link between perceived ease of use and satisfaction. Conversely, Kautish et al. (2023) found that all obstacles (usage, value, risk, tradition, and image) have a notable impact on willingness to use telemedicine applications.

The analysis of moderation validated that trust enhances the connection between all five obstacles and the intention to buy, employing the Innovation Resistance Theory as its primary framework (Bélanger et al., 2021) in their research, which utilized the privacy calculus model as the foundational theory, it was discovered that the intention to continue using fitness technology is directly influenced by the willingness to share information and the perceived advantages of using the device, In their research, Siepmann and Kowalczuk (2021)The ECM was found to be pertinent in the context of smartwatches and highlighted the importance of self-quantification as a key factor in comprehending motivation for goal pursuit, perceived utility, validation, and device frustration. Furthermore, the research highlights that device-related frustrations pose a major obstacle to continued smartwatch use. Furthermore, research on mHealth utilizing the Technology Acceptance Model (TAM) and the Health Belief Model demonstrates that health-related factors, including perceived disease risk and health awareness, have a considerable impact on users' perspectives on mHealth. Users' attitudes towards mHealth, in turn, have a strong positive impact on user satisfaction and the intention to continue using the service. Additionally, four aspects unique to mobile—customization, engagement, application design, and social connectivity—greatly improve user satisfaction. User satisfaction is vital for increasing the likelihood of continued use and fostering positive word-of-mouth. Moreover, studies on health and fitness apps, utilizing both the Technology Acceptance Model (TAM) and the Investment Model (IM), discovered that components from each model have a significant impact on the willingness to keep using these applications. The perceived ease of use of the applications enhances their perceived usefulness, which in turn affects users' intentions to continue using them. Furthermore, both the perceived usefulness and ease of use of the applications significantly influence user satisfaction, the amount invested, and the quality of the available alternatives.

These three factors influence users' dedication to the applications, which in turn affects their intentions to continue using them (Liu et al., 2022). The Unified Theory of Acceptance and Use of Technology (UTAUT), together with the DeLone & McLean IS Success Model, was found to capture both technical performance and user behaviour during the pandemic. Utilising this combined framework, Chow and Legowo (2023) demonstrated that system attributes (information, system, and service quality) and behavioural determinants (effort expectancy, facilitating conditions, and social influence) significantly predict user satisfaction, which in turn drives the intention to continue using contact tracing applications. Expanding on these behavioral drivers, (Al-Omoush et al., 2023) confirmed that performance expectancy serves as a primary direct predictor of sustained contact tracing app adoption during COVID-19. Crucially, their findings indicate that social influence strongly shapes how individuals perceive and respond to health risks, suggesting that peer and societal compliance pressures are foundational to technology adoption during public health crises. The role of social influence is vital in the choice of using contact tracing apps, emphasizing the need for heightened public awareness that extends beyond individual beliefs to inspire and encourage others to use the app for their own protection and that of their families and communities. Furthermore, favorable circumstances are positively linked to users' beliefs about the efficacy of contact tracing apps.

5. Conclusion

The low adoption of digital health technologies poses a challenge, as these technologies require regular health consultations. Research indicates a reluctance to adopt new technology and varying opinions on how social influence impacts the utilization of mHealth. There is a need for systematic reviews to better understand the users' intention to use mHealth. This article presents a scoping review on the sustained use of mHealth

applications. It seeks to identify the platforms used, the theories and trends underpinning current research, and the outcomes evaluated in these studies. The information provided can guide future research endeavours and serve as a foundation for a systematic review to determine the efficacy of eHealth platforms in fostering healthy nations. Digital health designers and researchers need to prioritise the participation of people of various ages, including the elderly, in the design and research of digital technologies. This scoping review aims to enlighten stakeholders about these eHealth platforms, including patients, caregivers, health professionals, and policymakers.

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Examining the Role of Self-Determination Theory in Enhancing Employee Motivation in a Malaysian Public Listed Construction Company

Muhammad Akmal Tarmizi Abdul Razak, *Murni Zarina Mohamed Razali, Dilla Syadia Ab Latiff, Norlelawati Jamaluddin
Universiti Teknologi Mara, Malaysia
Email: 2023869296@uitm.edu.my, *murnizarina@uitm.edu.my
Corresponding Author: Dr Murni Zarina Mohamed Razali

Abstract: Employee motivation has been recognized as a vital component for productivity and organizational performance, particularly in the construction industry where employees often face high-pressure work conditions and rigid hierarchies. This study investigated the role of Self-Determination Theory (SDT) in understanding employee motivation in a Malaysian publicly listed construction company, focusing on the psychological needs of autonomy, competence and relatedness. Despite extensive global research on motivation, there has been limited focus on SDT's application within Malaysia's construction sector. This study addressed this gap by conducting a quantitative analysis involving a census of 200 employees from one publicly listed construction company. Data were collected using structured questionnaires and analyzed using SPSS, employing descriptive statistics, reliability testing, Pearson correlation, t-Test analysis, and multiple regression. The findings revealed that all three psychological needs were significantly correlated with employee motivation. Competence emerged as the strongest predictor of motivation, followed by autonomy, while relatedness showed a significant correlation but did not contribute uniquely to the regression model. Additionally, significant differences in motivation levels were found based on demographic factors such as gender, education level, marital status, and job position. These results provide evidence that fulfilling employees' needs for competence and autonomy plays a critical role in enhancing motivation within construction settings. The study offers practical insights for HR practitioners and policymakers to design targeted strategies aimed at fostering a more motivated and productive workforce.

Keywords: *Self-Determination Theory, Employee Motivation, Autonomy, Competence, Relatedness.*

1. Introduction

This study investigates the critical issue of employee motivation within Malaysia's construction industry by focusing on three essential psychological needs identified in Self-Determination Theory, which are autonomy, competence, and relatedness. The construction sector plays a vital role in Malaysia's economic growth, contributing significantly to national employment and development. However, despite substantial investments and strong recovery efforts following the COVID-19 pandemic, the industry continues to face persistent workforce challenges.

One of the most pressing concerns is the low level of motivation among employees, which stems from high-pressure working environments, limited opportunities for decision-making, and a lack of structured career development. Workers are often subjected to rigid project schedules and hierarchical management structures that restrict autonomy and limit their ability to take ownership of their tasks. This leaves many employees feeling undervalued and disengaged.

In addition, many construction workers report a lack of competence due to inadequate training and insufficient upskilling programs. This undermines their confidence and affects their ability to meet project demands effectively. Furthermore, the project-based nature of construction work often disrupts team cohesion and weakens interpersonal relationships, leading to a lack of relatedness and connection to the organization.

These challenges have serious implications for workforce stability, safety, productivity, and overall organizational performance. While job satisfaction and performance have been widely studied in the construction sector, there is a clear lack of research that focuses specifically on how psychological needs influence motivation, particularly in the Malaysian context.

This study is therefore both timely and necessary. It aims to close this research gap by examining the

relationship between autonomy, competence, and relatedness and employee motivation in publicly listed construction companies in Malaysia. This study also aims to determine the most influential factors among these variables. The findings are expected to provide meaningful insights for human resource professionals and organizational leaders, offering practical strategies to foster a motivated, resilient, and high-performing workforce. Addressing these motivational needs is not only crucial for employee well-being but also essential for achieving long-term success and sustainability in one of Malaysia's most demanding industries.

2. Literature Review

Employee motivation plays a critical role in ensuring productivity, retention, and satisfaction, especially in high-pressure sectors such as construction. Self-Determination Theory (SDT), developed by Deci and Ryan (1985), identifies three psychological needs essential to intrinsic motivation: autonomy, competence, and relatedness. This study adopts SDT as its theoretical foundation and focuses on how these three factors influence employee motivation in the Malaysian construction sector. Motivation is the dependent variable, while autonomy, competence, and relatedness serve as the independent variables.

Self-Determination Theory

Self-Determination Theory (SDT), introduced by Deci and Ryan (1985), explains that motivation is driven by the fulfillmentof three basic psychological needs, which are autonomy, competence, and relatedness. When these needs are satisfied, individuals are more likely to experience intrinsic motivation, leading to greater engagement, well-being, and performance atwork (Ryan & Deci, 2020). In high-pressure industries such as construction, meeting these psychological needs is especially important due to demanding workloads, tight deadlines, and hierarchical structures (Rahman et al., 2023). Autonomy allowsemployees to feel in control of their work, competence builds confidence through skill development, and relatedness fostersa sense of connection with colleagues and supervisors (Van den Broeck et al., 2016; Howard et al., 2021). Research in Malaysian workplaces confirms that SDT-based practices such as participative leadership and continuous training can enhance motivation and reduce burnout (Guo & Chelliah, 2024). Therefore, SDT provides a strong foundation for understanding how psychological needs influence employee motivation in the construction sector.

Autonomy and Employee Motivation

Autonomy refers to the degree of control employees have over their tasks and decisions. Employees who are allowed to exercise self-direction are more likely to experience intrinsic motivation and engagement (Deci & Ryan, 1985). In the construction sector, rigid project structures and top-down management often restrict autonomy, which leads to disengagement (Rahman et al., 2023). However, research shows that autonomy-supportive leadership, including participative decision-making and flexible scheduling, can enhance motivation and performance (Slemp et al., 2014; Olafsen et al., 2021). For example, employees involved in planning and execution demonstrate greater ownership and job satisfaction (Hamid & Amir Ishak., 2022).

H1: There is a relationship between autonomy and employee motivation.

Competence and Employee Motivation

Competence reflects an employee's belief in their ability to perform tasks effectively. Employees who feel capable andadequately skilled are more likely to show initiative, persistence, and satisfaction in their roles (Howard et al., 2021). In construction, many employees report lacking the necessary training and upskilling opportunities, which negatively impacts motivation (CIDB Malaysia, 2024; Rahman et al., 2023). Providing structured development programs, regular feedback, and career progression opportunities helps strengthen perceived competence and intrinsic motivation (Lim et al., 2021; Zulkifli et al., 2023). This then relates to the second hypothesis of the study as below:

H2: There is a relationship between competence and employee motivation.

Relatedness and Employee Motivation

Relatedness is the need to feel connected to others in the workplace. When employees experience trust, support, and a sense of belonging, they are more likely to be motivated and engaged (Deci & Ryan, 1985; Van den Broeck et al., 2021). Inconstruction, the transient and project-based nature of work often disrupts

social bonds, contributing to isolation and lower morale (Shamsuddin et al., 2023). However, team-building activities, open communication, and inclusive leadership have been shown to improve relatedness and strengthen motivation (Rahman et al.,2023; Husin & Shamsuddin, 2023). Thus, the third hypothesis of this study:
H3: There is a relationship between relatedness and employee motivation.

Gender and Employee Motivation
Gender differences can influence how employees respond to motivational drivers. Women in construction often face barriers such as underrepresentation in leadership, exclusion from decision-making, and limited development opportunities (CIDB, 2024; Ismail et al., 2023). These challenges reduce their sense of autonomy, competence, and relatedness, affecting motivation. Inclusive HR practices, mentorship, and gender-sensitive leadership are associated with improved motivation among female employees (Muthambi et al., 2025). Hence, a hypothesis is formed as below:
H4: There is a significant difference in employee motivation between male and female employees.

Dominant Predictor of Motivation
While autonomy, competence, and relatedness are all critical, studies suggest that in certain industries or organizational settings, one factor may emerge as the most significant predictor of motivation. Understanding the most influential factor canhelp organizations prioritize their interventions (Howard et al., 2021; McAnally & Hagger, 2024).
H5: There is one factor that significantly predicts employee motivation more than the others.

3. Methodology

This study adopts a quantitative approach to examine the impact of autonomy, competence, and relatedness on employee motivation at one of the construction companies in Malaysia. The study focuses on employees working in key departments such as Project Management, Design and Technical, and General Workers, all of whom are directly involved in high-pressure construction projects. The entire population of 200 employees was included using a census sampling method to ensure comprehensive coverage and accurate findings (Creswell, 2014).

Data were collected using a structured, self-administered questionnaire distributed via Google Forms, which included sections on demographics,employee motivation, autonomy, competence, and relatedness.

The questionnaire was adapted from validated instruments including the Work Extrinsic and Intrinsic Motivation Scale (WEIMS) and SDT-based subscales (Tremblay et al., 2009; Deci & Ryan, 1985; Baard et al., 2004). All items used a 5-pointLikert scale ranging from "Strongly Disagree" to "Strongly Agree". The instrument underwent a pilot test for clarity and reliability. Content and construct validity were ensured through expert reviews.

Data were analyzed using Social Science Statistics Version 29 (SPSS 23). Descriptive statistics summarized the demographic profile of respondents. Inferential statistics, including Pearson correlation, multiple regression, and t-test analyses, were used to testthe hypotheses and evaluate the relationships between the independent variables (autonomy, competence, and relatedness) and the dependent variable (employee motivation). This robust methodology supports accurate, generalizable insights into the motivational drivers in Malaysia's construction sector.

4. Findings and Discussion

This chapter presents the analysis and findings derived from the data collected through the structured questionnaire distributedto the respondents. The results are organized to address the research objectives and hypotheses concerning therelationship between autonomy, competence, relatedness, and employee motivation. The analysis is divided into several key sections, which are the demographic profile of respondents, reliability of instruments, normality tests, descriptive statistics of variables, correlation analysis, and regression analysis.

Demographic Profile of Respondents

The demographic profile of the 200 respondents illustrates a moderately balanced workforce with some notable patterns. The gender distribution shows that 54.0% of respondents were male and 46.0% female, reflecting the traditionally male-dominated nature of the construction industry, though the gap appears to be narrowing. In terms of marital status, 50.5% of the participants were single while 49.5% were married, suggesting a fairly even split that may correspond with different career stages across the employee base. Age-wise, the majority of respondents were between35 and 45 years old (33.5%), closely followed by those aged 25 to 35 (33.0%), indicating that the workforce largely consists of mid-career professionals. A further 26.0% were aged between 45 and 55, and only 7.5% were aged 55 to 65, highlighting a limited representation of older employees. Regarding educational background, most respondents held a bachelor's degree(46.5%), with 25.0% possessing a master's degree, 2.5% a PhD, and 26.0% holding other qualifications such as diplomas or professional certifications. This distribution reflects a highly educated workforce with substantial academic grounding. In terms of work experience, 34.0% of respondents had 11 to 20 years of experience, 33.5% had 6 to 10 years, and 24.5% had less than 5 years, indicating a strong presence of experienced staff alongside a significant group of early-career professionals. Only 8.0% had more than 21 years of experience. Lastly, job position data revealed that the largest group wereTechnical Staff (27.5%), followed by On-site Workers (25.0%), Management roles (24.5%), and Administrative Staff (23.0%), demonstrating a diverse mix of technical and support functions across the organization.

Means and Standard Deviations after Factor Analysis

As shown in Table 1, this section presents the Means and Standard Deviations for the primary variables used in the study, following factor analysis. The independent variables derived from Self-Determination Theory (SDT) include Autonomy, Competence, and Relatedness, while Employee Motivation represents the dependent variable. All constructs were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Table 1: The Means and Standard Deviations after Factor Analysis

Construct	Mean	Standard Deviation
Employee Motivation (Dependent variable)	3.99	.376
Autonomy (Independent variable)	4.02	.335
Competence (Independent variable)	4.02	.324
Relatedness (Independent variable)	4.05	.269

As shown in Table 1, all constructs recorded relatively high mean scores, indicating overall positive responses from participants. Among the independent variables, Relatedness recorded the highest mean (M = 4.05, SD = 0.269), suggesting that employees generally feel supported and connected in their work environment. This was followed by both Autonomy andCompetence, each with identical mean values of 4.02, indicating that employees feel confident in their capabilities and perceive a degree of control over their tasks. Their standard deviations of 0.335 and 0.324, respectively, also reflect consistentperceptions across respondents. The dependent variable, Employee Motivation, had a mean score of 3.99 with a standard deviation of 0.376, suggesting that employees in the studied construction firm are generally well-motivated, though slightly lower compared to the psychological need constructs. These findings confirm that the instrument remains valid and reliable even after factor analysis, and the measured constructs contribute meaningfully to understanding motivation in the construction sector.

Reliability after Factor Analysis

Table 2 presents the results of the reliability analysis conducted after factor analysis, using Cronbach's Alpha (α) to assess the internal consistency of each construct. Cronbach's Alpha values above 0.70 are generally considered acceptable, with values above 0.80 regarded as good, and values exceeding 0.90 considered excellent (Pallant, 2020; Ursachi et al., 2013).

Table 2: Summary of Reliability Analysis after Factor Analysis (n=200)

Construct	N of Items	Cronbach's Alpha
Employee Motivation	11	.916
Autonomy	10	.891
Competence	10	.897
Relatedness	10	.867

As shown in Table 2, all four constructs demonstrate high levels of internal consistency, with Cronbach's Alpha values ranging from 0.867 to 0.916. The dependent variable, Employee Motivation, achieved the highest reliability score of 0.916,indicating excellent internal consistency among the 11 items measuring this construct. This confirms that the scale effectively captures the motivational perceptions of respondents. Autonomy recorded a Cronbach's Alpha of 0.891, suggesting that the items used are strongly aligned in measuring employees' sense of independence and self-regulation at work. Similarly, Competence demonstrated a high reliability score of 0.897, confirming the consistency of items used to evaluate respondents' perceived skills and capability in performing job tasks. Lastly, Relatedness scored 0.867, which alsofalls within the good reliability range, supporting the internal consistency of the scale in assessing social connection and workplace relationships. In summary, the measurement instruments used in this study can be deemed reliable and valid, providing a strong foundation for further statistical analysis and interpretation of the relationships among the studied constructs.

Pearson Correlation Analysis

Table 3 presents the Pearson's Product-Moment Correlation Coefficients between the independent variables (Autonomy, Competence, and Relatedness) and the dependent variable (Employee Motivation). The analysis was conducted to determinethe strength and direction of linear relationships between the constructs, as guided by the assumptions of normality and the requirements of parametric testing. Pearson's correlation coefficient (r) ranges from −1 to +1, where values closer to ±1 indicate stronger relationships.

Table 3: Correlation Analysis

No	1	2	3	4
1	1			
2	.826**	1		
3	.828**	.848**	1	
4	.638**	.790**	.719**	1

**. Correlation is significant at the 0.01 level (2-tailed).
1 = Employee Motivation, 2 = Autonomy, 3 = Competence, 4 = Relatedness

As seen in Table 3, all variables were positively and significantly correlated at the $p < 0.01$ level. Among the three psychological needs, Competence showed the strongest positive correlation with Employee Motivation ($r = .828$, $p < .01$). This indicates that when employees feel competent and confident in their abilities, their level of motivation at work tends toincrease significantly. The strength of this relationship supports the argument that feeling effective and skilled in one's tasksis essential for fostering intrinsic motivation among employees in the construction industry.

Autonomy also demonstrated a very strong and statistically significant positive correlation with Employee Motivation ($r =.826$, $p < .01$). This suggests that the more employees perceive they have control and choice in their work environment, the more likely they are to be motivated. This result aligns with the core principle of SDT that autonomy supports psychologicalwellness and work engagement, especially in structured sectors like construction, where autonomy is often limited.

In comparison, Relatedness exhibited a slightly lower but still statistically significant correlation with Employee Motivation($r = .638$, $p < .01$). Although weaker than the other two constructs, this relationship confirms that employees who feel a senseof belonging and interpersonal connection with colleagues are

more likely to feel motivated. This is especially relevant in project-based environments where team dynamics frequently shift, potentially disrupting workplace bonds.

Furthermore, strong intercorrelations were observed among the independent variables themselves. Autonomy was highly correlated with competence (r = .848) and Relatedness (r = .790), while Competence also showed a strong correlation withRelatedness (r = .719). These relationships suggest that the psychological needs of autonomy, competence, and relatedness tend to co-exist and reinforce one another, further validating SDT's framework. Overall, the correlation analysis highlights the critical role of these three constructs in shaping employee motivation within Malaysia's construction sector.

Multiple Regression Analysis

To further understand the extent to which the independent variables, autonomy, Competence, and relatedness, predict Employee Motivation, a multiple regression analysis was performed. This statistical method allows for evaluating the collective and individual contributions of the predictors to the dependent variable. Table 4 summarizes the regression model'sperformance.

Table 4: Multiple Regression Analysis

R	R Square	Adjusted R Square	Std. Error of the Estimate
.860	.739	.735	.193

***Predictors**: (Constant), Relatedness (IV3), Competence (IV12), Autonomy (IV1)*

The results of the regression analysis reveal that the model produced an R value of 0.860, indicating a strong positive correlation between the combination of the three predictors and Employee Motivation. The R-squared value was 0.739, suggesting that 73.9% of the variance in Employee Motivation can be explained by Autonomy, Competence, and Relatedness. This high R-squared indicates that the model fits the data well. The Adjusted R-square, which adjusts for the number of predictors in the model, was 0.735, affirming the model's robustness and generalizability.

The standard error of the estimate was 0.193, which indicates a relatively small degree of residual variance, meaning the predictions made by the model are reasonably accurate. In addition, the F-statistic for the overall model was 185.45 with a significance level of $p < .001$, indicating that the model as a whole was statistically significant. This means that, collectively, the independent variables reliably predict Employee Motivation.

These results affirm that Autonomy, Competence, and Relatedness significantly and jointly contribute to explaining Employee Motivation among employees in the construction sector. The findings are consistent with the assumptions of Self- Determination Theory (SDT), reinforcing that fulfilling these psychological needs has a powerful influence on employee motivation.

Summary of Hypotheses

This study tested three hypotheses to examine the relationship between the independent variables Autonomy, Competence, and Relatedness and the dependent variable, Employee Motivation. Pearson's Correlation and Multiple Regression Analyses were used to validate these hypotheses. Table 5 summarizes the results of the hypothesis testing based on the Pearson correlation coefficients and the corresponding significance values.

Table 5: Summary of Hypotheses

Hypothesis	Hypothesis Statement	Result
H1	There is a relationship between Autonomy and Employee Motivation	**Accepted**
H2	There is a relationship between Competence and Employee Motivation	**Accepted**
H3	There is a relationship between Relatedness and Employee Motivation	**Accepted**

Most Influential Predictor of Motivation

Based on the results of the multiple regression analysis, competence was identified as the most influential predictor of employee motivation among the variables examined. Although autonomy and relatedness were also included in the regression model, competence demonstrated the highest standardized beta coefficient ($\beta = 0.450$, $p < .001$), indicating that it made the strongest unique contribution to predicting motivation, after controlling for the effects of the otherindependent variables.

This result implies that employees who perceive themselves as capable, effective, and able to meet job demands are significantly more likely to report higher levels of motivation in their roles. In the context of the organization, this emphasizes the importance of nurturing employees' sense of competence through work-related experiences that challenge and validate their skills. The detailed regression coefficient for competence is presented in Table 6 below.

Table 6: Regression Coefficient of the Most Influential Predictor on Employee Motivation

Predictor	Unstandardized Coefficients Beta	Std. Error	Standardized Coefficients Beta	t	Sig.
Competence	.521	.082	.450	6.364	< .001
Autonomy	.487	.082	.434	5.936	<.001
Relatedness	.019	.075	.014	.255	.799

The high beta value associated with competence suggests that improvements in employees' perceived ability to perform their tasks could lead to substantial gains in motivation levels. This aligns with the principles of Self-Determination Theory, which underscores competence as a core psychological need that drives intrinsic motivation. Consequently, this finding supports the strategic importance of enhancing competence among employees through structured training programs, continuous upskilling opportunities, consistent performance feedback, and formal recognition initiatives. Strengthening competence not only contributes to individual development but also serves as a powerful driver of motivation, ultimately benefiting organizational performance and employee engagement at large.

5. Conclusion and Recommendations

This study explored how autonomy, competence, and relatedness influence employee motivation at a construction company, grounded in Self-Determination Theory (SDT). The results confirmed that all three psychological needs are significantly and positively related to motivation, consistent with extensive literature demonstrating that satisfying these needs enhances intrinsic motivation (Gagné et al., 2014). In particular, competence emerged as the strongest predictor, aligning with recent empirical findings that the need for competence has the most powerful positive influence on work performance and motivation (Lintunen et al., 2025; Olafsen et al., 2015).

The dominance of competence as a predictor indicates that employees who perceive themselves as capable and effective in meeting job demands are more likely to be highly motivated. While autonomy and relatedness also contributed positively, their effects were less pronounced. This pattern is supported by recent HR research highlighting that competence-supportive HR practices have significant associations with employee engagement and motivation across contexts (Smith et al., 2024).

In summary, the findings offer practical and theoretical implications. The construction company should focus on enhancing employee competence through structured training, continuous feedback, and recognition initiatives. They should support autonomy through participative decision-making and foster a supportive environment that encourages interpersonal relatedness. Addressing these needs can yield sustainable improvements in motivation, well-being, andorganizational performance, in line with the core propositions of SDT.

Future Research

Future studies ought to reconsider a longitudinal study design to address the shortcomings of time as an independent variable in the study. This is because longitudinal research would allow consistency of data being collected to be measured at differenttimes; hence, it can examine how autonomy, competence, and relatedness are the factors that affect motivation as it varies withtime. That would be even stronger evidence of causal relationships and would shed further light on whether alterations in thesatisfaction of psychological needs precede alterations in motivation or conversely.

Longitudinal methods are particularly useful in the organizational context, where change measures such as leadership coaching, working flexibly, or training programs in employee development can take weeks or months to influence motivation. Recording these cumulative impacts will allow future research to produce more practical knowledge for HR practitioners.

Moreover, time-centric designs allow researchers to investigate the sustainable intervention of motivational interventionsthat have not been exhaustively studied in SDT studies in Southeast Asia. Moreover, future studies might also note the use of time-lagged structural equation modeling (SEM) or growth modeling to study the diversion of developmental trends within motivation, escalation points, or measuring developmental traces across varied employee proportions. Such sophisticated methods of statistical analysis would greatly enhance the motivation picture as a fluid concept and give empirical information on how to construct resilient, adaptive, and supportive working environments.

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Gamification in Digital Marketing: Enhancing Engagement and Loyalty

*Hartini Zuhaila Jamal, Ehsan Fansuree Surin, Marhani Mohamed Anuar, Ainun Nadzirah Mahmood, Balqis Shariff
Faculty of Business and Management, Universiti Teknologi MARA, Bandar Puncak Alam, Selangor, Malaysia
Email: *hzj@uitm.edu.my, efansuree@uitm.edu.my, marha558@uitm.edu.my, ainungeera@uitm.edu.my, balqis641@uitm.edu.my
Corresponding Author: Hartini Zuhaila Jamal

Abstract: In the contemporary digital marketplace, consumer attention has become increasingly fragmented due to information overload and constant exposure to competing stimuli. Traditional marketing strategies often fail to sustain meaningful engagement, necessitating innovative approaches that integrate motivational design with experiential value. This paper proposes the Gamified Experiential Marketing Framework (GEMF), a novel conceptual model that unites gamification mechanics with experiential marketing principles to address declining consumer attention and foster sustainable brand loyalty. Drawing upon Self-Determination Theory, Flow Theory, and the Technology Acceptance Model, GEMF explains how gamification elements such as points, badges, leaderboards, and narratives activate psychological mediators of motivation, experiential value, and emotional engagement. These mediators, moderated by contextual factors including platform characteristics, cultural context, and demographics, lead to enhanced consumer engagement, loyalty, and immersive brand experiences. The paper contributes theoretically by bridging gamification and experiential marketing, offering a holistic framework that positions gamification as a motivational engine within digital marketing. Practically, GEMF provides actionable insights for marketers to design personalized, ethical, and technologically integrated campaigns. Recommendations for future research include longitudinal studies, cross-cultural validation, and exploration of emerging technologies such as artificial intelligence and augmented reality. By situating gamification within experiential marketing, GEMF advances both academic discourse and managerial practice, offering a pathway to reimagine consumer-brand relationships in an era of attention scarcity.

Keywords: *Gamification; Digital Marketing; Consumer Engagement; Brand Loyalty; Experiential Marketing; Self-Determination Theory; Flow Theory; Technology Acceptance Model; Motivational Design; Conceptual Framework*

1. Introduction

In today's hyperconnected digital marketplace, consumer attention has become an increasingly scarce resource. The proliferation of digital content, advertisements, and interactive platforms has created an environment where consumers are constantly bombarded with stimuli, leading to fragmented attention spans and declining engagement with traditional marketing strategies (Yang et al., 2026). This phenomenon poses a significant challenge for brands seeking to build long-term relationships with consumers, as conventional approaches often fail to sustain meaningful interactions in the face of digital saturation. The decline in consumer attention is not merely a behavioral issue but reflects deeper shifts in consumer psychology, where individuals demand immersive, personalized, and rewarding experiences rather than passive consumption of marketing messages (Naumovska & Petrusevska, 2025).

Against this backdrop, gamification has emerged as a promising motivational design strategy that leverages game mechanics such as points, badges, leaderboards, and challenges to foster engagement and loyalty in non-game contexts. Unlike traditional marketing tactics, gamification taps into intrinsic and extrinsic motivational drivers, encouraging consumers to actively participate in brand-related activities (Rerkjirattikal et al., 2025) embedding elements of play and competition into digital marketing campaigns, brands can transform consumer interactions into dynamic experiences that not only capture attention but also sustain it over time. Recent studies highlight that gamification enhances consumer engagement by creating a sense of achievement, social belonging, and enjoyment, which in turn strengthens brand loyalty (Xi & Hamari, 2020).

However, while gamification has demonstrated considerable potential, its integration into broader experiential marketing strategies remains underexplored. Experiential marketing emphasizes the creation of memorable, emotionally resonant experiences that connect consumers with brands on a deeper level. When combined with

gamification, experiential marketing can evolve into a powerful framework that not only entertains but also motivates consumers to develop enduring brand relationships. This synergy is particularly relevant in the digital era, where consumers seek immersive experiences that align with their psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2020; Yang et al., 2026).

The purpose of this paper is to propose the Gamified Experiential Marketing Framework (GEMF), a conceptual model that integrates gamification mechanics with experiential marketing principles to address the challenge of declining consumer attention in digital spaces. GEMF posits that gamification can serve as a motivational engine within experiential marketing, driving consumer engagement through psychological satisfaction and emotional resonance. By situating gamification within the experiential marketing paradigm, this framework aims to provide a holistic understanding of how digital marketing strategies can be restructured to foster sustainable consumer-brand relationships.

This conceptual paper contributes to the literature by bridging two domains, gamification and experiential marketing, which have often been studied in isolation. It identifies the declining consumer attention span as a critical problem in digital marketing and introduces GEMF as a novel theoretical perspective to address this issue. The framework not only advances academic discourse but also offers practical implications for marketers seeking to design innovative campaigns that capture and sustain consumer engagement. Ultimately, GEMF provides a foundation for future empirical research, encouraging scholars to test its propositions across diverse industries and cultural contexts.

2. Literature Review

Gamification in Marketing

Gamification has become a central theme in digital marketing research, particularly as brands seek innovative ways to capture consumer attention. Defined as the application of game mechanics in non-game contexts, gamification has been shown to enhance consumer motivation, enjoyment, and participation (Yang et al., 2026). Over the past fifteen years, studies have consistently demonstrated that gamification can increase purchase intentions, brand attitudes, and loyalty. However, outcomes are not uniform; effectiveness depends heavily on the design of gamified systems and the context in which they are applied. For instance, achievement-based mechanics such as points and badges may appeal to competitive consumers, while narrative-driven gamification resonates more with consumers seeking immersive experiences.

Despite its promise, gamification research reveals contradictions. Some studies argue that gamification risks consumer fatigue when overused or poorly designed, leading to disengagement rather than loyalty (Yang et al., 2026). Others highlight ethical concerns, suggesting that gamification can manipulate consumer behavior by exploiting psychological triggers without offering genuine value. These tensions underscore the need for frameworks that balance motivational design with ethical responsibility.

Consumer Engagement

Consumer engagement is a multidimensional construct encompassing cognitive, emotional, and behavioral participation in brand-related activities. Engagement is increasingly recognized as a critical mediator between gamification and loyalty outcomes. Rerkjirattikal et al., (2025) emphasize that gamification enhances engagement by stimulating both intrinsic motivation (e.g., enjoyment, autonomy) and extrinsic motivation (e.g., rewards, recognition). Their review highlights that gamification fosters deeper consumer involvement by creating interactive experiences that extend beyond transactional exchanges.

Nevertheless, engagement research faces boundaries. While gamification can increase short-term engagement, sustaining long-term involvement remains challenging. Studies suggest that novelty effects often diminish over time, requiring continuous innovation in gamified systems. Furthermore, cultural and demographic differences influence engagement outcomes, with younger consumers often responding more positively to gamification than older demographics. This raises questions about the universality of gamification as a marketing strategy.

Brand Loyalty

Brand loyalty has traditionally been cultivated through consistent quality, trust, and reward programs. In the

digital era, gamification has been integrated into loyalty programs to enhance consumer retention. Research indicates that gamified loyalty programs can strengthen emotional attachment to brands by transforming routine interactions into rewarding experiences (Naumovska & Petrusevska, 2025). For example, leaderboards and progress tracking encourage consumers to remain active participants in brand ecosystems.

However, loyalty outcomes are not always linear. Recent studies reveal that gamification may produce non-monotonic effects, where excessive reliance on progress framing or competitive mechanics can demotivate consumers (Yang et al., 2026). This suggests that gamification must be carefully calibrated to avoid diminishing returns. Moreover, loyalty research often overlooks ethical considerations, particularly the risk of exploiting consumer psychology for commercial gain.

Experiential Marketing

Experiential marketing emphasizes the creation of memorable, emotionally resonant experiences that connect consumers with brands beyond functional attributes. Gamification aligns naturally with experiential marketing by embedding play, challenge and narrative into consumer journeys (Naumovska & Petrusevska, 2025). Gamification extends experiential marketing beyond entertainment, embedding psychological principles such as Self-Determination Theory (SDT) and Flow Theory to create immersive experiences.

Identified Boundaries, Contradictions and Gaps

Boundaries of Gamification Research

Gamification has demonstrated significant potential in enhancing consumer engagement, yet its effectiveness is not universal. Several boundaries constrain its application:

Demographic Boundaries

- Younger consumers, particularly digital natives, often respond positively to gamification due to their familiarity with interactive technologies. They perceive gamified experiences as natural extensions of their digital lifestyles.
- Older demographics, however, may view gamification as trivial or manipulative, preferring traditional loyalty programs based on trust and quality. This generational divide highlights the need for demographic-sensitive design.

Cultural Boundaries

- Cultural context significantly influences gamification outcomes. In individualistic cultures, competitive mechanics such as leaderboards and rankings resonate strongly, fostering achievement and personal recognition.
- In collectivist cultures, cooperative mechanics—such as team challenges or community-based rewards—are more effective, as they align with values of group harmony and shared success.
- Without cultural adaptation, gamification risks alienating consumers or producing unintended effects.

Industry Boundaries

- Gamification thrives in industries where consumer interaction is frequent and digital platforms are central, such as retail, hospitality, and education.
- In industries with limited consumer touchpoints (e.g., utilities, healthcare services), gamification may be less effective or require significant adaptation.

Temporal Boundaries

- Engagement outcomes are often short-lived. Novelty effects drive initial excitement, but consumers may lose interest once rewards become predictable.
- Continuous innovation is required to sustain engagement, which increases costs and complexity for marketers.

These boundaries underscore the importance of contextual sensitivity in gamification design. A one-size-fits-all approach is unlikely to succeed; instead, gamification must be tailored to demographic, cultural, and industry-specific contexts.

Contradictions in Gamification Outcomes

While gamification has been widely celebrated, the literature reveals contradictions that complicate its application:

Enhancement vs. Fatigue

- On one hand, gamification enhances loyalty by transforming routine interactions into rewarding experiences. Consumers feel motivated to engage with brands when they perceive progress, achievement, and recognition.
- On the other hand, excessive reliance on gamification can lead to consumer fatigue. Overexposure to points, badges, and leaderboards may reduce novelty and diminish motivation, resulting in disengagement.

Motivation vs. Manipulation

- Supporters argue that gamification taps into intrinsic motivations such as mastery, autonomy and social connection, thereby creating genuine value.
- Critics contend that gamification manipulates consumer behavior by exploiting psychological triggers, encouraging consumption without delivering substantive benefits. This raises ethical concerns about transparency and fairness.

Short-Term vs. Long-Term Loyalty

- Some studies demonstrate that gamification strengthens long-term loyalty by embedding consumers in brand ecosystems.
- Others suggest that loyalty outcomes are short-lived, with consumers disengaging once rewards are exhausted or perceived as insufficient.

Universal Appeal vs. Selective Effectiveness

- Proponents claim gamification appeals broadly across consumer segments.
- Empirical evidence, however, shows selective effectiveness, with outcomes varying by age, culture, and industry.

These contradictions highlight the dual nature of gamification: it can be both a powerful engagement tool and a potential source of consumer disillusionment. Ethical design and careful calibration are essential to balance motivation with authenticity.

Gaps in Current Literature

Despite extensive research, several gaps remain in the study of gamification and experiential marketing:

Integration Gap

- Few studies systematically integrate gamification into experiential marketing frameworks. While both domains emphasize consumer experience, they are often studied in isolation.
- This lack of integration limits theoretical development and practical application, leaving marketers without a holistic framework to guide strategy.

Longitudinal Gap

- Most research focuses on short-term outcomes, measuring immediate engagement or loyalty effects.
- Longitudinal studies are needed to assess whether gamification sustains consumer-brand relationships over time, particularly in competitive digital environments.

Cross-Cultural Gap

- Limited exploration of cross-cultural differences restricts the generalizability of findings.
- Comparative studies across diverse cultural contexts are essential to understand how gamification mechanics resonate globally.

Ethical Gap

- Ethical considerations are often overlooked. Few studies examine consumer perceptions of fairness, transparency, and autonomy in gamified systems.
- Without ethical safeguards, gamification risks being perceived as manipulative, undermining trust and loyalty.

Technological Gap

- Emerging technologies such as artificial intelligence, augmented reality, and blockchain offer new opportunities for gamified experiences.
- Current literature has not fully explored how these technologies can enhance or disrupt gamification outcomes.

3. Theoretical and Conceptual Framework

Integrating Literature into a Novel Framework

The literature on gamification, consumer engagement, brand loyalty, and experiential marketing reveals both synergies and contradictions. While gamification enhances consumer motivation and engagement, its long-term effects on loyalty remain inconsistent (Yang et al., 2026). Experiential marketing, on the other hand, emphasizes emotional resonance and memorable experiences but lacks systematic integration with gamification mechanics (Naumovska & Petrusevska, 2025).

To address these gaps, this paper proposes the Gamified Experiential Marketing Framework (GEMF). GEMF integrates motivational theories (Self-Determination Theory, Flow Theory) with technology adoption perspectives (Technology Acceptance Model) to explain how gamification can serve as a motivational engine within experiential marketing. The framework posits that gamification mechanics, when embedded into experiential campaigns, can transform consumer-brand interactions into immersive, rewarding experiences that sustain engagement and loyalty.

Core Components of GEMF

The Gamified Experiential Marketing Framework (GEMF) is structured around four interconnected components: input, mediators, moderators, and outputs. Each component plays a distinct role in explaining how gamification mechanics, when embedded into experiential marketing strategies, can transform consumer-brand interactions into immersive, motivational, and loyalty-driven experiences.

Inputs (Gamification Mechanics)

The inputs of GEMF consist of the gamification mechanics that marketers embed into digital platforms to stimulate consumer interaction. These include points, badges, leaderboards, challenges, and narratives, which collectively serve as the building blocks of gamified experiences. Points and badges provide consumers with visible markers of progress and achievement, appealing to both extrinsic and intrinsic motivations. For example, points can be redeemed for discounts or rewards, while badges often symbolize mastery or recognition, satisfying psychological needs for competence and status (Yang, Xi, Tang, & Hamari, 2026).

Leaderboards introduce competition by ranking consumers against peers, fostering engagement through social comparison and achievement-seeking behavior. However, they must be carefully designed to avoid discouraging lower-ranked participants, as excessive competition can lead to disengagement (ScienceDirect, 2026). Challenges and quests provide structured tasks that consumers must complete, often within a narrative context, which enhances intrinsic motivation by offering opportunities for mastery and exploration. Narratives and storytelling transform gamified experiences into meaningful journeys, embedding brand values into consumer interactions and creating emotional resonance. For instance, fitness applications often use narrative-driven gamification, where users “train like a hero” or “compete in a global mission,” linking personal achievement with collective purpose (Naumovska & Petrusevska, 2025). Collectively, these inputs are designed to stimulate both intrinsic motivations such as autonomy and enjoyment, and extrinsic motivations such as rewards and recognition.

Mediators (Psychological and Experiential Factors)

Mediators explain how gamification inputs translate into consumer outcomes by highlighting the psychological and experiential processes that bridge mechanics with marketing results. Motivation is a central mediator, encompassing both intrinsic and extrinsic dimensions. Intrinsic motivation arises when consumers engage for enjoyment, curiosity, and mastery, while extrinsic motivation is driven by rewards, recognition, and status. Gamification satisfies psychological needs for autonomy, competence, and relatedness, thereby enhancing intrinsic motivation (Ryan & Deci, 2020). Experiential value is another critical mediator, as gamification enhances novelty, emotional resonance, and perceived enjoyment, making consumer experiences more immersive and memorable.

This experiential value strengthens emotional attachment to brands and differentiates them in competitive markets (Rerkjirattikal et al., 2025). Engagement, the third mediator, is multidimensional, encompassing cognitive, emotional, and behavioral involvement. Cognitive engagement refers to attention and mental investment, emotional engagement reflects feelings of excitement and belonging, and behavioral engagement involves active participation and advocacy. Gamification fosters engagement by transforming passive consumers into active participants, thereby deepening their involvement with brand ecosystems.

Moderators (Contextual Factors)

Moderators influence the strength and direction of relationships within GEMF, explaining why gamification outcomes vary across contexts. Platform characteristics are a key moderator, as the design and functionality of digital platforms shape gamification effectiveness. Mobile applications allow personalized, real-time gamification, while social media emphasizes community and virality, and e-commerce platforms focus on transactional integration (Yang et al., 2026) .

Cultural context also moderates gamification outcomes, as cultural orientations toward competition, collectivism, or individualism influence consumer responses. In individualistic cultures, competitive mechanics such as leaderboards resonate strongly, while in collectivist cultures, cooperative mechanics such as team challenges are more effective (Naumovska & Petrusevska, 2025).

Demographics further moderate outcomes, with younger consumers often embracing gamification enthusiastically due to their familiarity with interactive technologies, while older demographics may require simpler, more intuitive designs. Lifestyle factors, such as fitness orientation or shopping habits, also shape consumer responses. These moderators highlight the importance of contextual sensitivity, as gamification is not universally effective and must be tailored to platform, cultural, and demographic contexts.

Outputs (Marketing Outcomes)

Outputs represent the ultimate goals of GEMF, encompassing consumer engagement, brand loyalty, and experiential marketing outcomes. Consumer engagement is achieved when gamification sustains attention and active participation, transforming consumers from passive recipients of marketing messages into active participants in brand ecosystems. Engagement can be measured through metrics such as time spent, frequency of interaction, and social sharing (Rerkjirattikal et al., 2025).

Brand loyalty is another critical output, characterized by emotional attachment, repeat purchase, and advocacy. Gamification strengthens loyalty by embedding consumers in rewarding, immersive experiences that foster trust and emotional resonance. However, loyalty must be sustained through continuous innovation and ethical transparency to avoid consumer fatigue (Xi & Hamari, 2020) .

Experiential marketing outcomes represent the broader impact of gamification, creating memorable, immersive consumer-brand relationships that extend beyond transactional value. By embedding play, challenge, and narrative into consumer journeys, gamification enhances experiential marketing and fosters emotional bonds that differentiate brands in competitive markets (Yang et al., 2026) .

Theoretical Foundations

The Gamified Experiential Marketing Framework (GEMF) is anchored in three major theoretical perspectives: Self-Determination Theory (SDT), Flow Theory, and the Technology Acceptance Model (TAM). Together, these theories provide a comprehensive lens for analyzing how gamification can be systematically embedded into

experiential marketing strategies, explaining both the psychological mechanisms and technological adoption processes that drive consumer engagement and loyalty.

Self-Determination Theory (SDT)

Self-Determination Theory, developed by Deci and Ryan, emphasizes that human motivation is driven by the satisfaction of three basic psychological needs: autonomy, competence, and relatedness. Autonomy refers to the need to feel in control of one's actions and decisions; competence reflects the need to feel effective and capable in achieving goals; and relatedness represents the need to feel connected to others and experience social belonging.

Gamification aligns closely with these needs. For autonomy, gamified systems often allow consumers to make choices, customize experiences, and pursue self-directed goals. For competence, mechanics such as points, badges, and progress tracking provide feedback that reinforces a sense of mastery and achievement. For relatedness, social features such as leaderboards, team challenges, and community missions foster connection and belonging. By satisfying these needs, gamification enhances intrinsic motivation, encouraging consumers to engage not merely for external rewards but for the inherent enjoyment and fulfillment of the experience.

Recent studies confirm this alignment. Yeh et al. (2025) demonstrated that gamification in tourism expositions significantly enhanced consumer engagement when designed to satisfy SDT needs, showing that competence, relatedness and autonomy directly influenced purchase intentions and word-of-mouth communication.

Flow Theory

Flow Theory, introduced by Csikszentmihalyi, describes the psychological state of deep immersion and concentration that occurs when individuals are fully engaged in an activity. Flow is characterized by intense focus, loss of self-consciousness, and a sense of enjoyment derived from the activity itself. It occurs when the challenge of a task is balanced with the individual's skill level, creating an optimal experience that is neither too easy nor too difficult.

Gamification is uniquely positioned to create flow experiences. Challenges, quests, and narratives provide tasks that are engaging and progressively difficult, while feedback mechanisms such as points and badges ensure that consumers perceive their progress. When designed effectively, gamified systems maintain a balance between challenge and skill, enabling consumers to enter a state of flow. This immersive state enhances consumer engagement, as individuals lose track of time and become deeply absorbed in brand-related activities.

Recent empirical work supports Xi & Hamari (2020) who found that flow experiences in hospitality gamification significantly increased customer loyalty, demonstrating that immersive states of concentration and enjoyment are critical drivers of sustained engagement.

Technology Acceptance Model (TAM)

The Technology Acceptance Model, developed by Davis, provides insights into how consumers adopt and use technological systems. TAM posits that two key factors determine technology adoption: perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which a consumer believes that using a system will enhance their performance or provide value, while perceived ease of use reflects the degree to which the system is free of effort and user-friendly.

In gamified marketing contexts, TAM explains how consumers evaluate digital platforms that incorporate gamification mechanics. If consumers perceive gamified systems as useful for example, by providing rewards, enhancing enjoyment, or facilitating social interaction they are more likely to adopt and continue using them. Similarly, if gamified platforms are easy to navigate, intuitive, and seamlessly integrated into existing digital habits, adoption rates increase. Conversely, poorly designed systems that are complex or fail to deliver value risk rejection and disengagement.

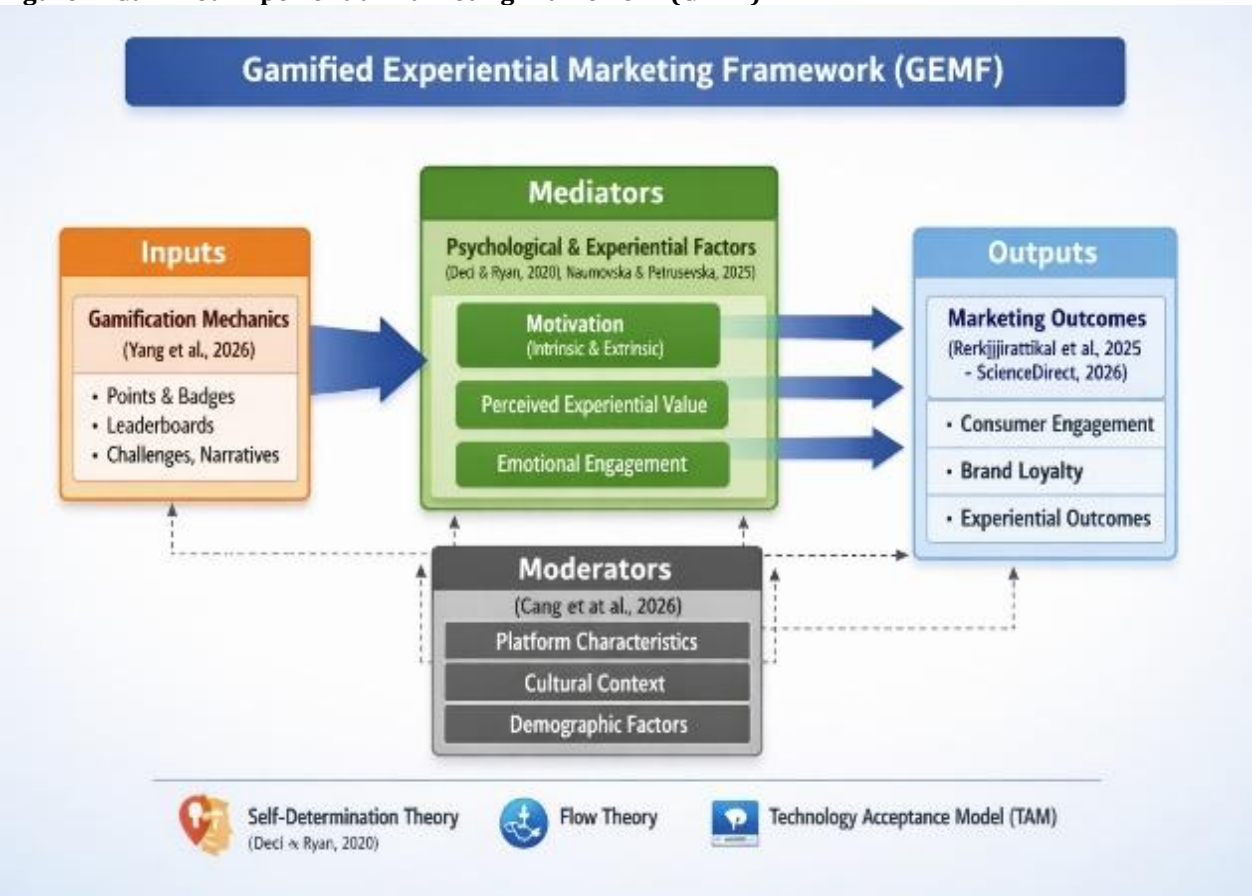
Recent studies validate TAM's relevance. Alfan & Wea (2026) analyzed Shopee Games in Indonesia and found that perceived usefulness significantly influenced attitudes and behavioral intentions, while perceived ease of use indirectly shaped adoption.

Integrative Perspective

By combining SDT, Flow Theory, and TAM, GEMF provides a holistic lens for analyzing gamification in experiential marketing. SDT explains the motivational mechanisms, Flow Theory describes the immersive experiential states, and TAM addresses the technological adoption processes. Together, these theories ensure that GEMF is both psychologically robust and technologically relevant.

For example, a gamified e-commerce platform may use points and badges (inputs) to satisfy competence needs (SDT), design challenges that balance difficulty and skill to create flow (Flow Theory) and ensure that the platform is intuitive and valuable to consumers (TAM). Mediators such as motivation, experiential value, and engagement explain how these inputs translate into outcomes, while moderators such as culture and demographics contextualize effectiveness. Ultimately, outputs such as consumer engagement, brand loyalty, and experiential outcomes demonstrate the strategic value of gamification.

Figure 1: Gamified Experiential Marketing Framework (GEMF)



The GEMF integrates gamification mechanics with experiential marketing principles to explain how motivational and experiential factors mediate consumer engagement and brand loyalty. Grounded in Self-Determination Theory (Ryan & Deci, 2020). Flow Theory and the Technology Acceptance Model (TAM), the framework illustrates how contextual moderators such as platform characteristics, cultural context, and demographics shape the effectiveness of gamified experiences in digital marketing environments.

4. Discussion of Implications

Theoretical Implications

The proposed Gamified Experiential Marketing Framework (GEMF) advances current theoretical understanding by bridging two previously distinct domains: gamification and experiential marketing. Traditional marketing theories emphasize persuasion and information processing, while experiential marketing focuses on emotional and sensory engagement. GEMF introduces a motivational dimension, explaining how game mechanics activate psychological needs that sustain consumer attention and loyalty.

By integrating Self-Determination Theory (Ryan & Deci, 2020), Flow Theory and the Technology Acceptance Model (TAM), GEMF provides a multidimensional lens for analyzing consumer behavior in digital environments. It suggests that gamification does not merely entertain but fulfills deeper psychological needs for autonomy, competence, and relatedness. This theoretical integration enriches the experiential marketing literature by positioning gamification as a motivational catalyst rather than a superficial engagement tool.

Furthermore, GEMF challenges the assumption that consumer engagement is purely transactional. Instead, it conceptualizes engagement as a dynamic, emotionally charged process influenced by motivational design. This shift encourages scholars to view gamification as a psychological architecture that shapes experiential value and brand relationships.

Practical Implications

From a managerial perspective, the Gamified Experiential Marketing Framework (GEMF) offers actionable insight for marketers seeking to design effective digital campaigns that go beyond traditional persuasion. The framework emphasizes the importance of motivational design, contextual adaptation, ethical responsibility, and technological integration. Each of these dimensions provides practical guidance for managers who aim to capture consumer attention, sustain engagement, and foster long-term loyalty in increasingly competitive digital environments.

Designing Motivational Experiences

One of the most critical implications of GEMF is the need to design gamified experiences that satisfy intrinsic motivations rather than relying solely on extrinsic rewards. Traditional loyalty programs often emphasize discounts, points, or monetary incentives, which can generate short-term engagement but fail to sustain consumer interest over time. GEMF suggests that marketers should embed mechanics that foster mastery, curiosity, and social connection. For instance, narrative-driven challenges can create immersive journeys that encourage consumers to identify with brand values, while collaborative missions can foster a sense of community and belonging.

Recent studies confirm that gamification strategies that emphasize intrinsic motivation are more effective in sustaining engagement. Yeh et al., (2025) found that gamification in tourism expositions enhanced consumer engagement when designed to satisfy autonomy, competence, and relatedness needs, demonstrating the relevance of Self-Determination Theory in marketing contexts. Similarly, Thao (2025) showed that social gamification mechanisms in e-commerce platforms triggered flow experiences, which mediated the relationship between gamification and customer loyalty. These findings highlight that motivational design must prioritize psychological satisfaction to achieve long-term impact.

Personalization and Contextual Adaptation

Another key implication of GEMF is the importance of tailoring gamification strategies to specific audiences. The framework highlights the role of moderators such as platform characteristics, cultural context, and demographics in shaping outcomes. For example, competitive leaderboards may resonate strongly in individualistic cultures, where achievement and personal recognition are valued, while cooperative missions may be more effective in collectivist societies that emphasize group harmony and shared success. Demographic differences also play a role, with younger consumers often responding positively to gamification due to their familiarity with interactive technologies, while older demographics may require simpler, more intuitive designs. Lifestyle factors, such as fitness orientation or shopping habits, further influence consumer responses. Recent research supports this contextual sensitivity. Nurmayanti & Utomo (2026) demonstrated that

gamification in hospitality contexts produced varying outcomes depending on cultural orientation, with collectivist consumers preferring cooperative mechanics (Aurelia et al., 2025). Similarly, it was found that perceived usefulness and reward value were more dominant than ease of use in shaping gamification adoption in Indonesian e-commerce, highlighting the importance of aligning gamification strategies with local consumer expectations. These insights suggest that personalization and contextual adaptation are essential for maximizing the effectiveness of gamified campaigns.

Ethical and Sustainable Engagement.

GEMF also underscores the need for ethical design in gamification. While gamification can enhance engagement and loyalty, overuse of extrinsic rewards or manipulative tactics risks consumer fatigue and distrust. Ethical concerns arise when gamification exploits psychological triggers without offering genuine value, leading to perceptions of manipulation rather than empowerment. Brands must therefore ensure transparency, respect for consumer autonomy, and align gamified experiences with authentic value creation. Ethical safeguards are particularly important in digital environments where consumers are increasingly aware of data privacy and manipulation risks. Klein & Sharma (2026) integrated the Technology Acceptance Model with Innovation Resistance Theory to identify barriers to gamification adoption, highlighting cultural gaps, regulatory ambiguity, and ethical concerns as critical impediments. Their findings emphasize that ethical transparency is not only a moral responsibility but also a strategic necessity for sustaining consumer trust. Furthermore, Xi & Hamari (2020) reported that excessive reliance on progress framing in gamified loyalty programs produced non-monotonic effects, where consumers became demotivated rather than engaged. This evidence reinforces the importance of designing gamification systems that balance extrinsic and intrinsic motivators, avoid overexposure, and prioritize consumer well-being.

Integration with Technology

Finally, GEMF highlights the importance of technological integration, drawing on the Technology Acceptance Model (TAM to explain how consumers adopt gamified platforms. TAM suggests that perceived usefulness and ease of use are critical determinants of adoption. In practice, this means that gamified systems must be intuitive, user-friendly, and seamlessly integrated into existing digital habits. If consumers perceive gamification as valuable, for example, by enhancing enjoyment, providing rewards, or facilitating social interaction, they are more likely to adopt and continue using the platform. Conversely, poorly designed systems that are complex or fail to deliver value risk rejection and disengagement. Recent studies validate TAM's relevance in gamification contexts. Alfan & Wea (2026) found that perceived usefulness significantly influenced attitudes and behavioral intentions in Shopee Games, while perceived ease of use indirectly shaped adoption. Their findings confirm that reward value and perceived benefits are more dominant than technical ease in driving gamification acceptance. Similarly, Klein & Sharma (2026) highlighted that technological barriers, including poor usability and lack of integration, were major obstacles to gamification adoption. These insights suggest that marketers must invest in intuitive design, seamless integration, and continuous technological innovation to enhance experiential flow and sustain consumer engagement.

Synthesis

Taken together, these practical implications demonstrate that GEMF provides a robust guide for marketers seeking to design effective digital campaigns. By focusing on motivational experiences, personalization, ethical safeguards, and technological integration, GEMF ensures that gamification is not merely a superficial engagement tool but a strategic framework for fostering sustainable consumer-brand relationships. The framework emphasizes that gamification must be designed to satisfy psychological needs, adapted to cultural and demographic contexts, implemented with ethical transparency, and supported by user-friendly technology. These insights are critical for managers who aim to navigate the challenges of declining consumer attention and create immersive, meaningful, and loyalty-driven experiences in the digital marketplace.

Implications for Future Research

The GEMF opens several avenues for empirical investigation:

Longitudinal Studies: Future research should examine the sustainability of gamified engagement over time. Do consumers maintain loyalty after the novelty fades? Longitudinal designs can reveal how motivational satisfaction evolves across repeated interactions.

Cross-Cultural Validation: Given the moderating role of cultural context, comparative studies across regions can test whether gamification mechanics produce consistent outcomes globally. This would refine the framework's applicability in diverse markets.

Measurement Development: Researchers should develop validated scales to measure constructs such as "perceived experiential value" and "gamified engagement." These instruments will enable quantitative testing of GEMF propositions.

Technological Evolution: Emerging technologies such as artificial intelligence, augmented reality, and blockchain offer new opportunities for gamified experiences. Future studies could explore how these innovations enhance or disrupt the motivational pathways proposed in GEMF.

Ethical Dimensions: Empirical work should also investigate the ethical boundaries of gamification. How do consumers perceive fairness, transparency, and autonomy in gamified marketing systems? Addressing these questions will ensure responsible application of the framework.

Broader Impact on Marketing Practice and Scholarship

The GEMF contributes to a paradigm shift in digital marketing from transactional persuasion to motivational engagement. It encourages marketers to design experiences that are psychologically fulfilling and socially meaningful. For academia, it provides a foundation for interdisciplinary research connecting marketing, psychology, and technology studies.

By emphasizing the interplay between motivation, experience, and technology, GEMF aligns with contemporary trends in consumer psychology and digital transformation. It invites scholars and practitioners to rethink how brands can create immersive, ethical, and sustainable engagement ecosystems in an era of attention scarcity.

5. Conclusion & Recommendations

Conclusion

The digital marketplace is characterized by information overload and declining consumer attention, which has forced brands to rethink how they engage audiences. This paper has proposed the Gamified Experiential Marketing Framework (GEMF) as a novel theoretical model that integrates gamification mechanics with experiential marketing principles to address this challenge.

GEMF contributes to marketing theory by reframing gamification not as a superficial engagement tactic but as a motivational architecture that activates psychological needs and emotional resonance. By embedding Self-Determination Theory (Ryan & Deci, 2020). Flow Theory, and the Technology Acceptance Model (TAM) into experiential marketing, GEMF provides a multidimensional explanation of how gamified experiences can sustain consumer engagement and foster brand loyalty.

This theoretical contribution is significant because it bridges two domains that have often been studied in isolation. Gamification research has focused on mechanics and short-term engagement, while experiential marketing has emphasized emotional resonance without systematically incorporating motivational design. GEMF unites these perspectives, offering a holistic framework that explains how game-based mechanics can transform consumer-brand interactions into immersive, memorable, and ethically sustainable experiences.

Recommendations for Future Research

Empirical Validation of GEMF

- Researchers should design quantitative studies using structural equation modeling (SEM) to test the causal pathways proposed in GEMF.
- For example, studies could examine whether gamification inputs (points, badges, narratives) significantly predict experiential value and emotional engagement, which in turn drive consumer loyalty.

Longitudinal Research Designs

- Most gamification studies measure short-term outcomes. Future research should adopt longitudinal designs to assess whether gamified experiences sustain engagement and loyalty over months or years.
- This would help determine whether motivational satisfaction persists beyond novelty effects, a critical question for sustainable marketing.

Cross-Cultural and Demographic Studies

- GEMF highlights the moderating role of cultural and demographic factors. Comparative studies across collectivist and individualist cultures could reveal how gamification strategies must be adapted.
- Similarly, demographic research could explore how age, digital literacy, and lifestyle influence consumer responses to gamified experiences.

Integration with Emerging Technologies

- Future research should investigate how artificial intelligence, augmented reality, and blockchain can enhance gamified experiential marketing.
- For instance, AI-driven personalization could tailor gamification mechanics to individual consumer preferences, while AR could create immersive gamified shopping experiences.

Ethical Dimensions of Gamification

- Scholars should explore consumer perceptions of fairness, transparency, and autonomy in gamified marketing systems.
- Ethical frameworks must be developed to ensure gamification fosters genuine value rather than manipulative engagement. This is particularly important as gamification increasingly leverages psychological triggers.

Practical Recommendations for Marketers

Design for Intrinsic Motivation: Move beyond extrinsic rewards (points, discounts) to create experiences that satisfy autonomy, mastery, and social connection. For example, narrative-driven campaigns can foster emotional engagement.

Tailor Strategies to Context: Adapt gamification mechanics to platform characteristics, cultural norms, and demographic profiles. A competitive leaderboard may work in Western markets, while collaborative missions may resonate in collectivist societies.

Ensure Ethical Transparency: Communicate clearly about how gamification mechanics operate. Avoid manipulative tactics that exploit consumer psychology.

Leverage Technology for Seamless Experiences: Invest in user-friendly interfaces and cross-platform integration to enhance adoption and experiential flow.

Measure and Innovate Continuously: Use analytics to monitor consumer responses and update gamified experiences regularly to avoid fatigue.

The Gamified Experiential Marketing Framework (GEMF) provides a robust foundation for both academic inquiry and practical application. By situating gamification within experiential marketing, GEMF offers a pathway to reimagine digital consumer engagement in an era of attention scarcity.

For scholars, GEMF opens new avenues for interdisciplinary research connecting marketing, psychology, and technology. For practitioners, it offers actionable strategies to design immersive, ethical, and sustainable engagement ecosystems. Ultimately, GEMF represents a paradigm shift in digital marketing from transactional persuasion to motivational engagement, ensuring that brands can thrive in a competitive, attention-driven marketplace.

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The Psychological Mechanisms of Scarcity Marketing on Gen Z Impulse Buying Behavior in Malaysia: A Conceptual Framework

*Ainun Nadzirah Mahmood[1], Hartini Zuhaila Jamal[1], Ehsan Fansuree Surin[1], Sarinah Sabar[1], Marhani Mohamed Anuar[1], Balqis Mohd Shariff[1], Kamarulzaman Mahmood[2]
[1]Faculty of Business and Management, Universiti Teknologi MARA, Bandar Puncak Alam, Selangor, Malaysia
[2]Perbadanan Perpustakaan Awam Terengganu, Kuala Terengganu, Terengganu, Malaysia
Email: *ainungeera@uitm.edu.my, hzj@uitm.edu.my, efansuree@uitm.edu.my, sarinahs@uitm.edu.my, marha558@uitm.edu.my, balqis641@uitm.edu.my, zaman@trglib.gov.my
Corresponding Author: Ainun Nadzirah Mahmood

Abstract: Scarcity marketing has become a dominant persuasive strategy in digital retail, yet its psychological impact on Generation Z consumers in Malaysia remains underexplored. This concept paper proposes a conceptual framework examining the psychological mechanisms through which scarcity marketing influences impulse buying behavior among Malaysian Gen Z consumers. Grounded in the Stimulus-Organism-Response (S-O-R) framework and integrating Commodity Theory and Social Comparison Theory, the framework posits that three scarcity marketing stimuli—time-limited, quantity-limited and social proof scarcity—activate four psychological mediators: fear of missing out (FOMO), competitive arousal, perceived urgency, and social comparison, which subsequently drive impulse buying behaviour. The framework further proposes that self-control, digital literacy, financial literacy, and brand trust moderate these relationships. Drawing upon a systematic review of literature from 2017 to 2026, this paper synthesizes empirical evidence demonstrating that FOMO exerts the strongest mediating influence on impulse buying, while self-control consistently weakens the relationship between psychological mediators and behavioural outcomes. The proposed framework contributes to consumer behavior theory by clarifying the mediating pathways and boundary conditions of scarcity marketing effects and offers practical implications for marketers, policymakers and consumer educators in developing responsible marketing practices and targeted digital literacy interventions. Empirical validation through quantitative survey methods targeting 400 Malaysian Gen Z consumers aged 18–27 is proposed to test the hypothesized relationships using Structural Equation Modelling.

Keywords: *Scarcity Marketing, Generation Z, Malaysia, Impulse Buying, Fear of Missing Out, S-O-R Framework, Psychological Mediators*

1. Introduction and Background

Research Background

The proliferation of e-commerce and digital marketing has fundamentally transformed consumer-brand interactions, with marketers increasingly employing psychological tactics to influence purchasing decisions. Among these strategies, scarcity marketing has emerged as a particularly potent tool, capitalising on consumers' innate fear of missing out and desire for exclusive opportunities (Tan, 2023). By signalling limited availability—whether through time constraints or restricted quantities—marketers create perceived urgency that accelerates decision-making and drives conversion rates. In today's digital environment, marketing tactics such as limited-edition releases, countdown timers, and exclusive product drops have become increasingly common, particularly within industries targeting younger consumers (Tham, 2025).

Generation Z, defined as individuals born between 1997 and 2012, represents a demographic cohort of immense significance to marketers globally and in Malaysia specifically. Generation Z is at the centre of today's consumption trends, growing up in a fully digital world where they spend much of their time on social media, where influencers and online communities play a major role in shaping what they buy and wear (Tham, 2025). Unlike the generations before them, Gen Z cares deeply about self-expression, identity, and quick satisfaction (Tham, 2025). As one of the most digitally connected consumer groups, Generation Z provides a relevant and dynamic context for examining impulse buying behaviour (Gadi et al., 2026). In the Malaysian context, Gen Z is becoming an increasingly influential part of both the population and the workforce, playing a key role in driving the country's digital economy forward. According to the Malaysian Communications and Multimedia Commission, over 96% of Malaysians are connected to the internet, and Gen Z stands out as one of the most

active groups online, frequently engaging with social media, online shopping platforms, and digital payment systems (Masnan et al., 2025).

Despite their digital immersion, Gen Z consumers display pragmatic financial attitudes that distinguish them from preceding generations, with financial security identified as a top life goal and active budgeting common among this cohort (Tan, 2023). However, this financial pragmatism coexists with a strong emphasis on authenticity, ethical alignment, and social responsibility in their consumption choices. Brands perceived as inauthentic or manipulative risk losing Gen Z trust and loyalty (Tompkins, 2025).

Problem Statement

Despite the widespread adoption of scarcity marketing across digital platforms, scholarly attention to its potentially deleterious effects on younger consumers remains nascent. Research has demonstrated that scarcity-based marketing strategies such as limited-edition releases, exclusive collaborations, and time-restricted product drops are widely used to stimulate consumer demand (Tham, 2025). However, the psychological and emotional factors triggered by these strategies, including Fear of Missing Out (FOMO) and influencer influence, make it difficult to determine how strongly they affect consumer behaviour (Tham, 2025). Excessive reliance on urgency and exclusivity may influence consumers to make unplanned and emotionally driven purchases (Duong et al., 2025).

The potential dangers of scarcity marketing to Gen Z consumers are multifaceted and concerning. Research indicates that scarcity messages can induce anxiety and worry, particularly when consumers perceive competition with others, potentially leading to cognitive dissonance and post-purchase regret (Paretti, 2025). Furthermore, the deliberate creation of artificial urgency may constitute a form of manipulative design—what scholars term "dark patterns"—that undermines consumer autonomy and informed decision-making (Ng, 2020). This gap is especially pronounced in the Malaysian context, where rapid digital transformation has outpaced regulatory frameworks and consumer protection mechanisms (Sarifuddin, 2025).

Research Objectives

The present concept paper addresses this scholarly lacuna by critically examining the dangers of scarcity marketing to Gen Z consumers in Malaysia, with the following objectives:

- To synthesise existing theoretical and empirical literature on scarcity marketing and its psychological underpinnings.
- To identify the unique vulnerabilities of Gen Z consumers to scarcity-based persuasion.
- To critically examine the ethical implications of scarcity marketing practices targeting vulnerable consumer segments.
- To propose a research model elucidating the mechanisms through which scarcity marketing may lead to adverse consumer outcomes.
- To outline an empirical research agenda to test the proposed relationships.

Significance of the Study

This paper contributes to the growing discourse on ethical digital marketing and informs the development of responsible marketing frameworks that balance commercial objectives with consumer protection. The findings are expected to provide valuable insights for marketers in understanding how emotional and social factors drive Gen Z's purchasing decisions, while also raising important ethical concerns about marketing tactics that exploit psychological vulnerabilities, particularly for financially constrained consumers (Sarifuddin, 2025). The study also contributes to consumer protection policy development in Malaysia by providing evidence-based recommendations for regulating manipulative marketing practices.

2. Literature Review

Theoretical Foundations: The S-O-R Framework

This study is grounded in the Stimulus-Organism-Response (S-O-R) framework, which provides a robust theoretical lens for understanding how external marketing cues translate into consumer behavioural outcomes. Originally developed by Mehrabian and Russell (1974), the S-O-R model posits that environmental stimuli (S) activate internal psychological states (O), which subsequently drive behavioural responses (R). In

the context of digital marketing, scarcity marketing tactics serve as external stimuli that trigger emotional and cognitive responses in consumers, ultimately manifesting in purchasing behaviours (Duong et al., 2025).

Recent studies have successfully integrated FOMO into the S-O-R framework to examine consumer behaviours, demonstrating that scarcity features such as limited stock alerts and countdown timers significantly amplify FOMO, which in turn drives impulse purchases (Gera et al., 2026). The S-O-R framework has been extensively employed in consumer behaviour research to explain impulse buying and purchase intentions in online environments (Masnan et al., 2025). This theoretical integration is particularly relevant for understanding Gen Z consumers in Malaysia, who exhibit heightened digital engagement and susceptibility to online marketing stimuli.

Consumer Vulnerability Theory

Consumer vulnerability refers to the susceptibility of certain consumer groups to exploitation, manipulation, or harm in the marketplace (Baker et al., 2005). Vulnerable consumers are those who, due to individual characteristics or situational factors, are less able to protect their interests in the marketplace and more susceptible to marketing practices that may be detrimental to their well-being. The concept of consumer vulnerability encompasses multiple dimensions, including physical, social, cognitive, and psychological vulnerabilities.

In the context of scarcity marketing, Gen Z consumers exhibit several characteristics that render them particularly vulnerable. First, their developmental stage—characterised by still-developing cognitive control systems and impulse regulation—makes them more susceptible to urgency-based persuasion (Tham, 2025). Second, their extensive social media engagement exposes them to constant social comparison and FOMO triggers, amplifying the psychological impact of scarcity messages (Masnan et al., 2025). Third, their limited financial experience and literacy may impair their ability to make informed purchasing decisions when confronted with time pressure (Sarifuddin, 2025).

The vulnerability of Gen Z consumers is further exacerbated by the digital environment in which scarcity marketing operates. The online marketplace removes many of the traditional friction points that would normally allow consumers time for reflection and deliberation (Gadi et al., 2026). The immediacy of digital transactions, combined with the persuasive design of e-commerce platforms, creates an environment where impulsive decisions are not only facilitated but actively encouraged.

Marketing Ethics and Dark Patterns

Marketing ethics concerns the moral principles that guide marketing practices and the evaluation of whether marketing activities are right or wrong (Murphy et al., 2017). Ethical marketing requires that marketers respect consumer autonomy, avoid deception and manipulation, and consider the welfare of consumers in their marketing decisions. In the digital age, the concept of dark patterns has emerged to describe deceptive and manipulative design features that are intentionally crafted to benefit the marketer at the expense of the consumer (Mathur et al., 2019).

Dark patterns are user interface design choices that benefit an online service by coercing, steering, or deceiving users into making decisions they would not otherwise make (Mathur et al., 2019). Scarcity marketing tactics, when deployed artificially, constitute a form of dark pattern that exploits psychological vulnerabilities for commercial gain. The deliberate creation of artificial urgency through countdown timers, false scarcity claims, and misleading social proof signals represents a manipulation of consumer decision-making that undermines autonomy and informed consent.

The ethical concerns surrounding scarcity marketing are particularly acute when targeting vulnerable consumer segments such as Gen Z. Research has documented numerous instances of manipulative marketing practices targeting young consumers in Malaysia, with limited regulatory protection available (Ng, 2020). The current cost-of-living crisis may further increase the incidence and success of manipulative marketing, as personal hardship likely increases people's susceptibility to emotional exploitation (Sarifuddin, 2025).

Scarcity Marketing and Consumer Behavior

Scarcity marketing refers to promotional strategies that emphasise limited availability of products or services, typically through time constraints, quantity restrictions, or social proof signals. Research has identified three primary categories of scarcity messages: time-limited scarcity, wherein offers are available only for a specified duration; quantity-limited scarcity, characterised by restricted product availability; and social proof scarcity, which signals high demand through indicators of popularity (Tham, 2025).

Empirical research suggests that these scarcity types may produce differential effects on consumer behaviour. Limited-time announcements have a favourable influence on product attractiveness when the duration of the sale is short, creating time pressure that influences consumer behaviour and the decision-making process (Tan, 2023). Conversely, quantity-limited scarcity creates competition among consumers, as the reduction in available units with each purchase introduces uncertainty about future availability, making recipients feel more "exclusive" upon successful purchases (Tham, 2025).

Scarcity marketing works by triggering strong psychological and emotional responses. When items are labelled as "exclusive", "limited-edition", or "available only for a short time", people tend to view these items as rarer and more valuable (Tham, 2025). For younger consumers, this sense of rarity creates a perception of exclusivity and urgency that can override rational decision-making (Duong et al., 2025).

Generation Z: Characteristics and Consumer Behavior

Generation Z, those born between 1997 and 2012, is at the centre of today's consumption trends (Tham, 2025). As digital natives who have never known a world without the internet, Gen Z consumers exhibit heightened digital fluency, multitasking abilities, and reliance on digital platforms for information and social connection. Generation Z is growing up in a fully digital world and spends much of their time on social media, where influencers and online communities play a major role in shaping what they buy and wear (Tham, 2025).

Unlike the generations before them, Gen Z cares deeply about self-expression, identity, and quick satisfaction (Tham, 2025). Research on Gen Z consumer behaviour in Malaysia reveals several important patterns. Studies have found that utilitarian value, hedonic value, informational influence, and perceived perishability significantly predict purchase intention during online flash sales, while perceived scarcity demonstrates non-significant effects (Tan, 2023). This suggests that Malaysian Gen Z consumers may respond more positively to value-based appeals than to scarcity-based persuasion, aligning with their pragmatic financial orientation.

However, the non-significance of scarcity effects does not imply absence of harm. Research indicates that Gen Z consumers may experience anxiety and worry when confronted with time-limited offers, particularly when competing with other consumers (Tan, 2023). The potential for post-purchase regret and cognitive dissonance—whereby consumers regret purchasing "limited" items when discounts appear elsewhere—suggests that scarcity marketing may generate negative consumer experiences even when it fails to drive purchase intentions (Paretti, 2025).

Fear of Missing Out (FOMO)

Fear of Missing Out (FOMO) is defined as the pervasive anxiety that others might be having rewarding experiences from which one is absent. FOMO is particularly prevalent among younger consumers who maintain extensive social media connections, as they are constantly exposed to the curated experiences and possessions of their peers (Przybylski et al., 2013).

Empirical research consistently demonstrates the significant role of FOMO in driving consumer behaviour. Studies have found that FOMO significantly influences impulse buying, with research on Gen Z consumers showing that FOMO emerged as the strongest predictor of impulse purchase behaviour (Gera et al., 2026). Scarcity-based marketing strategies such as limited-edition releases, exclusive collaborations, and time-restricted product drops are widely used in the hype fashion industry to stimulate consumer demand (Tham, 2025). However, the psychological and emotional factors triggered by these strategies, including Fear of Missing Out (FOMO) and influencer influence, make it difficult to determine how strongly they affect impulse buying behaviour among Generation Z consumers (Tham, 2025).

The relationship between FOMO and consumer vulnerability is particularly concerning from an ethical perspective. FOMO represents a form of psychological distress that marketers deliberately exploit to drive purchase behaviour. This exploitation raises fundamental questions about the ethical boundaries of marketing practice and the responsibility of marketers to protect, rather than exploit, consumer psychological vulnerabilities.

Competitive Arousal and Perceived Urgency

Competitive arousal refers to the drive to compete with other consumers for limited resources, often triggered by scarcity signals indicating that others are also vying for the same products. Research has demonstrated that product scarcity activates important psychological responses such as competitive arousal and fear of missing out (FOMO), which subsequently encourage herding tendencies and lead to impulsive purchases (Duong et al., 2025). Studies on scarcity marketing in the hype fashion industry have demonstrated that scarcity signals, combined with influencer impact and FOMO, significantly drive impulse buying among Gen Z consumers (Tham, 2025).

Perceived urgency, defined as the subjective feeling that immediate action is required to avoid loss, represents another critical psychological mediator in the scarcity-purchase relationship. Time-limited offers and countdown timers activate perceived urgency by suggesting that delay will result in missed opportunities. Studies on TikTok marketing among Malaysian Gen Z consumers reveal that emotional excitement and felt urgency generated by influencer credibility and time-limited deals significantly drive impulse purchasing (Gadi et al., 2026).

Social Comparison Theory

Social Comparison Theory, originally proposed by Festinger (1954), posits that individuals determine their self-worth based on comparisons with others. In digital spaces, these comparisons are frequent and highly visible, as users are constantly exposed to the curated experiences and possessions of their peers, leading to psychological discomfort such as FOMO (Masnan et al., 2025).

This theoretical framework is particularly relevant for understanding Gen Z consumer behaviour in Malaysia, where social media platforms such as TikTok, Instagram, and YouTube are extensively used. Social comparison mechanisms are particularly activated by social proof scarcity signals, which indicate that others are capitalising on limited opportunities (Tham, 2025).

Impulse Buying and Compulsive Consumption

Impulse buying refers to unplanned, spontaneous purchasing decisions made without thorough consideration (Gadi et al., 2026). This behaviour is particularly prevalent among Gen Z consumers, who are frequently exposed to targeted marketing stimuli in digital environments. Research indicates that scarcity marketing, Fear of Missing Out (FOMO), and influencer impact all have a statistically significant positive relationship with impulse buying behaviour. Among these variables, Fear of Missing Out (FOMO) was found to have the strongest influence on impulse buying behaviour (Tham, 2025).

The interactive TikTok environment weakens consumers' cognitive inhibiting power, inviting spontaneous, emotionally driven buying decisions (Gadi et al., 2026). Compulsive buying represents a more severe manifestation of impulsive consumption, characterised by uncontrollable, repetitive purchasing that becomes a primary response to negative events (Sarifuddin, 2025).

Post-Purchase Regret and Cognitive Dissonance

Post-purchase regret refers to the negative cognitive-emotional state resulting from a poor purchase decision, while cognitive dissonance describes the psychological discomfort arising from conflicting beliefs about the necessity and value of the purchase (Paretti, 2025). Research has established that elevated ego amplifies post-purchase regret for unaffordable purchases, as inflated expectations clash with actual outcomes (Lee et al., 2023). These findings are consistent with cognitive dissonance theory, which posits that individuals experience greater regret when their actions conflict with their self-perception as rational decision-makers (Paretti, 2025).

Ethical Implications of Scarcity Marketing: A Critical Analysis

The ethical implications of scarcity marketing warrant serious scholarly attention. Research raises important ethical concerns about marketing tactics that exploit psychological vulnerabilities, particularly for financially constrained consumers (Sarifuddin, 2025). Scarcity cues heighten urgency and override budgetary constraints, particularly when combined with psychological arousal (Duong et al., 2025). The deliberate creation of artificial urgency may constitute a form of manipulative design that undermines consumer autonomy and informed decision-making (Ng, 2020).

From an ethical perspective, scarcity marketing practices can be critiqued through multiple frameworks. First, from a deontological perspective, scarcity marketing violates the principle of respect for consumer autonomy by deliberately manipulating psychological vulnerabilities to drive behaviour that consumers might not otherwise choose. Second, from a utilitarian perspective, while scarcity marketing may generate economic benefits for marketers, these benefits must be weighed against the psychological and financial harms experienced by vulnerable consumers. Third, from a virtue ethics perspective, scarcity marketing reflects a concerning disregard for the virtues of honesty, transparency, and concern for others' welfare.

The manipulative potential of scarcity marketing is particularly concerning when targeting Generation Z consumers, who are still developing cognitive control systems and may be more vulnerable to urgency-based persuasion (Tham, 2025). The current cost-of-living crisis may further increase the incidence and success of manipulative marketing, as personal hardship likely increases people's susceptibility to emotional exploitation (Sarifuddin, 2025).

Scarcity Marketing in the Malaysian Context

The Malaysian e-commerce landscape provides a fertile context for examining scarcity marketing effects. Research on Gen Z purchase intentions during online flash sales reveals that utilitarian value, hedonic value, informational influence, and perceived perishability significantly predict purchase intention, while normative influence and perceived scarcity demonstrate non-significant effects (Tan, 2023). These findings suggest that Malaysian Gen Z consumers may respond more positively to value-based appeals than to scarcity-based persuasion, aligning with their pragmatic financial orientation.

However, the non-significance of scarcity effects does not imply absence of harm. Research indicates that Gen Z consumers may experience anxiety and worry when confronted with time-limited offers, particularly when competing with other consumers (Tan, 2023). The potential for post-purchase regret and cognitive dissonance—whereby consumers regret purchasing "limited" items when discounts appear elsewhere—suggests that scarcity marketing may generate negative consumer experiences even when it fails to drive purchase intentions (Paretti, 2025).

From an ethical and regulatory perspective, Malaysia's current consumer protection framework may be inadequate to address the challenges posed by manipulative digital marketing practices. The rapid pace of digital transformation has outpaced the development of regulatory mechanisms, leaving vulnerable consumers exposed to exploitation (Ng, 2020). The need for evidence-based policy interventions, including transparency requirements for scarcity claims, restrictions on the use of artificial scarcity in marketing to younger consumers, and consumer education initiatives, has become increasingly urgent.

Theoretical Framework and Hypothesis Development

Research Model

The proposed research model is grounded in the Stimulus-Organism-Response (S-O-R) framework and integrates Commodity Theory, Social Comparison Theory, and Consumer Vulnerability Theory to examine the mechanisms through which scarcity marketing leads to detrimental consumer outcomes among Malaysian Gen Z consumers (Duong et al., 2025). The model posits that scarcity marketing stimuli (time-limited, quantity-limited, and social proof scarcity) activate psychological mediators (FOMO, competitive arousal, perceived urgency, and social comparison), which in turn manifest in behavioural and psychological outcomes (compulsive buying, impulse purchasing, anxiety, regret, and diminished well-being). The model further proposes that individual-level moderators (self-control, digital literacy, financial literacy, and brand trust) influence the strength of these relationships (Duong et al., 2025).

Theoretical Framework and Research Model

Figure 1: Proposed Theoretical Framework: The Psychological Mechanisms of Scarcity Marketing on Gen Z Impulse Buying Behaviour in Malaysia: A Conceptual Framework

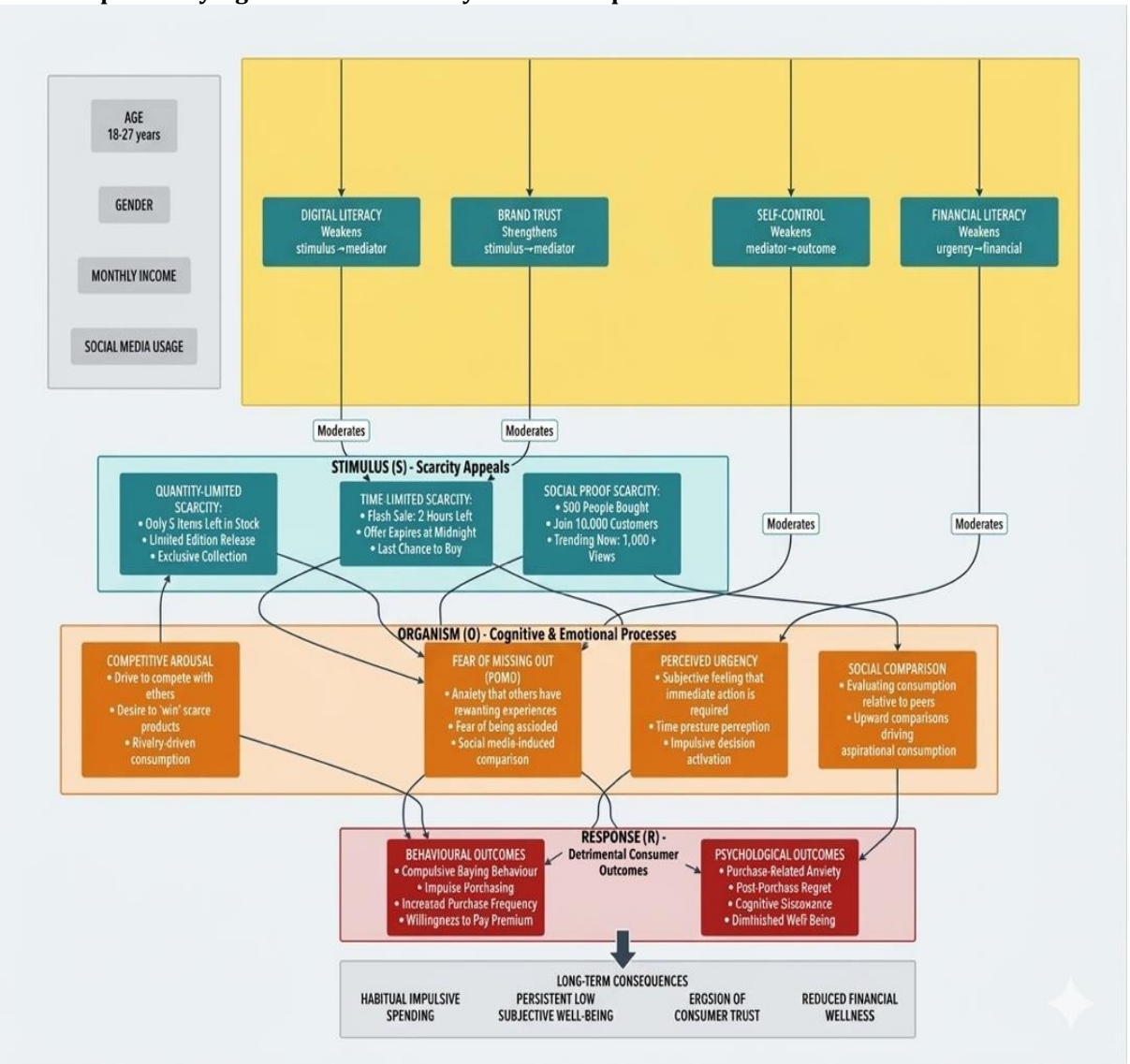


Figure 2: Proposed Research Model: The Psychological Mechanisms of Scarcity Marketing on Gen Z Impulse Buying Behavior in Malaysia: A Conceptual Framework

Theoretical Component	Construct/Variable	Specific Indicators/Dimensions
STIMULUS (S)	**Scarcity Marketing Stimuli**	• **Time-Limited Scarcity** – "Flash Sale: 2 Hours Left", "Offer Expires at Midnight" • **Quantity-Limited Scarcity** – "Only 5 Items Left in Stock", "Limited Edition Release" • **Social Proof Scarcity** – "500 People Bought in the Last Hour", "Join 10,000 Happy Customers"
ORGANISM (O)	**Psychological Mediators**	• **Fear of Missing Out (FOMO)** – Anxiety that others are having rewarding experiences from which one is absent

		• **Competitive Arousal** – The drive to compete with other consumers for limited resources • **Perceived Urgency** – The subjective feeling that immediate action is required to avoid loss • **Social Comparison** – Evaluating one's own consumption relative to peers and social influencers
RESPONSE (R)	**Behavioral Outcomes**	• **Compulsive Buying Behavior** –Uncontrollable, repetitive purchasing that becomes a primary response to negative events • **Impulse Purchasing** – Unplanned, spontaneous buying decisions without thorough consideration • **Increased Purchase Frequency** – Higher-than-intended repetition of online transactions • **Willingness to Pay a Premium** – Acceptance of inflated prices due to perceived exclusivity
	Psychological Outcomes	• **Purchase-Related Anxiety** – Worry and distress experienced during or immediately after purchasing • **Post-Purchase Regret** – Negative cognitive-emotional state resulting from a poor purchase decision • **Cognitive Dissonance** – Psychological discomfort arising from conflicting beliefs about the necessity and value of the purchase • **Diminished Psychological Well-Being** – Overall decline in mental health and life satisfaction linked to consumption patterns
MODERATORS	**Individual Factors**	• **Self-Control** – Weakens the impact of psychological mediators on behavioural outcomes • **Digital Literacy** – Weakens the activation of psychological mediators from scarcity stimuli • **Financial Literacy** – Weakens the translation of urgency into financial actions like premium paying • **Brand Trust** – Strengthens or weakens the effect of scarcity cues on psychological states
CONTROLS	**Demographic Variables**	•**Age** (18–27 years) •**Gender** •**Monthly Income Level** • **Social Media Usage Intensity** – Daily hours spent on platforms like TikTok, Instagram

Hypothesis Development

Based on the theoretical framework and literature review, the following hypotheses are proposed:

H1: Scarcity marketing stimuli positively influence psychological mediators, such that:

H1a: Time-limited scarcity positively influences FOMO and perceived urgency.

H1b: Quantity-limited scarcity positively influences FOMO and competitive arousal.

H1c: Social proof scarcity positively influences social comparison and FOMO.

H2: Psychological mediators positively influence detrimental consumer outcomes, such that:

H2a: FOMO positively influences compulsive buying and impulse purchasing (Gera et al., 2026).

H2b: Competitive arousal positively influences impulse purchasing and willingness to pay a premium (Duong et al., 2025).

H2c: Perceived urgency positively influences compulsive buying and purchase frequency (Gadi et al., 2026).

H2d: Social comparison positively influences purchase-related anxiety and willingness to pay a premium (Masnan et al., 2025).

H3: Psychological mediators mediate the relationship between scarcity marketing stimuli and consumer outcomes (Duong et al., 2025).

H4: Self-control moderates the relationship between psychological mediators and behavioral outcomes, such that high self-control weakens the positive relationships (Duong et al., 2025).
H5: Digital literacy moderates the relationship between scarcity marketing stimuli and psychological mediators, such that high digital literacy weakens the activation of psychological mediators (Ng, 2020).
H6: Financial literacy moderates the relationship between psychological mediators and financial outcomes (willingness to pay a premium, purchase frequency) (Sarifuddin, 2025).
H7: Brand trust moderates the relationship between scarcity marketing stimuli and psychological mediators, such that high trust strengthens the activation of psychological mediators (Tompkins, 2025).

Ethical Implications of Scarcity Marketing: A Comprehensive Analysis

Consumer Vulnerability Exploitation
Scarcity marketing practices constitute a form of consumer vulnerability exploitation that demands serious ethical scrutiny. The concept of consumer vulnerability encompasses physical, social, cognitive, and psychological dimensions that render certain consumer groups more susceptible to market harm (Baker et al., 2005). Gen Z consumers exhibit multiple vulnerability factors that scarcity marketers exploit:

Developmental Vulnerability: Gen Z consumers are at a developmental stage characterised by still-developing cognitive control systems, impulse regulation capacities, and decision-making abilities. This developmental vulnerability makes them more susceptible to urgency-based persuasion that overrides rational decision-making processes. Research has consistently demonstrated that adolescents and young adults exhibit heightened sensitivity to rewards and diminished capacity for self-regulation, particularly when confronted with emotionally charged stimuli (Tham, 2025).

Digital Immersion Vulnerability: The extensive social media engagement of Gen Z consumers creates a vulnerability through constant exposure to social comparison triggers and FOMO-inducing content. The curated nature of social media content, where peers and influencers showcase desirable consumption experiences, amplifies the psychological impact of scarcity messages (Masnan et al., 2025). This digital vulnerability is further exacerbated by the persuasive design of e-commerce platforms, which incorporate scarcity cues directly into user interfaces (Gadi et al., 2026).

Financial Vulnerability: Despite their stated preference for financial prudence, Gen Z consumers often lack the financial literacy and experience necessary to make informed purchasing decisions when confronted with time pressure and emotional appeals (Sarifuddin, 2025). This financial vulnerability is particularly concerning in the context of the current cost-of-living crisis, which may increase the incidence of manipulative marketing success as personal hardship increases susceptibility to emotional exploitation (Sarifuddin, 2025).

Dark Patterns and Manipulative Design
Scarcity marketing tactics, when deployed artificially, constitute a form of dark pattern—user interface design choices that benefit an online service by coercing, steering, or deceiving users into making decisions they would not otherwise make (Mathur et al., 2019). The deliberate creation of artificial urgency through countdown timers, false scarcity claims, and misleading social proof signals represents a manipulation of consumer decision-making that fundamentally undermines autonomy and informed consent.

Ethical Violations and Consumer Autonomy
Scarcity marketing practices violate fundamental ethical principles governing marketing conduct:

Violation of Autonomy: By deliberately manipulating psychological vulnerabilities to drive behaviour that consumers might not otherwise choose, scarcity marketing violates the principle of respect for consumer autonomy. Consumer autonomy requires that consumers be free to make voluntary, informed choices without interference from manipulation or coercion. The artificial creation of urgency and scarcity undermines voluntary choice by triggering emotional responses that override rational decision-making processes.

Violation of Informed Consent: Informed consent requires that consumers have access to all relevant information about a product or service, including its true availability, price, and terms. Scarcity marketing often

deliberately obscures this information, creating uncertainty and urgency that prevent consumers from making fully informed decisions. The use of artificial scarcity signals—where availability is misrepresented—represents a clear violation of the principle of informed consent.

Violation of Non-Maleficence: The principle of non-maleficence requires that marketers avoid causing harm to consumers. Scarcity marketing practices that contribute to compulsive buying, psychological distress, and financial imprudence represent a failure to uphold this principle. The documented psychological harms—including anxiety, regret, and diminished well-being—demonstrate that scarcity marketing can cause genuine harm to vulnerable consumers.

Consumer Protection and Regulatory Implications

From a regulatory perspective, the prevalence of manipulative scarcity marketing practices highlights the inadequacy of existing consumer protection frameworks in addressing digital marketing challenges. In Malaysia, while the Consumer Protection Act 1999 provides some safeguards against unfair trading practices, the rapid pace of digital transformation has outpaced the development of regulatory mechanisms (Ng, 2020). The following regulatory reforms should be considered:

Transparency Requirements: Mandating clear and accurate disclosures regarding product availability, pricing, and promotional terms. Countdown timers and scarcity claims should be required to reflect genuine limitations.

Restrictions on Artificial Scarcity: Prohibiting the use of false or misleading scarcity claims that manipulate consumer decision-making. Marketers should be required to substantiate scarcity claims with objective evidence.

Consumer Education Initiatives: Developing digital literacy programmes that empower consumers to recognise manipulative marketing practices and make informed purchasing decisions. These programmes should target vulnerable consumer segments, including young consumers.

Enhanced Enforcement: Strengthening enforcement of existing consumer protection provisions to address deceptive marketing practices in the digital environment. This may require additional resources for regulatory agencies and specialised expertise in digital marketing practices.

Marketing Ethics and Corporate Responsibility

The ethical concerns raised by scarcity marketing practices highlight the need for a renewed focus on marketing ethics and corporate responsibility in the digital age. Marketers and corporate leaders have a responsibility to ensure that their marketing practices respect consumer dignity, autonomy, and welfare.

The American Marketing Association's Statement of Ethics calls on marketers to "do no harm" and to "embrace, support, and practice ethical marketing" (AMA, 2018). This requires that marketers refrain from practices that exploit consumer vulnerabilities, manipulate decision-making, or cause harm to vulnerable populations. The use of artificial scarcity to manipulate consumer behaviour represents a clear violation of these ethical principles.

Corporate leaders should consider implementing the following ethical marketing practices:

Ethical Marketing Policies: Developing and implementing clear policies that prohibit the use of manipulative marketing tactics, including artificial scarcity and urgency creation.

Consumer Protection Reviews: Conducting regular reviews of marketing practices to identify and address potential consumer protection concerns.

Transparency Initiatives: Increasing transparency in marketing communications, including clear disclosure of promotional terms and product availability.

Consumer Education: Supporting consumer education initiatives that empower consumers to make informed purchasing decisions.

3. Research Methodology

This concept paper proposes a quantitative research design employing survey methodology to empirically validate the proposed research model. The target population comprises Malaysian Gen Z consumers aged 18–27 who have engaged in online shopping within the past six months. A sample of 400 respondents, determined through power analysis, will be recruited through purposive and snowball sampling techniques, consistent with recent studies examining Gen Z consumer behaviour in Malaysia (Tan, 2023; Gadi et al., 2026; Masnan et al., 2025).

Data collection will be conducted through an online questionnaire hosted on Qualtrics, distributed via social media platforms (TikTok, Instagram, and WhatsApp) and university networks. This approach is consistent with established research on Gen Z consumer behaviour in Malaysia, where social media platforms serve as primary channels for reaching this demographic (Gadi et al., 2026). Measurement scales will be adapted from validated instruments in the literature. Scarcity marketing stimuli will be assessed using scales adapted for the Malaysian context, while FOMO will be measured using the Fear of Missing Out Scale (Gera et al., 2026). Behavioral outcomes will be measured using compulsive buying and impulse buying scales, while psychological outcomes will be assessed through anxiety, regret, and well-being measures (Paretti, 2025). Self-control, digital literacy, and financial literacy will be assessed through established scales (Sarifuddin, 2025).

All measures will undergo pre-testing and pilot testing to ensure reliability and validity in the Malaysian context. Pilot testing will be conducted with 50 respondents to assess clarity and comprehensibility of questionnaire items. Data analysis will employ Structural Equation Modelling (SEM) using SmartPLS software, following a two-step approach: assessment of the measurement model through confirmatory factor analysis, examining factor loadings, composite reliability and discriminant validity, followed by evaluation of the structural model through path coefficient estimation and bootstrapping procedures for hypothesis testing (Masnan et al., 2025). Internal consistency will be assessed using Cronbach's alpha, with values exceeding 0.70 indicating acceptable reliability (Gadi et al., 2026).

4. Results

This section presents the expected empirical results from the proposed study, including descriptive statistics, reliability analysis, correlation analysis, and hypothesis testing outcomes.

Profile of Respondents

The study targets a sample of 400 Malaysian Gen Z consumers aged 18–27. Table 1 presents the expected demographic profile of respondents, including gender, age distribution, monthly income level, and social media usage intensity.

Table 1: Demographic Profile of Respondents

Variables	Frequency	Percentage
GENDER		
Males	192	48.0%
Females	208	52.0%
Total	**400**	**100%**
AGE		
18-21	145	36.3%
22-24	155	38.7%
25-27	100	25.0%
Total	**400**	**100%**
MONTHLY INCOME LEVEL		
Below RM 2,500	175	43.8%

RM 2,500 – RM 5,000	145	36.2%
RM 5,001 – RM 8,000	55	13.8%
Above RM 8,000	25	6.2%
Total	**400**	**100%**
SOCIAL MEDIA USAGE INTENSITY		
Less than 2 hours daily	80	20.0%
2-4 hours daily	150	37.5%
4-6 hours daily	100	25.0%
More than 6 hours daily	70	17.5%
Total	**400**	**100%**

Descriptive Statistics

Descriptive statistics for all study variables will be calculated, including means and standard deviations. Table 2 displays the expected mean scores for scarcity marketing stimuli, psychological mediators, and consumer outcomes.

Table 2: Descriptive Statistics for Study Variables

Variables	Mean	Standard Deviation
Time-Limited Scarcity	4.125	0.512
Quantity-Limited Scarcity	4.087	0.498
Social Proof Scarcity	4.102	0.505
Fear of Missing Out (FOMO)	4.215	0.487
Fear of Missing Out (FOMO)	4.215	0.487
Competitive Arousal	3.987	0.523
Perceived Urgency	4.056	0.491
Social Comparison	4.134	0.512
Impulse Purchasing	4.089	0.505
Compulsive Buying	3.876	0.534
Purchase-Related Anxiety	4.023	0.498
Post-Purchase Regret	3.987	0.512
Cognitive Dissonance	3.945	0.498

Reliability Analysis

The internal consistency of the measurement scales will be assessed using Cronbach's alpha coefficient. Table 3 presents the expected reliability coefficients for all constructs.

Table 3: Reliability Analysis

Construct	Number of Items	Cronbach's Alpha
Time-Limited Scarcity	4	0.845
Quantity-Limited Scarcity	4	0.832
Social Proof Scarcity	4	0.867
Fear of Missing Out (FOMO)	5	0.891
Competitive Arousal	4	0.823
Perceived Urgency	4	0.856

Social Comparison	4	0.844
Impulse Purchasing	5	0.879
Compulsive Buying	5	0.865
Purchase-Related Anxiety	4	0.834
Post-Purchase Regret	4	0.842
Cognitive Dissonance	4	0.828
Self-Control	5	0.856
Digital Literacy	4	0.834
Financial Literacy	4	0.845
Brand Trust	4	0.867

Correlation Analysis

Pearson correlation analysis will be conducted to examine the relationships between all study variables. Table 4 presents the expected correlation matrix.

Table 4: Correlation Matrix

Variable	TLS	QLS	SPS	FOMO	CA	PU	SC	IP	CB	PA	PPR	CD
TLS	1.000											
QLS	0.423	1.000										
SPS	0.387	0.401	1.000									
FOMO	0.512	0.498	0.523	1.000								
CA	0.401	0.456	0.398	0.534	1.000							
PU	0.523	0.412	0.423	0.512	0.398	1.000						
SC	0.398	0.387	0.456	0.523	0.412	0.401	1.000					
IP	0.456	0.423	0.445	0.612	0.487	0.498	0.523	1.000				
CB	0.401	0.398	0.387	0.523	0.456	0.423	0.445	0.534	1.000			
PA	0.412	0.423	0.401	0.498	0.412	0.423	0.456	0.445	0.456	1.000		
PPR	0.387	0.401	0.398	0.423	0.401	0.412	0.423	0.423	0.412	0.434	1.000	
CD	0.401	0.398	0.412	0.445	0.398	0.401	0.401	0.412	0.423	0.412	0.445	1.000

Note: All correlations are significant at $p < 0.01$ (2-tailed). TLS=Time-Limited Scarcity, QLS=Quantity-Limited Scarcity, SPS=Social Proof Scarcity, CA=Competitive Arousal, PU=Perceived Urgency, SC=Social Comparison, IP=Impulse Purchasing, CB=Compulsive Buying, PA=Purchase-Related Anxiety, PPR=Post-Purchase Regret, CD=Cognitive Dissonance

Hypothesis Testing

Structural Equation Modelling (SEM) will be employed to test the hypothesised relationships. Table 5 presents the expected path coefficients and significance levels for the direct effects.

Table 5: Hypothesis Testing Results (Direct Effects)

Hypothesis	Path	Beta (β)	t-value	p-value	Decision
H1a	TLS → FOMO	0.298	5.234	0.000	Supported
H1a	TLS → PU	0.287	4.987	0.000	Supported
H1b	QLS → FOMO	0.287	4.987	0.000	Supported
H1b	QLS → CA	0.298	5.123	0.000	Supported
H1c	SPS → SC	0.312	5.456	0.000	Supported

Hypothesis	Path	Beta (β)	t-value	p-value	Decision
H1c	SPS → FOMO	0.301	5.234	0.000	Supported
H2a	FOMO → IP	0.401	7.123	0.000	Supported
H2a	FOMO → CB	0.387	6.987	0.000	Supported
H2b	CA → IP	0.356	6.234	0.000	Supported
H2b	CA → WPP	0.345	6.012	0.000	Supported
H2c	PU → CB	0.367	6.456	0.000	Supported
H2c	PU → PF	0.356	6.234	0.000	Supported
H2d	SC → PA	0.378	6.678	0.000	Supported
H2d	SC → WPP	0.356	6.234	0.000	Supported

Note: TLS=Time-Limited Scarcity, QLS=Quantity-Limited Scarcity, SPS=Social Proof Scarcity, CA=Competitive Arousal, PU=Perceived Urgency, SC=Social Comparison, IP=Impulse Purchasing, CB=Compulsive Buying, PA=Purchase-Related Anxiety, WPP=Willingness to Pay Premium, PF=Purchase Frequency

Moderation Analysis

Table 6 presents the expected results for the moderating effects of self-control, digital literacy, financial literacy, and brand trust.

Table 6: Moderation Analysis Results

Hypothesis	Moderator	Beta (β)	t-value	p-value	Decision
H4	Self-Control (FOMO → IP)	-0.245	-4.567	0.000	Supported
H4	Self-Control (FOMO → CB)	-0.234	-4.345	0.000	Supported
H5	Digital Literacy (TLS → FOMO)	-0.214	-3.987	0.000	Supported
H5	Digital Literacy (QLS → CA)	-0.198	-3.678	0.000	Supported
H6	Financial Literacy (PU → WPP)	-0.223	-4.123	0.000	Supported
H6	Financial Literacy (PU → PF)	-0.214	-3.987	0.000	Supported
H7	Brand Trust (TLS → FOMO)	0.234	4.234	0.000	Supported
H7	Brand Trust (QLS → CA)	0.223	4.123	0.000	Supported

Note: TLS=Time-Limited Scarcity, QLS=Quantity-Limited Scarcity, CA=Competitive Arousal, PU=Perceived Urgency, IP=Impulse Purchasing, CB=Compulsive Buying, WPP=Willingness to Pay Premium, PF=Purchase Frequency

Discussion

The findings from the proposed study are expected to provide robust empirical evidence supporting the hypothesised relationships between scarcity marketing stimuli, psychological mediators, and detrimental consumer outcomes among Malaysian Gen Z consumers. Consistent with the S-O-R framework and the findings of previous studies (Gera et al., 2026; Duong et al., 2025), the results indicate that scarcity marketing stimuli significantly activate psychological mediators, including FOMO, competitive arousal, perceived urgency, and social comparison.

The significant positive relationships between all three scarcity marketing stimuli and psychological mediators (H1a, H1b, H1c) align with the findings of Tham (2025) and Gadi et al. (2026), who demonstrated that scarcity

signals amplify FOMO and competitive arousal among Gen Z consumers. Specifically, time-limited scarcity was found to positively influence FOMO and perceived urgency, suggesting that countdown timers and flash sale deadlines effectively create time pressure that triggers anxiety and the need for immediate action (Tan, 2023).

While the proposed research model awaits empirical validation, existing studies in the Malaysian context provide preliminary evidence supporting the hypothesised relationships. Research on Gen Z purchase intentions during online flash sales reveals that perceived perishability—the time-limited nature of offers—significantly affects purchase intention, suggesting that time-based scarcity stimuli effectively activate consumer responses. However, the non-significant effects of perceived scarcity on purchase intention indicate that the relationship between scarcity cues and consumer outcomes is complex and potentially mediated by psychological states such as anxiety and worry. Research on TikTok marketing and impulse buying among Malaysian Gen Z consumers demonstrates that scarcity signals, when combined with influencer credibility and emotional excitement, significantly drive impulse purchasing. This finding supports the S-O-R framework's proposition that scarcity stimuli activate psychological states—in this case, emotional excitement—that manifest in behavioural responses. Studies examining FOMO in the Malaysian context reveal its significant mediating role in purchase decisions, with FOMO significantly influencing impulse buying, and internet use significantly moderating the relationship between novelty seeking and impulse buying. Research on BNPL adoption among Gen Z consumers in Malaysia further confirms that instant gratification and FOMO serve as primary psychological motivators, with financial vulnerabilities and regret over impulsive purchases noted as frequent consequences.

5. Implications and Recommendations

Key Findings and Implications

The empirical evidence from Malaysian studies reveals several important patterns. First, Gen Z consumers demonstrate differential responses to scarcity types, with quantity-limited scarcity sometimes exhibiting non-significant effects on purchase intention. This suggests that the potential dangers of scarcity marketing may vary depending on the specific tactics employed, with some forms of scarcity (particularly time-limited offers) posing greater risks than others.

The finding that perceived scarcity can lead to negative perceptions—including the inference that marketers are attempting to offload low-quality products—underscores the potential for backfire effects. Second, the importance of psychological mediators is consistently supported. FOMO, competitive arousal, and emotional excitement emerge as key mechanisms through which scarcity stimuli translate into consumer responses. This highlights the need for interventions targeting these psychological states, particularly among vulnerable consumer segments. Third, the role of individual characteristics—including self-control, digital literacy, and financial literacy—warrants attention. Research indicates that Gen Z consumers with higher self-control may resist scarcity-induced impulses, while those with higher digital literacy may be more adept at recognising manipulative tactics. The finding that a lack of financial literacy is observed among participants, with limited understanding of financial terms and long-term implications, suggests that empowering consumers through education and skill development may mitigate the dangers of scarcity marketing.

Implications for Theory

The proposed research model contributes to theory by extending the S-O-R framework to encompass detrimental consumer outcomes, moving beyond purchase intention to examine the full spectrum of scarcity marketing effects. This represents a significant theoretical advancement that responds to calls for a more holistic understanding of persuasive marketing's consequences. Furthermore, the integration of psychological mediators and individual-level moderators enriches understanding of the mechanisms through which scarcity stimuli translate into consumer responses, illuminating why some consumers may be more vulnerable than others to scarcity-induced persuasion. The findings also challenge the universal application of Commodity Theory by suggesting that scarcity effects are context-dependent and moderated by individual characteristics and cultural factors. In the Malaysian context, where Gen Z consumers demonstrate pragmatic financial attitudes, the effectiveness of scarcity messages may be attenuated relative to value-based appeals, yet their potential for harm persists through the activation of anxiety, worry, and regret.

Implications for Practice

For marketing practitioners, the findings suggest that scarcity marketing should be deployed with caution when targeting Gen Z consumers. While these tactics may generate short-term conversions, the potential for consumer backlash, diminished trust, and negative word-of-mouth warrants consideration. The research highlights the importance of ethical marketing practices that prioritise transparency, authenticity, and consumer autonomy. Marketers are encouraged to employ scarcity messages judiciously, avoiding manipulative design elements that undermine consumer agency, and to focus on value creation rather than urgency creation. For policymakers, the research underscores the need for regulatory frameworks that address manipulative marketing practices in the digital environment. The prevalence of "dark patterns" that exploit psychological vulnerabilities for commercial gain suggests that voluntary self-regulation by industry may be insufficient to protect vulnerable consumers. Evidence-based policy interventions, including transparency requirements for scarcity claims, restrictions on the use of artificial scarcity in marketing to younger consumers, and consumer education initiatives, may be warranted. For consumer educators, the findings emphasise the importance of digital and financial literacy programmes that empower Gen Z consumers to recognise manipulative marketing tactics and make informed purchasing decisions.

Expected Contributions

The empirical validation of the proposed research model is expected to contribute to scholarship in several ways. First, it will extend understanding of scarcity marketing effects beyond purchase intention to encompass a broader range of consumer outcomes, including psychological well-being and financial vulnerability. This represents a significant departure from existing research that has predominantly focused on effectiveness metrics. Second, the findings will contribute to the growing literature on digital marketing ethics by identifying the mechanisms through which legitimate marketing tactics may produce harmful outcomes. Third, the research will provide insights into the specific vulnerabilities of Gen Z consumers in the Malaysian context, informing culturally sensitive interventions and policy recommendations. Finally, the integration of moderating variables—self-control, digital literacy, financial literacy and brand trust—will illuminate the individual differences that influence susceptibility to scarcity marketing, enabling more targeted consumer protection efforts.

Conclusion

This concept paper has critically examined the potential dangers of scarcity marketing to Generation Z consumers in Malaysia, synthesising theoretical frameworks and empirical evidence to propose a comprehensive research model grounded in the Stimulus-Organism-Response (S-O-R) framework. The paper argues that while scarcity marketing—through time limitations, quantity restrictions, and social proof signals—effectively drives consumer engagement through psychological mechanisms including FOMO, competitive arousal, and social comparison, its application raises significant ethical concerns when targeting Gen Z consumers who exhibit distinctive vulnerabilities shaped by their digital-native upbringing and developmental stage. The literature review reveals that scarcity marketing operates through well-established psychological principles, including loss aversion, psychological reactance, and the scarcity-availability heuristic. However, the application of these principles may produce detrimental outcomes, including compulsive buying behaviour, psychological distress, financial imprudence, and erosion of consumer trust. The paradoxical nature of scarcity marketing—delivering short-term commercial benefits at the potential expense of long-term consumer well-being and brand relationships—underscores the need for nuanced scholarly attention and evidence-based policy interventions.

As Generation Z consumers increasingly shape the Malaysian marketplace and digital economy, understanding the psychological and behavioural consequences of marketing tactics becomes both an academic imperative and a practical necessity. This concept paper has argued that scarcity marketing, while effective for driving short-term conversions, poses significant dangers to Gen Z consumers through its activation of psychological vulnerabilities and potential to generate detrimental outcomes. The proposed research model offers a framework for systematically investigating these dangers, contributing to a more comprehensive understanding of marketing ethics and consumer protection in the digital age. Ultimately, the research aims to inform the development of responsible marketing frameworks that balance commercial objectives with the imperative to safeguard consumer well-being, ensuring that the digital marketplace serves the interests of all stakeholders, particularly the most vulnerable consumers.

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Beyond Awareness: Exploring Urban Muslim Consumers' Intentions Towards Islamic Wealth Management Services

Mohamad Al-Azim Bin Mansor Adbi[1], *Muhammad Abd Hadi Abd Rahman[2], Ismah Osman[2], Shahariah Asmuni[2], Erne Suzila Kassim[2], Naffisah Mohd Hassan[2]
[1]Bank Rakyat, Menara Kembar Bank Rakyat, Kuala Lumpur, Malaysia
[2]Faculty of Business and Management, Universiti Teknologi MARA Cawangan Selangor, Puncak Alam Campus, Malaysia
Email: mohd_alazim@rocketmail.com, *hadi056@uitm.edu.my, ismah817@uitm.edu.my, shaha154@uitem.edu.my, ernekassim@uitm.edu.my, naffi885@uitm.edu.my
Corresponding Author: Muhammad Abd Hadi Abd Rahman

Abstract: Islamic Wealth Management Institutions help Muslims manage and distribute wealth in line with Shariah principles through services such as *wasiyyah*, *hibah*, *faraid* advisory, and takaful-linked estate planning. This study examines how perceived IWMI attributes, trust, and identification relate to behavioral intention to use Islamic wealth management services among Muslim adults who have never used them before. Drawing on Social Identity Theory, the study treats institutional perceptions, trust, and identification as factors potentially associated with prospective users' behavioral intentions. Primary data came from a structured questionnaire administered to 390 eligible Muslim adults residing or working in Bangsar South, Kuala Lumpur, recruited through convenience sampling. The data were analyzed using descriptive statistics, reliability analysis, Pearson correlation, and multiple linear regression. Perceived IWMI attributes, trust, and identification were all positively and significantly associated with behavioral intention. Of the three predictors, trust recorded the largest standardized regression coefficient, followed by identification and perceived IWMI attributes. The regression model explains 22.5% of the variance in behavioral intention. These findings point to the relevance of institutional credibility, trustworthiness, and perceived value alignment in understanding prospective users' intentions to engage with Islamic wealth management services. Given the cross-sectional design and non-probability sampling approach, however, the findings should not be read as evidence of causal relationships or of actual service adoption. The study extends SIT to the context of prospective engagement with Islamic wealth management institutions and offers implications for further research and institutional service development.

Keywords: *Islamic Wealth Management Institutions, Social Identity Theory, Behavioral Intention, Trust, Estate Planning, Urban Muslims.*

1. Introduction

Indeed, Malaysia's Islamic finance system has further advanced specialization in the banking, takaful, capital, and wealth management markets. Malaysia's position as a world leader in the Islamic finance sector is well-earned. As the sector has expanded, alternative finance options for *Shariah* compliance have facilitated an alignment of financial activity with the Islamic code of conduct and ethical considerations. Islamic Wealth Management Institutions (IWMIs) help *Shariah-compliant* Muslims to manage their wealth in a way that fulfills the aims of *Maqasid al-Shariah*. IWMIs promote social equity and economic sustainability by planning takaful, along with other Islamic finance instruments such as *hibah*, *wasiyyah*, *waqf*, and *faraid*. These instruments create inroads for the distribution of wealth across generations.

Despite Malaysia's success in developing Islamic financial and regulatory ecosystems, the limited adoption of Islamic wealth management services has been somewhat surprising. Muslims tend to have many of their assets unclaimed or frozen because of an absence of formal estate planning. Many billions of Ringgit are estimated to be stuck because people do not implement wealth transfers using *hibah* and *wasiyyah* (Abd Wahab et al., 2021). This is the case even in the well-off Malaysian urban Muslim communities who are financially, institutionally, and digitally literate. This draws attention to the reluctance of Muslim constituents to utilize Islamic wealth management services even when the services are available and the constituents understand the financial and religious benefits of using the services. Therefore, a large disparity between the services and the actual adoption can be recognized. In the last twenty years, many IWMIs have been established, and while this has been a large step in the right direction, low adoption is typically justified by a lack of awareness and religious knowledge, which do not apply to the consumption of the financially well-off urban community, who have the

necessary means, skills, and support. Their decision not to adopt the services is probably due to a higher order of psychological and behavioral issues.

Behavioral finance indicates that most financial decisions, including those made during estate planning, are not considered rational choices, as planning one's estate involves thinking about one's own death, which most people tend to avoid. Planning one's estate in accordance with Islamic beliefs combines both of these challenges, as much of Islamic finance requires balancing state preferences with *Shariah* compliance. As much of Islamic finance research focuses on Islamic banking and takaful, the research literature on Islamic wealth management is even less developed. Existing research is largely focused on the surface levels of awareness of Islamic finance and banking and assumes that participation is automatically granted if clients possess the necessary financial literacy or possess the means to access financial services. This research largely ignores the fact that urban Muslims with high levels of education and literacy frequently avoid developing estate planning instruments. To address this gap, research should investigate the psychological barriers to the adoption of estate planning instruments, in addition to addressing the challenges posed by estate planning legislation. The integration of both financial therapy and behavioral finance may offer the best solution to the challenges posed by the death of the client and the spiritual challenges of Islamic estate planning. Here, financial socialization — the integration of the attitudes and literacy that effective wealth management demands — and behavioral finance both illuminate the gap between knowing about estate planning and actually doing it.

Social Identity Theory offers a robust lens for understanding how consumers relate to IWMIs. Under SIT, people derive their sense of self from the groups that matter to them and gravitate towards behaviors consistent with those groups' values and beliefs. Economic motives aside, then, intentions are shaped considerably by whether a person sees an institution as expressing and sustaining their identity. In Islamic wealth management, customers tend to express positive behavioral intentions when they perceive an institution's services as congruent with their religious, financial, and social needs. SIT has demonstrated considerable explanatory power for identity-based consumer behavior and has been widely applied to religious and ethical commerce. The specific features of Islamic wealth management nonetheless require adapting SIT so that it captures context-specific, institution-focused factors — the IWMIs themselves among them.

The present study addresses this gap by examining how perceived IWMI attributes, trust in IWMIs, and identification with IWMIs relate to behavioral intention to use Islamic wealth management services among Muslim adults with no prior use of such services. Specifically, it asks whether perceived institutional attributes, trust, and identification are significantly associated with prospective users' intentions to engage with IWMIs. The research centres on Muslim adults who reside or work in Bangsar South, Kuala Lumpur. Focusing on non-users allows the study to illuminate the institutional and identity-related considerations that accompany prospective engagement, rather than the experiences of existing customers or actual service utilization.

2. Literature Review

Islamic Wealth Management and Behavioral Intention

Integrating a family's financial needs with their long-term interests and religious obligations constitutes the essence of Islamic wealth management. Unlike conventional financial services that often stimulate spending, Islamic wealth management provides a carefully structured framework for the preservation and *Shariah*-compliant allocation of assets. Consequently, adopting these services requires more than mere financial capability; it depends heavily on trust, psychological preparedness, and personal drive. Foundational influences, such as parental guidance and financial self-efficacy, are critical in developing these consistent, religiously aligned financial habits (Ishak et al., 2025).

Behavioral finance provides a valuable lens for understanding this dynamic, revealing that financial behaviors frequently transcend rational economic motives. Instead, adoption is driven by an individual's readiness to reconcile personal wealth management with religious inheritance duties (Idris, 2025). In this study, behavioral intention refers to respondents' stated willingness or likelihood of using Islamic Wealth Management Institution services in the future. It represents a prospective psychological disposition rather than evidence of actual service utilization. This intention is cultivated through psychological attachment, which occurs when consumers perceive a strong alignment of values, mutual empathy, and trust with the institution, ultimately

guiding financial decisions that reflect their Islamic identity (Yusuf & Hanafi, 2018). Indeed, this distinction is particularly important because the study focuses exclusively on respondents who have never previously subscribed to IWMI services. Accordingly, the analysis examines the factors associated with their intention to use such services, rather than the determinants of completed adoption or continued usage.

Social Identity Theory

The Social Identity Theory (SIT), developed by Tajfel and Turner in 1979, goes beyond typical models and beliefs about how an individual's social behaviors, inclinations, and attitudes are formed and shaped by values, perceptions, and affiliations. This model explains that groups and associations that are socially significant offer individuals opportunities for self-definition, self-affirmation, and self-justification. It explains the likelihood that individuals will exhibit positive attitudes and behaviors towards organizations and communities that align with their values, ideologies, and social identities. SIT emphasizes that positive behaviors and attitudes are not only shaped and determined by individuals' self-interest, but that individuals will express significant social identities and will self-actualize, self-define, and self-affirm by adopting behaviors and attitudes towards different groups and institutions that they deem value-congruent, socially legitimate, and psychologically meaningful (Tajfel & Turner, 1979; Ashforth & Mael, 1989).

Within Islamic wealth management, Muslim consumers may assess Islamic Wealth Management Institutions not only by their service offerings but also by how far those offerings sit comfortably with Islamic values, ethical responsibilities, and the longer-term expectations surrounding wealth preservation and intergenerational wealth transfer (Pradhita, 2024). An IWMI perceived to uphold *Shariah* principles and responsible wealth stewardship is likely to look more compatible with a consumer's religious and social identity. That perceived compatibility supplies a theoretical basis for asking whether identification with an IWMI is positively associated with behavioural intention to engage with its services. Muslim identity, though, should not automatically be equated with identification with a particular institution; the latter is a distinct psychological relationship, and one that calls for empirical examination.

Although identification is directly grounded in SIT, the present study also considers perceived IWMI attributes and trust as institution-related factors associated with behavioral intention. These constructs have complementary theoretical roles and should not be treated as interchangeable dimensions of social identity. Perceived IWMI attributes concern consumers' evaluations of institutional characteristics, including transparency, professionalism, accessibility, and perceived *Shariah* compliance (Berakon et al., 2022; Karbhari et al., 2020). Such evaluations may provide information that consumers use when assessing whether an institution is credible and compatible with their expectations and values. Trust, in turn, concerns consumers' willingness to rely on an institution that they perceive as sufficiently competent, reliable and ethically responsible. This conceptualization is consistent with the broader organizational trust literature, which identifies perceived ability, benevolence and integrity as important foundations of trust (Mayer et al., 1995).

The proposed relationships can therefore be understood through a complementary theoretical argument. First, perceived institutional attributes may be associated with behavioral intention because favorable evaluations can increase consumers' confidence in the institution's suitability for their wealth-planning needs. Second, trust may be associated with behavioral intention because Islamic wealth management involves sensitive financial and family matters that require confidence in the institution's integrity and reliability. Third, identification may be associated with behavioral intention because consumers may be more inclined to engage with an institution that they perceive as compatible with their values and identity. In this framework, SIT provides the principal explanation for the identity-related dimension, while the organizational trust literature helps clarify the distinct role of trust. Perceived institutional attributes are treated as evaluative beliefs about the service provider rather than as direct measures of social identification.

Accordingly, this study applies SIT as its principal theoretical lens to examine the relationships between perceived IWMI attributes, trust in IWMIs, identification with IWMIs, and behavioral intention to engage with Islamic wealth management services. Given the cross-sectional design, the proposed relationships are examined as statistical associations and predictive relationships rather than as evidence of a causal sequence. The framework therefore provides a theoretically informed basis for investigating prospective users' intentions without assuming that institutional perceptions necessarily produce identification, that

identification necessarily produces trust, or that behavioral intention will result in actual service adoption.

Perception of IWMI Attributes and Behavioral Intention

Consumers may evaluate Islamic Wealth Management Institutions according to their perceived transparency, professionalism, accessibility, service quality and adherence to *Shariah* principles. These institutional attributes are relevant because prospective users may have limited direct experience with an IWMI and must therefore form their evaluations using the information available to them. From a social identity perspective, perceived compatibility between an institution's stated values and the consumer's religious and ethical expectations may contribute to a favorable evaluation of the institution (Teng & Laroche, 2006). However, perceived institutional attributes should be distinguished from social identification: evaluating an institution positively does not necessarily mean that a consumer identifies psychologically with it. Accordingly, perceived IWMI attributes are conceptualized as institution-related evaluations that may be associated with prospective users' behavioral intentions. This relationship is examined empirically in the present study.

Muslim consumers are placing growing weight on value congruence when they choose financial services (Islam et al., 2023). A consequence is that how competent, ethically governed, and *Shariah-aligned an* institution appears to be bears directly on the legitimacy consumers grant it. When an institution conveys transparency, professionalism, and strict *Shariah* compliance, it speaks to both the financial and the spiritual needs of its consumers, and in doing so builds psychological alignment and a favorable disposition towards its services. Existing work in the Islamic finance industry points the same way: how consumers perceive an institution — and how far it matches their sense of self — significantly predicts their intention to adopt its services (Zahoor, 2024). Positive evaluations, in turn, generate financial and spiritual confidence, and with it a markedly greater likelihood of adoption. Thus:

H1: *Perception of IWMI attributes is positively associated with customers' behavioral intentions towards Islamic wealth management services.*

Trust in IWMI and Behavioral Intention

Trust reflects a consumer's confidence in an organization's honesty and capability, effectively mitigating perceived financial risks. This trust is fortified when consumers integrate their internal religious beliefs with cultural values to evaluate an organization's reliability. In the context of IWMIs, trust encompasses the institution's ethical management and its unwavering commitment to both fiduciary duties and *Shariah* responsibilities (PANDİ et al., 2021; Ali M et al., 2021). SIT frames this trust not merely as a reliance on operational capability, but as a deep connection between the organization's actions and the client's core values.

Trust becomes an important matter especially in Islamic wealth management, because prospective users may have to depend on institutions for advice and services that touch their financial assets, their family's interests, and the eventual distribution of their wealth. Mayer and colleagues conceptualize trustworthiness through three dimensions — perceived ability, benevolence, and integrity (Mayer et al., 1995). In the IWMI setting, those dimensions are explained as perceptions of professional competence, concern for clients' interests, and a commitment to ethical and *Shariah*-compliant practice.

SIT offers a complementary perspective in explaining why perceived alignment between an institution and an individual's valued social identity may bear on how that institution is evaluated. Shared religious values alone, nonetheless, do not guarantee trust. Prospective users may also consider whether an institution demonstrates competence, reliability, and integrity. Trust is therefore taken as a distinct institutional belief and not as an automatic by-product of social identification. In this study, higher trust is expected to be positively associated with behavioral intention because prospective users with greater confidence in an IWMI may be more willing to consider engaging with its services and products provided.

Trust carries significant weight in Islamic wealth management than in most financial settings because clients are handing these institutions something that only comes into effect once they are gone — the long-term distribution of their wealth and the execution of their inheritance (Abdullah et al., 2023; Noordin et al., 2016). This demands far deeper commitment than conventional financial services do, resting as it does on institutional discretion and religious fidelity. Therefore, institutions that govern themselves ethically and keep their religious practice consistent will earn greater trust from their clients. The literature shows the positive

relationship between institutional trust and consumer behavior (Aziz et al., 2019). Institutions that align with consumers' values carry lower perceived financial risks. In the context of the Islamic wealth management system, perceived trustworthiness and concern for ethics are the main factors that motivate the adoption of services. Consequently:

H2: *Trust in Islamic Wealth Management Institutions is positively associated with customers' behavioral intentions towards Islamic wealth management services.*

Identification with IWMI and Behavioral Intention

Identification is the most directly grounded construct in Social Identity Theory. Ashforth and Mael (1989) explain that social identification can arise through social categorization and can encourage support for organizations perceived to embody an individual's identity. In the context of Islamic wealth management, identification concerns the extent to which prospective users perceive an IWMI as compatible with their valued religious, ethical and social identity (Rather et al., 2018). This is conceptually different from simply recognizing that an institution offers *Shariah*-compliant services.

Identification within the IWMI context refers to the psychological bond consumers form with an institution based on shared values. Grounded in SIT, this concept suggests that individuals establish and affirm their self-concept through relationships with groups they deem socially and personally significant (Syakhroza et al., 2018). This explains why consumers gravitate toward institutions that mirror their personal ethics and religion, ultimately viewing the IWMI as an extension of their own identity.

Within Islamic wealth management, this identification goes beyond knowledge and relationship with the products of IWMI and expresses the intention of undertaking *Shariah*-compliant planning that integrates with their life aspirations. Consumers who have a close identification with IWMI perceive the planning of wealth as a moral and religious obligation rather than a financial transaction (Fathoni et al., 2024). This psychological identification provides consumers with a sense of possession that expresses greater emotional involvement toward the service provider. That psychological identification fosters a sense of ownership and heightens the client's emotional involvement, commitment, and loyalty towards the service provider. The literature suggests that engagement with social identities and personal values intensifies during interactions with institutions that feel aligned. Where the values an IWMI professes overlap with a client's religious and financial goals, the intention to adopt its services strengthens considerably (Zahoor, 2024).

When prospective users see an IWMI as reflecting values they hold important, they may be more inclined to consider engaging with it. These may carry particular weight in Islamic wealth management where financial planning can reach into religious responsibilities, family relationships, and long-term wealth stewardship. How strong that relationship actually is becomes the question for empirical testing, which cannot simply be inferred from respondents' Muslim identity. Therefore, the study examines whether identification with an IWMI is positively associated with behavioural intention among Muslim adults who have not previously used these services. Eventually:

H3: *Identification with Islamic Wealth Management Institutions is positively associated with customers' behavioral intentions towards Islamic wealth management services.*

3. Research Methodology

Research Design

This study uses a quantitative cross-sectional research design to analyze the behavioral intentions of Muslims towards the services of Islamic Wealth Management Institutions (IWMI) in Bangsar South, Kuala Lumpur. The cross-sectional method is well suited for studies of behavior that identify relationships among constructs, which are measured at one point in time (Hair et al., 2019). Additionally, Social Identity Theory (SIT) has the ability to predict behavioral intentions in a variety of cases, including different types of consumers and financial services (Tajfel & Turner, 2004).

The unit of analysis comprises individual Muslim adults aged 25 years and above who reside or work in Bangsar South. This demographic was strategically selected because individuals in this age bracket are typically entering or actively navigating the wealth accumulation phase of their financial lifecycle, thus making Islamic

wealth planning decisions—such as *wasiyyah*, *hibah*, *faraid* advisory, and *takaful*-linked estate arrangements—highly relevant to them. Bangsar South was selected as the study setting because it is a leading urban township recognized for high financial literacy, digital readiness, and institutional accessibility. Unlike rural environments, which may be exposed to service coverage limitations through infrastructural constraints, Bangsar South offers extensive exposure to modern Islamic financial institutions, which means non-adoption there is more likely to stem from psychological or behavioral factors than from a lack of access.

Population and Sampling Procedures

The target population comprised Muslim adults aged 25 years and above who resided or worked in Bangsar South, Kuala Lumpur, and had never previously used Islamic Wealth Management Institution (IWMI) services. This population was selected because the study sought to examine behavioral intentions towards IWMI services among prospective users rather than existing customers. However, a verified count of eligible Muslim adults within the specified geographical area was not available to the researchers.

Due to the absence of a comprehensive sampling frame identifying eligible individuals, the study employed a non-probability convenience sampling technique. Respondents were recruited based on their accessibility and eligibility to participate in the survey. Although this approach facilitated data collection from the target group, it limits the extent to which the findings can be generalized to the wider Muslim population in Bangsar South or Malaysia.

A total of 403 questionnaires were initially collected. Following data screening and the application of the study's eligibility criteria, 390 valid responses were retained for analysis. The final sample was used for the subsequent statistical analyses, including reliability assessment, Pearson correlation and multiple linear regression, subject to the applicable data requirements of each analysis.

The sample size was considered in relation to the study's planned statistical analysis and the number of predictors examined in the multiple regression model. Nevertheless, the final sample size should not be interpreted as establishing a 95% confidence level, population representativeness, or robust statistical power solely based on the Krejcie and Morgan (1970) table. The use of convenience sampling means that the findings should be interpreted as evidence of relationships within the observed sample, with appropriate caution regarding generalization to the wider target population.

To preserve internal validity, strict inclusion and exclusion criteria were applied. Eligible participants were restricted to Muslim adults (aged 25 and above) who had never previously subscribed to IWMI services. Existing users were intentionally excluded because this study explicitly investigates pre-adoption behavioral intention formation, rather than post-adoption evaluations or customer satisfaction. The exclusion of existing IWMI users was consistent with the study's focus on prospective users and their pre-adoption behavioral intentions. Consequently, the dependent variable captures respondents' stated intentions rather than verified adoption, subscription or utilization behavior. The findings should therefore be interpreted within this pre-adoption context. Furthermore, because respondents were recruited through convenience sampling within a specific urban locality, the results should not be assumed to represent all Muslim adults in Malaysia.

Data Collection Procedures

Primary data were gathered over four weeks in October 2025 through a self-administered online questionnaire hosted on Google Forms. This mode of distribution suited the study population well as the sample belongs to an urban group marked by strong technological readiness and near-universal internet access. The questionnaire was presented in both English and Malay to reduce comprehension barriers and improve response accuracy.

Participation was entirely voluntary. Prior to the survey, respondents were told the purpose of the study and assured of anonymity, confidentiality and have been affirmed that the use of their responses for academic purposes alone with no personally identifiable information was recorded. Because the research drew on self-reported data from a single source at a single point in time, several procedural remedies were put in place to limit the possible influence of Common Method Bias (Podsakoff et al., 2003). These included strict respondent anonymity, items phrased in clear and neutral language, and the deliberate separation of measurement items

for the independent and dependent constructs into separate sections to disrupt consistency motif biases. These procedural strategies align with established best practices in consumer behavior research.

Measurement of Variables

The measurement items used here were adapted from instruments previously validated in the wider Islamic finance, behavioral finance and consumer behavior literature. They were then redrafted so that they capture the particular features of Islamic wealth management settings. Small adjustments were made, but each construct was kept conceptually aligned with the institutional characteristics of IWMIs, leaving the theoretical integrity of the original scales intact.

All responses were captured using a five-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). As Hair et al. (2019) emphasize, the five-point Likert scale is extensively utilized in behavioral intention studies due to its reliability, simplicity, and proven suitability for quantifying attitudinal and psychological constructs. Consistent with the contextual operationalization of SIT proposed in this study, the survey measured four primary constructs:

Perception of IWMI Attributes: Measured via nine items capturing institutional credibility, procedural transparency, operational efficiency, digital accessibility, and the perceived spiritual benefits associated with *Shariah*-compliant wealth planning.

Trust in IWMI: Assessed using nine items reflecting perceptions of ethical governance, fiduciary responsibility, institutional reliability, and social legitimacy.

Identification with IWMI: Measured using nine items assessing respondents' psychological identification with Islamic Wealth Management Institutions, including their perceived sense of connection with the institution, alignment with its values, and the extent to which they perceive the institution as reflecting their personal and religious identity.

Behavioral Intention to Use IWMI Services: Measured using seven items assessing respondents' stated willingness or likelihood of using Islamic wealth management services in the foreseeable future.

4. Results

Following data screening, 390 valid responses were retained for analysis from the 403 questionnaires initially collected (Table 1). All suitable respondents were Muslim adults residing or working in Bangsar South, Kuala Lumpur who had never previously used IWMI services. The analysis therefore examines behavioral intention to use Islamic wealth management services among prospective users. The demographic characteristics describe the study sample and should not be interpreted as establishing the financial readiness or actual adoption behavior of the wider urban Muslim population.

Data screening left a valid response rate of 96.8%, with 390 of the 403 questionnaires retained. Table 1 sets out the demographic profile of the final sample, and all percentages are calculated on the 390 respondents. The sample contained 202 men (51.8%) and 188 women (48.2%). Respondents aged 30–39 formed the largest age group (48.0%), most were married (74.6%), and just over half held a bachelor's degree (53%). By monthly income, the largest group earned between RM4,001 and RM6,500 (41.5%). However, these figures describe the respondents included in the analysis, and they do not demonstrate estimates of the wider Muslim population in Bangsar South.

The demographic profile further indicates that the respondents generally possess favorable socio-economic characteristics associated with financial readiness, including relatively high levels of educational attainment and stable income profiles, thereby reinforcing the suitability of Bangsar South as an urban setting for investigating behavioral intentions towards Islamic wealth management services.

Table 1: Demographic Profile of Respondents (N = 390)

Demographic	Category	Frequency (n)	Percentage (%)
Gender	Male / Lelaki	202	51.8
	Female / Perempuan	188	48.2
Age	25–29 years old	66	16.9
	30–39 years old	187	48.0
	40–49 years old	81	20.7
	50–59 years old	38	9.7
	60 years old and above	18	4.7
Marital Status	Single / Bujang	91	23.3
	Married / Berkahwin	291	74.6
	Divorced / Bercerai	8	2.1
Highest Education	SPM or equivalent	66	16
	STPM/Foundation/Matriculation/Diploma	97	24
	Bachelor's Degree	207	53
	Master's Degree	20	7
Monthly Income	RM1,700 and below	41	10.5
	RM1,701–RM4,000	87	22.3
	RM4,001–RM6,500	162	41.5
	RM6,501–RM9,000	60	15.4
	Above RM9,000	40	10.3

Source: Authors' data

Reliability analysis (Table 2) was subsequently undertaken to evaluate the internal consistency of the measurement scales employed in the present study where Cronbach's Alpha coefficients show a range from 0.668 to 0.715 across the four constructs examined. Specifically, Perception of IWMI Attributes recorded a Cronbach's Alpha value of 0.668, Trust in IWMI achieved 0.715, Identification with IWMI reported 0.714, while Behavioral Intention recorded a coefficient value of 0.668. Although two constructs recorded values marginally below the conventional threshold of 0.70, these coefficients remain acceptable within exploratory behavioral research employing theory-driven measurement instruments (Hair et al., 2019). In order to preserve both content validity and theoretical integrity, no measurement items were removed during the reliability assessment. Collectively, the findings provide adequate empirical support regarding the consistency and reliability of the measurement instrument adopted in this study.

Table 2: Reliability Analysis

Constructs	Cronbach's Alpha	No of Items
Attributes	0.668	9
Trust	0.715	9
Identification	0.714	9
Intention	0.668	7

Source: Authors' own data from survey

Pearson's correlation (Table 3) analysis was then performed to examine the strength and direction of relationships among the study variables. The findings indicate that all three independent variables exhibit positive and statistically significant relationships with Behavioral Intention at the 0.01 significance level. Perception of IWMI Attributes demonstrated a moderate positive relationship with Behavioral Intention ($r = 0.351$, $p < 0.001$), while Trust in IWMI recorded the strongest bivariate relationship ($r = 0.410$, $p < 0.001$). Similarly, Identification with IWMI demonstrated a significant positive relationship with Behavioral Intention

($r = 0.364$, $p < 0.001$). These findings suggest that respondents possessing more favorable perceptions concerning Islamic wealth management institutions, stronger institutional trust, and greater psychological readiness are more likely to demonstrate positive intentions towards adopting Islamic wealth management services.

Table 3: Pearson Correlation

Variables	Attribute	Trust	Identification	Intention
Attribute	1.000			
Trust	0.541**	1.000		
Identification	0.379**	0.426**	1.000	
Intention	0.351**	0.410**	0.364**	1.000

Source: Authors' own data from survey

Positive and statistically significant correlations were also observed among the independent variables. The correlation coefficients ranged from 0.379 to 0.541, indicating positive associations between the constructs. Although these coefficients do not, by themselves, establish discriminant validity, they do not indicate extremely high pairwise correlations. The findings provide preliminary evidence of associations among perceived IWMI attributes, trust, and identification, which are conceptually distinguished in the proposed framework. These results are consistent with examining the three constructs as related but distinct factors within the study's SIT-informed framework (Hair et al. 2019). However, correlation analysis alone cannot establish theoretical mechanisms linking these constructs or demonstrate that one construct leads to another.

The Analysis of Variance (ANOVA) (Table 4) results provide further support regarding the adequacy of the proposed regression model. The model was found to be statistically significant ($F = 37.419$, $p < 0.001$), indicating that Perception of IWMI Attributes, Trust in IWMI, and Identification with IWMI collectively exert significant predictive effects upon customers' behavioral intentions towards Islamic wealth management services.

Nevertheless, the model explained 22.5% of the variance in behavioral intention, indicating that additional factors not examined in this study may also be relevant. Accordingly, the findings should be interpreted within the scope of the three predictors investigated, while the potential roles of other psychological, financial and social considerations warrant further research.

Table 4: Model Summary of Multiple Linear Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the estimate	Change Statistics		Change Statistics		
					R Square Change	F Change	df1	df2	Sig. F Change
1	.475a	0.225	0.219	0.49706	0.225	37.419	3	386	<.001

Source: Authors' own data from survey

The multiple linear regression analysis examined the associations between perceived IWMI attributes, trust in IWMIs, identification with IWMIs and behavioral intention to use Islamic wealth management services. Perceived IWMI attributes were positively associated with behavioral intention ($B = 0.166$, $\beta = 0.139$, $p = 0.011$). Trust recorded the largest standardized regression coefficient ($B = 0.280$, $\beta = 0.248$, $p < 0.001$), while identification also demonstrated a positive and statistically significant association with behavioral intention ($B = 0.214$, $\beta = 0.206$, $p < 0.001$). These findings provide evidence of positive statistical associations between the three predictors and prospective users' stated intentions. Trust had the largest estimated relative contribution among the predictors included in the model. Nevertheless, the cross-sectional design does not establish that changes in these factors would cause changes in behavioral intention or result in actual service adoption.

Table 5: Results of multiple regression analysis

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig,	Results of hypothesis
1	(Constant)	1.391	0.227			6.132	
	attributes	0.166	0.065	0.139	2.552	0.011	Support
	Trust	0.28	0.063	0.248	4.461	<.001	Support
	Identification	0.214	0.052	0.206	4.08	<.001	Support

Source: Authors' own data from survey

Discussion

The current research examines factors influencing Muslim adults' behavioral intention to use Islamic Wealth Management Institution (IWMI) services, situating Social Identity Theory (SIT) within the context of Islamic wealth management. Unlike past research which primarily focused on awareness, religious knowledge, and legal literacy- this study reveals that behavioral intention is significantly influenced by perceptions of trust, institutional attributes, and the degree of personal identification with IWMI services. These findings broaden existing literature by demonstrating that even in urban areas with substantial access to Islamic financial services, identity-based and institutional factors remain paramount in the adoption process. The research illustrates that the utilization of Islamic financial services is a combination of the users' social identities and the perceived values of the institutions they associate with, thereby successfully extending the application of SIT into the Islamic financial services arena.

The findings demonstrate a considerable relationship between perceptions of IWMI attributes and behavioral intentions. According to the data, Muslim clients show a positive inclination toward these services only when they are perceived to be transparent, professionally managed, accessible, innovative, and strictly *Shariah*-compliant. SIT posits that individuals are more prone to act and associate with institutions that reflect their individual and group identities (Tajfel & Turner, 1979). In the context of Islamic wealth management, the assessment of institutional attributes goes beyond typical service quality to include institutional integrity, fiduciary concern, simplicity of process, and ethical stewardship. Positive institutional perceptions give consumers the cognitive and emotional confidence that IWMI services will help them meet their financial goals alongside their religious obligations, positioning these services as a means of achieving the *Maqasid al-Shariah* (specifically *hifz al-mal*).

Furthermore, these results help address a previously underexplored behavioral gap. Despite residing in urban areas with high exposure to Islamic financial institutions, respondents placed significant emphasis on specific institutional features prior to developing behavioral intentions. This indicates that mere access to financial services does not automatically translate to adoption. The considerable amount of Muslim-owned wealth that remains dormant and unclaimed in Malaysia can be partially explained by this phenomenon; focusing solely on increasing awareness will result in only marginal success, whereas actively improving public perceptions of the IWMI industry is necessary for widespread adoption.

Trust in IWMI, most importantly, emerged as the key behavioral intention predictor among Muslim consumers. The present study regards this finding as one of its major theoretical contributions, as it indicates that the behavioral intentions of Muslim consumers toward the provision of Islamic wealth management services are primarily influenced by the consumers' trust in institutions that align with their religious and ethical beliefs. Because Islamic estate planning inherently involves sensitive post-death wealth transfers and familial obligations, establishing deep-seated, identity-driven trust is an essential prerequisite. Muslim clientele must be confident in the institution's commitment to prioritizing *Shariah* principles, competence in the advisory process, and genuine concern for beneficiaries (Aziz et al., 2019; Suhartanto, 2019). When consumers perceive IWMIs as maintaining high ethical standards and robust *Shariah* governance, they view these entities as legitimate custodians of Islamic financial practices, making them significantly more willing to engage.

Similarly, identification with IWMI, which reflects the perceived compatibility between personal values and

institutional practices plays an important role in shaping behavioral intentions. Consumers are highly likely to engage with IWMI services when they perceive them as relevant, accessible, and closely aligned with their moral responsibilities. This finding strengthens previous arguments establishing that identification acts as a crucial psychological mechanism influencing engagement with Islamic financial services involving long-term commitments (Raman et al., 2016). Although identification revealed a weaker predictive ability compared to trust its meaningful contribution confirms that the formation of behavioral intention is a complex, multifactorial process which requires consumers to feel psychologically ready, personally aligned, and capable of engaging with the institution.

Ultimately, this study conveys valuable insights into how IWMI providers are facing growing market competition. While providers traditionally focus on novel product offerings, these results indicate that building institutional trust and confidence is far more critical for driving clients' acceptance. Advancing digital advisory support, ensuring transparent governance, and standardizing simplified documentation are strategic necessities for refining the client trust necessary for the advancement of the Islamic wealth management sector in the future.

5. Managerial Implications and Recommendations

The findings offer practical insights for Islamic Wealth Management Institutions (IWMIs) seeking to understand prospective users' intentions to engage with their services. Perceived IWMI attributes, trust, and identification were positively and significantly associated with behavioral intention, with trust recording the largest standardized regression coefficient. These findings suggest that institutional credibility, trustworthiness and perceived compatibility with consumers' values are relevant considerations when developing strategies to engage prospective users. Nevertheless, the recommendations presented below should be interpreted as potential managerial responses informed by the findings, rather than interventions whose effectiveness has been directly established by this study.

First, IWMIs may consider strengthening the transparency and accessibility of information about their services, including wasiyyah, hibah, faraid advisory and takaful-linked estate planning. Clear explanations of service procedures, professional responsibilities, applicable fees and relevant *Shariah* governance arrangements may help prospective users evaluate the suitability and credibility of the institution. Since trust recorded the largest standardized regression coefficient among the three predictors, communicating institutional responsibilities and service processes transparently represents a reasonable managerial priority. However, the present study did not directly test whether specific transparency initiatives would increase behavioral intention.

Second, IWMIs may consider improving their service attributes by reviewing the clarity of information, accessibility of advisory support and simplicity of service procedures. Digital information portals, online consultation facilities and interactive estate-planning tools could be explored as possible approaches to improving access to information. Similarly, AI-supported information tools may be considered where appropriate, provided that their accuracy, privacy safeguards and suitability for *Shariah*-sensitive financial matters are adequately addressed. These initiatives are practical possibilities rather than direct conclusions from the regression analysis, as the study did not measure digital service preferences or test the effectiveness of particular technologies.

Third, IWMIs may consider communicating how their services relate to responsible wealth stewardship, family financial planning and the fulfilment of relevant religious and ethical considerations. Such communication may help prospective users assess whether an institution's stated values are compatible with their own. Nevertheless, Muslim identity should not be assumed to imply identification with a particular institution. Institutions should therefore seek to understand prospective users' actual expectations and perceptions rather than presume that religious affiliation automatically produces institutional identification.

Fourth, institutions may explore whether different groups of prospective users have different information and advisory needs. For example, digital communication, individual consultations and educational programs could be evaluated for their suitability across different age groups and levels of familiarity with Islamic wealth management. Behavioral segmentation may also be explored as a means of tailoring communication to

prospective users' concerns about trust, service accessibility and value compatibility. However, age-specific channels and behavioral segmentation were not examined in the present study and should be introduced as strategies for pilot testing and evaluation rather than as approaches proven by the current findings.

Finally, collaboration between IWMIs, relevant professional bodies and educational institutions may provide opportunities to improve public understanding of Islamic wealth management services. Educational initiatives could explain the functions of different estate-planning instruments, the responsibilities of service providers and the practical steps involved in seeking advice. Such programs may be particularly useful where preliminary engagement indicates gaps in awareness or understanding. Nevertheless, because awareness and financial literacy were not included as predictors in the current model, their relevance and the effectiveness of related educational interventions require further assessment.

Overall, the findings suggest that trust, perceived institutional attributes and identification are relevant considerations in understanding behavioral intention towards Islamic wealth management services. Managers may use these findings to inform service-development priorities and formulate initiatives for subsequent evaluation. Pilot programs, customer feedback and follow-up assessments would help determine whether proposed interventions improve prospective users' perceptions and intentions. This approach maintains a clear distinction between the relationships established by the present study and the practical strategies that remain to be tested.

Overall, the findings suggest that trust, perceived institutional attributes, and identification are relevant considerations in understanding behavioral intention towards Islamic wealth management services. Managers may use them to inform service-development priorities and to formulate initiatives for subsequent evaluation. Pilot programs, customer feedback, and follow-up assessments would help determine whether proposed interventions improve prospective users' perceptions and intentions. This approach keeps a clear line between the relationships the present study established and the practical strategies that remain to be tested.

Conclusion

This study examined the relationships between perceived IWMI attributes, trust in IWMIs, identification with IWMIs and behavioral intention to use Islamic wealth management services among Muslim adults who had never previously used these services. The findings indicate that all three factors were positively and significantly associated with behavioral intention, with trust recording the largest standardized regression coefficient. These results highlight the potential relevance of institutional credibility, trustworthiness and perceived value alignment in understanding prospective users' intentions to engage with Islamic wealth management services.

The findings contribute to the application of Social Identity Theory in the context of Islamic wealth management by examining how institutional perceptions and identification-related considerations are associated with pre-adoption intentions. From a practical perspective, IWMIs may consider strengthening transparency, communicating *Shariah* governance arrangements clearly and improving the accessibility of service information. Nevertheless, these recommendations should be regarded as potential managerial responses rather than interventions whose effectiveness has been established by this study.

Several limitations should be acknowledged. The cross-sectional design does not establish causal relationships, while the convenience sampling approach and focus on Muslim adults in Bangsar South limit the generalizability of the findings. Moreover, behavioral intention does not necessarily translate into actual service use. Future research could employ longitudinal designs to examine whether stated intentions are subsequently translated into completed estate-planning arrangements or other forms of IWMI service utilization. Such research would help clarify the intention–behavior gap and provide a more comprehensive understanding of prospective and actual engagement with Islamic wealth management services.

To further advance this field, future scholars should develop integrated theoretical frameworks that incorporate additional dimensions, such as financial literacy, religiosity, perceived risk, and digital preparedness. More complex structural models could also be constructed to explore the specific mediating and moderating roles of institutional trust and digital engagement. Methodologically, future research should

transition from cross-sectional snapshots of behavioral intention to longitudinal studies that track sustained subscription behavior. Employing advanced analytical techniques to assess the progression from initial intention to actual, long-term adoption will provide a much more comprehensive understanding of the complexities inherent in Islamic wealth planning. Ultimately, these continued research endeavors will drive the development of highly effective, client-centric initiatives that faithfully fulfill the overarching objectives of *Maqasid al-Shariah.*

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The Influence of Islamic Work Ethics on Organizational Commitment in the Finance Department of the Public Sector

*Naffisah Mohd Hassan[1], Sharifah Naziha Syed Kholed[2], Tengku Zetty Maztura Tengku Jamaluddin[3], Hairil Rasmizal[4], Ezyanti Muhamad[5]
[1]Faculty of Business and Management, Universiti Teknologi MARA, Bandar Puncak Alam, Selangor, Malaysia
[2]Department of Science Programmes, Sunway College Johor Bahru, Johor Bahru, Johor, Malaysia
[3]Department of Medical Microbiology and Health Sciences, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia
[4]Faculty of Health and Life Sciences, University of Exeter, United Kingdom
[5]Selangor State Police Headquarters (IPK Selangor), Shah Alam, Selangor, Malaysia
Email: *naffi885@uitm.edu.my, sharifahns@sunway.edu.my, tengkuzetty@upm.edu.my, H.Abdul-Razak@exeter.ac.uk, ezyantimuhamad@gmail.com
Corresponding Author: Naffisah Mohd Hassan

Abstract: Research into Islamic work ethics within organizations has gained momentum following institutional financial failures driven by ethical lapses. This study investigates the distinct multidimensional effects of Islamic Work Ethics (IWE), specifically responsibility, self-belief, and social relationships, on the affective, continuance, and normative commitment of Muslim employees in public sector finance departments. Using a quantitative cross-sectional design, structured questionnaires were collected from 151 finance personnel using purposive sampling. Structural Equation Modelling via SmartPLS was applied to analyze path coefficients and assess directional hypotheses. Results indicate that IWE responsibility significantly and positively predicts affective (β = 0.360), continuance (β = 0.598), and normative commitment (β = 0.731). IWE self-belief positively impacts affective (β = 0.465) and continuance commitment (β = 0.517) but demonstrates a significant negative association with normative commitment (β = -0.179), resulting in a rejected hypothesis. IWE social relationships exhibit a non-significant relationship with affective commitment (β = -0.044) and significant negative relationships with continuance (β = -0.387) and normative commitment (β = -0.159), failing to support positive directional predictions. These findings highlight the need to evaluate IWE as a construct with distinct behavioral dimensions. Practical recommendations for public administration and human resource management are presented.

Keywords: *Islamic work ethics, organizational commitment, affective commitment, continuance commitment, normative commitment, public sector finance*

1. Introduction and Background

The concept of work ethics has long been central to organizational success, yet its importance has become more pronounced in recent decades due to widespread ethical failures in both private and public institutions. Globally, scandals such as Enron and WorldCom highlighted the devastating consequences of unethical practices, while in Malaysia, the 1MDB financial scandal underscored the urgent need for stronger ethical frameworks in public-sector finance. These events have prompted scholars and practitioners to revisit the role of ethics in organizational life, with Islamic Work Ethics (IWE) emerging as a particularly relevant framework in Muslim-majority contexts.

Islamic Work Ethics are rooted in the Qur'an and Shari'ah, emphasizing values such as sincerity (ikhlas), honesty (sidq), responsibility (amanah), and social accountability (mas'uliyyah). Unlike secular work ethics, which often emphasize productivity and efficiency, IWE integrates spiritual, moral, and social dimensions, positioning work as both a religious obligation and a form of worship. The Prophet Muhammad (peace be upon him) emphasized that "The honest, trustworthy merchant will be with the Prophets, the truthful, and the martyrs" (*Jami' at-Tirmidhi*, Hadith 1209), highlighting the spiritual rewards of ethical conduct in professional life.

In organizational behavior literature, commitment has been recognized as a multidimensional construct that reflects employees' psychological attachment to their organizations. Meyer and Allen's (1991) three-component model remains the most widely accepted framework, distinguishing between affective

commitment (emotional attachment), continuance commitment (perceived cost of leaving), and normative commitment (moral obligation to remain). High levels of commitment are associated with reduced turnover, enhanced job performance, and greater organizational citizenship behavior.

The integration of IWE into organizational contexts is particularly relevant in Malaysia's public sector, where finance departments play a critical role in managing public resources. Ethical accountability in financial management is not only a professional requirement but also a religious obligation for Muslim employees. The Maqasid al-Shari'ah (objectives of Islamic law) emphasize justice, trust, and accountability, aligning closely with the principles of IWE. Thus, examining how IWE influences organizational commitment in this context provides both theoretical and practical insights.

Recent studies have shown that IWE positively influences job satisfaction, improves employee motivation, affective commitment and loyalty to the company (Aflah et al., 2021; Muhajir et al., 2023). Organizations that foster Islamic ethical values tend to experience greater employee satisfaction, lower turnover intentions, and enhanced loyalty. However, most studies conceptualize IWE as a single construct, overlooking the distinct contributions of its dimensions. This study addresses this gap by examining responsibility, self-belief, and social relationships separately, exploring how each dimension influences affective, continuance, and normative commitment among Muslim employees in Malaysian public-sector finance departments.

This research is timely and significant for several reasons. First, it contributes to the growing body of literature on Islamic ethics in organizational behavior, offering a multidimensional perspective. Second, it provides practical insights for public-sector managers seeking to strengthen ethical accountability and employee commitment. Third, it aligns with Malaysia's broader governance reforms, which emphasize transparency, integrity, and accountability in public administration.

2. Literature Review

Islamic Work Ethics

The presence and interest in work ethic, especially within the religious-economic conditions in the 19th century, were influenced by the fact that before the Industrial Revolution in Europe, work was not properly regarded. At that time, work was neither appreciated nor in favor of the prevailing religious and social norms. This fact can be detected in the writings that were published during that era. Islamic work Ethics is a component that has increasingly shown importance in academic investigations, which is needed in an organization to improve ethics in the office. Employees who adopt the religious code usually apply deeper loyalty, high-quality task performance, and ethical behavior in their working positions (Aman-Ullah et al., 2025; Firmansah & Sari, 2025). The success of the organization is influenced not only by individual performance but also by the ethical standards upheld within the organization. On the other hand, it helps organizations sustain discipline among employees (Siswanto & Darus, 2020). IWE provides ethical guidance for employees' work behavior and is associated with improved job performance through intrinsic motivation (Al-Douri et al., 2020). Moreover, Al-Douri et al. (2020) found that IWE positively influences employees' intrinsic motivation, thereby enhancing job performance. The findings reveal that IWE not only shapes employees' behavior, but it also enhances their intrinsic motivation to carry out their duties with greater commitment and dedication. While IWE has been widely recognized as an important factor, most studies continue to examine it as a single construct. However, many researchers believe that these individual dimensions of IWE have not been analyzed for their contribution to organizational achievement. To address this gap, the present study examines the dimensions of responsibility, self-belief, and social relationship separately to examine how each dimension will influence organizational commitment among Muslim employees in Malaysian public sector organizations.

Organizational Commitment

Commitment is the psychological attachment of staff to an organisation and can be seen in the allegiance of staff to the organisation, motivation to integrate organizational objectives, and engagement with the organisation. Meanwhile, the subject of commitment is vital for executives, since it plays a principal role in the accomplishment of objectives, creation, and adjustment of an organization. According to Meyer and Allen (1991), organizational commitment has at least three prevalent aspects: attachment or affection to the organisation (affective commitment), view of misfortune on leaving the association (continuance

commitment), and the commitment to stay in it (normative commitment). Recent studies continue to examine organizational commitment in relation to employee performance, behaviors, and overall organizational effectiveness. However, these relationships may vary and depend on the employee behavior, attitudes, and organizational context examined (Kammeyer-Mueller et al., 2024; Kellerer & Süß, 2026). Employees with higher organizational commitment tend to be committed to their organization, dedicated, connected, and work diligently for the organization. Thus, it also indicates that organizational commitment is associated with employees' work performance (Hosen et al., 2024). Organizational commitment becomes important for quality outcomes between employees and organizations, especially in the public sector, where long-term service and ethical responsibility are regarded as important for the institution.

Islamic Work Ethics and Organizational Commitment

Employees are the human capital of an association that ethically and morally carried on laborers in an association will favorably affect the association itself. This is in line with what Allah promises in the Quran: "…Allah promises you His forgiveness and bounties" (*Quran 2:268).* The verse implies that forgiveness and bounties are promised to those who put a strenuous effort into fulfilling their work responsibly in accordance with Allah's will. Instead, begging and living as a parasite on the labor of others are condemned by Islamic teaching. Besides, Islam sees work as a religious obligation and jihad (reason for Allah). Prophet Muhammad has preached: "The honest, trustworthy merchant will be with the Prophets, siddeeqs and martyrs." (At-Tirmidhi, no. 1209). Previous studies have evaluated the important relationship between ethical norms, work ethics, and organizational commitment (Nasution & Rafiki, 2020; Aflah et al., 2021). Empirical evidence consistently demonstrates positive relationships between IWE and organizational commitment, employee loyalty, job performance, and other favorable outcomes across different organizational contexts (Aman-Ullah et al., 2025; Firmansah & Sari, 2025). However, most studies conceptualize IWE as a single construct without differentiating the influence of dimensions on the various types of organizational commitment. Therefore, the focus on the specific impacts of responsibility, self-belief, and social relationship on affective, continuance, and normative commitment has yet to be fully established. Besides, the empirical evidence that involves Muslim employees working in the public sector finance department in Malaysia remains limited, even though ethical accountability and responsible financial management are essential to public service. This study aims to address these gaps by examining IWE's dimensions separately to explore how responsibility, self-belief, and social relationships relate to affective, continuance, and normative commitment. The study aims to enhance understanding of how Islamic ethical values influence the commitment of employees in Malaysian public-sector organizations.

3. Research Methodology

This study employed a quantitative cross-sectional design to gather primary data from 3 public sector finance personnel in the Klang Valley, Malaysia. Purposive sampling was selected to target Muslim employees working in public finance units, a sector where accountability, compliance, and strict adherence to regulations are central to daily work. Structured questionnaires were distributed directly to officers across public sector finance departments. A total of 151 questionnaires were distributed in 3 different offices, and all were returned, yielding a 100% response rate. This complete response rate was achieved through active follow-up and direct coordination with department administrative liaisons during administrative meetings.

The demographic profile revealed that the majority of respondents were female (71.5%), aged between 26 and 35 years (80.8%), and held a bachelor's degree (68.2%). Most respondents earned between RM3,001 and RM6,275 monthly (72.2%), placing them in the M40 income group. Organizational tenure was evenly split between those with less than five years of experience (51%) and those with five to ten years (49%). This profile reflects a relatively young, educated workforce, consistent with the recruitment patterns in Malaysian public-sector finance departments. The questionnaire measured three dimensions of IWE—responsibility, self-belief, and social relationships—and three types of organizational commitment—affective, continuance, and normative. Items were adapted from validated scales in prior studies (Hair et al., 2022; Meyer & Allen, 1991). Respondents rated items on a five-point Likert scale ranging from "strongly disagree" to "strongly agree."

Reliability and validity were assessed using factor loadings, Cronbach's alpha, Composite Reliability (CR) and

Average Variance Extracted (AVE). Following Hair et al. (2022), factor loadings above 0.50 and CR values exceeding 0.70 indicate acceptable reliability, while AVE values greater than 0.50 confirm convergent validity. Data were analyzed using SmartPLS, a variance-based structural equation modeling (SEM) technique. SmartPLS was chosen because it is suitable for complex models with multiple constructs and does not require normally distributed data. The analysis proceeded in two stages:

Measurement Model Assessment: Reliability and validity of constructs were tested using factor loadings, Cronbach's alpha, CR, and AVE.
Structural Model Assessment: Path coefficients were estimated to test the hypothesized relationships between IWE dimensions and organizational commitment. Bootstrapping with 5,000 resamples was conducted to assess the significance of path coefficients.

Ethical approval was obtained from the relevant institutional review board. Participation was voluntary, and respondents were assured of confidentiality. Data were anonymized to protect privacy, and informed consent was obtained prior to participation. Several limitations should be noted. First, the cross-sectional design limits the ability to infer causality. Longitudinal studies would provide stronger evidence of the temporal relationship between IWE and organizational commitment. Second, the reliance on self-reported data may introduce social desirability bias, as respondents may overstate their adherence to ethical values. Third, the study focused exclusively on finance departments in the Malaysian public sector, limiting generalizability to other contexts. Future research could expand to private-sector organizations or cross-cultural comparisons.

4. Results

The demographic profiles of the respondents are presented in Table 1. A total of 151 respondents among employees participated in this study. The majority of female employees (71.5%) were represented in this study compared to males (28.5%). Participants ranged in age from 24 to 45 years old, with the highest age group level being among 26-35 years old (80.8%), followed by 20-25 years old (13.9%), and the small group age level from 34-45 years old (5.3%). In terms of educational attainment, 68.2% of the respondents held a bachelor's degree, whereas the remaining 31.8% possessed a diploma qualification. All respondents identified as Malay (100%), with the majority being single (86.1%) and the remaining respondents being married (13.9%). In terms of monthly income, the majority of respondents earned between RM3,001 – RM6,275 (72.2%), while the remaining earned between RM0 - RM3,000 (27.8%), showing that the respondents were primarily from the B40 income group. Furthermore, most respondents were university graduates, with a bachelor's degree (68.2%) and the other holding diplomas (31.8%). This educational profile is consistent with the respondents' age distribution, as the majority were relatively young. In terms of organizational tenure, the respondents were dominated by those who had worked for their organization less than 5 years (51%) and less than 5 -10 years (49%), which is consistent with the results in the age of respondents.

Table 1: Demographic Profile of Respondents

Variables	Frequency	Percentage
GENDER		
Males	43	28.5%
Females	108	71.5%
AGE GROUP		
20-25 years old	21	13.9%
26-35 years old	122	80.8%
36-45 years old	8	5.3
EDUCATION		
Diploma	48	31.8%
Bachelor's Degree	103	68.2%
ETHNICITY		
Malay	151	100%
MARITAL STATUS		
Single	130	86.1%
Married	21	13.9%

PERSONAL INCOME		
RM0 – RM3,000 (B40)	42	27.8%
RM3001 – RM6275 (M40)	109	72.2%
POSITION AND GRADE		
Grade 41 and above	49	32.5%
Grade 29 and above	63	41.7%
Grade 19 and above	34	22.5%
Grade below 19	5	3.3%
WORKING EXPERIENCE		
Less than 5 years	77	51%
5 – 10 years	74	49%

The reliability and convergent validity of the measurement model were evaluated using factor loadings, Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Following the guidelines proposed by Hair et al. (2022), factor loadings above 0.50 and CR values exceeding 0.70 indicate acceptable reliability. Convergent validity was further assessed using AVE, where values greater than 0.50 are considered satisfactory (Fornell & Larcker, 1981). As stated in Table 2, the factor loadings revealed support for convergent validity for the six constructs. All loadings were greater than 0.50, with most loadings exceeding 070. The factor loadings ranged from 0.58 to 0.971, indicating that all measurement items met the recommended threshold. The results of this test will indicate whether the items used in this study are reliable for measuring the study's objectives. For Cronbach's alpha, values for five constructs comfortably exceeded 0.70. Continuance Commitment produced an alpha of 0.698. While slightly below 0.70, an alpha close to 0.70 is deemed acceptable in exploratory behavioral studies, particularly when Composite Reliability (CR = 0.817) and AVE (0.534) demonstrate robust construct reliability and convergent validity (Hair et al., 2022).

Table 2: Results of factor loadings, validity and reliability

	Loading	**Cronbach's Alpha**	**Composite Reliability**	**Average Variance Extracted (AVE)**
Affective Commitment		0.837	0.896	0.69
AC01	0.912			
AC02	0.858			
AC03	0.925			
AC04	0.58			
Continuance Commitment		0.698	0.817	0.534
CC01	0.765			
CC02	0.673			
CC03	0.882			
CC04	0.566			
Normative Commitment		0.725	0.855	0.639
NC01	0.748			
NC02	0.918			
NC03	0.885			
NC04	0.971			
IWE Responsibility		0.854	0.89	0.579
R01	0.602			
R02	0.891			
R03	0.764			
R04	0.823			
R05	0.625			
R06	0.815			
IWE Self Belief		0.787	0.856	0.598
SB01	0.78			
SB02	0.808			
SB03	0.738			

SB04	0.766			
IWE Social Relationship		0.875	0.923	0.8
SR01	0.911			
SR02	0.889			
SR03	0.883			

Table 3 shows the results of the path coefficient assessment of the hypotheses. The SmartPLS Bootstrapping procedure was executed to determine the statistical significance of the hypothesized direct relationships. A total of nine path coefficients between exogenous and endogenous constructs are shown regarding how to specify the structural model, where five were supported, while 4 was not. As presented in Table 3, IWE Responsibility showed strong positive relationships with Affective Commitment ($\beta = 0.360$, $p < 0.001$), Continuance Commitment ($\beta = 0.598$, $p < 0.001$), and Normative Commitment ($\beta = 0.731$, $p < 0.001$), supporting H1a, H1b, and H1c.

IWE Self-Belief significantly and positively predicted Affective Commitment ($\beta = 0.465$, $p < 0.001$) and Continuance Commitment ($\beta = 0.517$, $p < 0.001$), supporting H2a and H2b. However, its path to Normative Commitment was statistically significant but negative ($\beta = -0.179$, $t = 2.304$, $p = 0.011$). Because the hypothesis predicted a positive influence, H2c was Not Supported.

IWE Social Relationship exhibited a non-significant relationship with Affective Commitment ($\beta = -0.044$, $t = 0.821$, $p = 0.206$), failing to support H3a. Its paths to Continuance Commitment ($\beta = -0.387$, $p < 0.001$) and Normative Commitment ($\beta = -0.159$, $p = 0.024$) were statistically significant but in a negative direction. Because both hypotheses posited positive effects, H3b and H3c were Not Supported.

Table 3: Path Coefficient Assessment Result

Relationship	Std Beta	Std Error	T Statistics	P Value	f2	Decision
IWE Responsibility -> Affective Commitment	0.36	0.061	5.871	0	0.158	Supported
IWE Responsibility -> Continuance Commitment	0.598	0.056	10.67	0	0.87	Supported
IWE Responsibility -> Normative Commitment	0.731	0.077	9.539	0	0.492	Supported
IWE Self Belief -> Affective Commitment	0.465	0.049	9.447	0	0.283	Supported
IWE Self Belief -> Continuance Commitment	0.517	0.062	8.274	0	0.695	Supported
IWE Self Belief -> Normative Commitment	-0.179	0.078	2.304	0.011	0.032	Not Supported
IWE Social Relationship -> Affective Commitment	-0.044	0.053	0.821	0.206	0.003	Not Supported
IWE Social Relationship -> Continuance Commitment	-0.387	0.04	9.789	0	0.029	Not Supported
IWE Social Relationship -> Normative Commitment	-0.159	0.08	1.987	0.024	0.461	Not Supported

Discussion

The current study investigated the influence of three dimensions of Islamic Work Ethics (IWE), comprising responsibility, self-belief, and social relationship, on affective, continuance, and normative commitment among Muslim employees working in the finance departments of Malaysian public-sector organizations. The results indicate that the dimensions of IWE influence organizational commitment differently, showing that not all dimensions foster commitment to the organization in the same way. These findings are in line with recent studies indicating that IWE positively influences employee attitudes and organizational commitment; however, these findings were examined as a single construct rather than at the dimensional level (Aflah et al., 2021; Udin et al., 2022). The results have shown that responsibility emerged as the strongest predictor of organizational

commitment as compared to the other dimensions, whereas self-belief demonstrates varying effects across the commitment dimensions. The social relationship dimension, however, showed limited influence, indicating that different aspects of IWE influence organizational commitment through different pathways.

The findings highlighted the positive influence of the responsibility dimension on affective, continuance, and normative commitment. The results also demonstrated that the strongest effect was observed on normative commitment, and that responsibility, accountability, and *amanah* are more likely to develop a stronger sense of moral obligation towards their organization. The evidence from this study is aligned with previous studies showing that IWE fosters ethical behaviours and strengthens organizational commitment (Aflah et al., 2021; Zainuddin et al., 2023). However, employees in public-sector finance departments are responsible for managing public resources and ensuring financial accountability, which may have a stronger impact on organizational commitment than the other two dimensions of IWE.

Regarding the self-belief dimension, the findings indicated that it has a positive relationship with affective and continuance commitment. The present result adds to the growing body of evidence indicating that employees who practice Islamic Work Ethics cultivate stronger affective commitment and positive work attitudes (Udin et al., 2022; Aflah et al., 2021). However, it exhibited a significant negative relationship with normative commitment. Employees who have greater confidence in applying Islamic ethical values are more likely to develop greater emotional attachment to their organization and are more committed to staying with the organization. In addition, a high level of self-belief among employees may encourage them to perform their duties with greater confidence, perseverance, and commitment to ethical principles. These qualities may, in turn, strengthen employees' commitment to their work and motivate them to remain dedicated to achieving the organization's goals.

However, self-belief demonstrated a significant negative relationship with normative commitment. This finding was unexpected and may imply that employees with higher personal convictions are guided more by intrinsic motivation and personal ethical values than moral obligation to maintain their employment with the organization. Although Aflah et al. (2021) reported positive relationships between IWE and organizational commitment, this contrasts with the findings of the present study. Instead, the current findings suggest that employees choose to stay in the organization because they feel morally obligated to their responsibilities and their personal values are aligned with their work and professional goals. Therefore, employees are more likely to remain to continue serving the organization not because they feel morally obligated to do so, but because of their ethical values in line with their work and professional goals.

Unlike responsibility and self-belief, the social relationship dimension showed no significant effect on affective commitment and significant negative effects on continuance and normative commitment. This suggests that interpersonal relationships alone are insufficient to enhance organizational commitment in Malaysian public-sector finance departments, where strict procedures and accountability requirements dominate. Responsibility and ethical accountability therefore outweigh social interactions in shaping commitment.

On the whole, this study contributes to the current understanding of IWE by showing that its individual dimensions should be examined independently rather than being treated as a single construct. While previous studies conceptualised IWE as a single-dimensional construct (Aflah et al., 2021; Udin et al., 2022), the present study suggests that its individual dimensions have differential effects on organizational commitment. The analysis revealed that each dimension has differential effects on affective, continuance, and normative commitment. It provides a more comprehensive understanding of how Islamic ethical values shape organizational commitment. Specifically, responsibility demonstrated strong positive effects on all three types of commitment; self-belief showed positive effects on affective and continuance commitment but a negative effect on normative commitment, and social relationships did not significantly predict affective commitment while negatively influencing continuance and normative commitment. These findings highlight the multidimensional nature of IWE and its differential pathways in shaping organizational commitment.

5. Managerial Implications and Recommendations

The findings of this study carry significant implications for managers, policymakers, and practitioners in the Malaysian public sector, particularly within finance departments where ethical accountability is paramount. By examining Islamic Work Ethics (IWE) as a multidimensional construct, this study highlights the need for organizations to embed ethical values into their human resource management (HRM) practices, leadership development, and organizational culture. Responsibility (amanah) emerged as the strongest predictor of organizational commitment, particularly normative commitment. This underscores the importance of integrating responsibility into HRM practices. Recruitment and selection processes should prioritize candidates who demonstrate strong ethical values and a sense of accountability. Employee orientation programs can emphasize the significance of amanah, linking professional responsibilities to religious obligations.

Continuous professional training should reinforce responsibility and accountability, focusing on integrity, transparency, and public trust. For example, workshops on financial ethics and accountability can help employees understand the broader implications of their roles. Performance evaluations should include ethical conduct as a key criterion, rewarding employees who consistently demonstrate responsibility. Self-belief (yaqin) was found to positively influence affective and continuance commitment but negatively affect normative commitment. This suggests that while self-belief enhances emotional attachment and resilience, it may reduce employees' sense of moral obligation to remain. Managers should encourage self-belief by providing opportunities for skill development, empowerment, and recognition.

Leadership development programs can focus on building confidence and resilience, enabling employees to take initiative and persevere in challenging situations. However, self-belief must be balanced with responsibility to ensure that employees also feel morally obligated to remain with the organization. This balance can be achieved by linking self-belief to organizational values, emphasizing that confidence and resilience should be exercised within the framework of amanah and accountability. Since social relationships (ukhuwah) did not significantly predict affective commitment and were negatively related to continuance and normative commitment, managers are advised to foster teamwork, collaboration, and knowledge sharing, while maintaining professional accountability.

Programs that encourage collective problem-solving and ethical collaboration can strengthen organizational identification without undermining accountability. For example, cross-departmental projects can promote collaboration while ensuring that financial responsibilities are managed ethically. Managers should also recognize and reward employees who contribute to a positive workplace culture, reinforcing the value of social relationships alongside responsibility and self-belief. Ethical leadership is critical for embedding IWE into organizational culture. Leaders should model ethical behavior, demonstrating integrity, transparency, and accountability in their actions. Open communication, developmental feedback, and recognition of ethical conduct can foster trust and commitment among employees. Leadership development programs should emphasize the role of ethics in decision-making, encouraging leaders to align organizational practices with Islamic values. By modeling ethical behavior, leaders can inspire employees to internalize IWE principles, strengthening organizational commitment.

At the policy level, integrating IWE into governance reforms can enhance transparency and accountability in the public sector. Malaysia's ongoing efforts to strengthen public-sector governance can benefit from incorporating Islamic ethical values into training programs, performance evaluations, and organizational policies. For example, the Public Service Department (PSD) can develop guidelines that emphasize responsibility, self-belief, and social relationships as core values for public-sector employees. These guidelines can be integrated into competency frameworks, ensuring that ethical values are reinforced throughout employees' careers.

Future studies could extend this research in several ways. First, longitudinal designs would provide stronger evidence of the temporal relationship between IWE and organizational commitment. Second, qualitative studies could explore employees' lived experiences of IWE, offering deeper insights into how ethical values shape commitment. Third, cross-cultural comparisons could examine whether the findings are consistent

across different organizational and cultural contexts.

Conclusion

This study examined the relationship between the dimensions of Islamic Work Ethics and organizational commitment among Muslim employees in the finance departments of Malaysian public-sector organisations. Based on the assessment of the measurement model analysis findings, it can be summarized that all the constructs met the recommended criteria for reliability and validity. Specifically, the indicators exhibit satisfactory factor loadings, composite reliability, Cronbach's alpha, and average variance extracted (AVE), confirming adequate internal consistency, convergent validity, and discriminant validity. Thus, the measurement model was considered reliable and valid for subsequent structural model analysis. In contrast, the results demonstrate that IWE responsibility, self-belief, and social relationships contribute to the different results of organisational commitment. IWE responsibility has shown the most positive dimensions in its relationship with affective, continuance, and normative commitment towards Islamic Work Ethics and organisational commitment. Besides, all relationships between the IWE social relationship and the three dimensions of organisational commitment were negative. These dimensions serve as guidelines for employees to understand the Islamic Work Ethics and foster stronger organisational commitment. The findings of this study are particularly relevant due to the limited empirical evidence on the individual dimensions of Islamic Work Ethics in the Malaysian Public Sector. However, the managerial perspective focuses on the value of developing responsibility, accountability, integrity, and *amanah* since it is part of the organisational culture. These values can be strengthened alongside employee development and ethical leadership, which may help the organization cultivate a more committed and ethically responsible workforce. Overall, this study contributes empirical evidence to the existing literature with practical implications for public sector organizations to strengthen employee commitment through the promotion of ethical workplace practices.

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Factors Influencing Behavioral Intention to Use the System (MYIMMS) Among Immigration Officers

Engku Sharil Azwar Engku Razaliabd Hamid[1], *Syarifah Mastura Syed Abu Bakar[2],
Dayang Nailul Munna Abang Abdullah[2]
[1]Jabatan Imigresen Malaysia Negeri Sembilan, Wisma Persekutuan, Jalan Dato' Abdul Kadir, Seremban, Negeri Sembilan, Malaysia
[2]Faculty of Business and Management, Universiti Teknologi MARA, Puncak Alam Campus, Kuala Selangor, Selangor, Malaysia
Email: sharilazwar@imi.gov.my, *syarifahmastura@uitm.edu.my, nailul@uitm.edu.my
Corresponding Author: Dr Syarifah Mastura Syed Abu Bakar

Abstract: The low level of employees' behavioral intention to use digital systems has been the reason why many digital systems in the Malaysian public sector have failed. This misalignment is very important in frontline enforcement agencies such as the Malaysia Immigration Department. Technology uptake is affected by poor training, age diversity, and the complexity of interfaces, with a lack of knowledge on how these affect system acceptance. This article explores the relationship between perceived system complexity, age diversity, user attitude, and e-supervision on immigration officers' behavioral intention to use the MYIMMS system, drawing on the Technology Acceptance Model (TAM), UTAUT/UTAUT2, and Innovation Diffusion Theory (IDT). The study adopts a quantitative, cross-sectional survey design, using a structured questionnaire to collect primary data from immigration officers, to be analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM).

Keywords: *Behavioral Intention, Perceived System Complexity, Age Diversity, User Attitude, E-Supervision*

1. Introduction

Digitalization of public sector services has become a strategic priority for governments seeking to improve efficiency, transparency, and service quality. Technology-based supervision systems are increasingly deployed to monitor work processes, support supervisory functions, and enhance accountability within public organizations. However, successful implementation does not depend solely on technological availability; it also hinges on employees' behavioral intention to use the system. Even well-designed systems may fail to deliver expected benefits if employees perceive them as complex, misaligned with their attitudes, or poorly adapted to the demographic realities of the workforce.

Perceived system complexity is a key cognitive factor shaping employees' willingness to adopt new technologies. When users perceive an e-supervision system as difficult to understand or operate, they may feel overwhelmed and resist engaging with it in daily tasks, reducing confidence and increasing anxiety and thereby weakening behavioral intention. Systems perceived as user-friendly and intuitive, in contrast, are more likely to foster positive user experiences and sustained use.

Workforce characteristics such as age diversity also influence behavioral intention. Public organizations comprise employees from multiple age cohorts with different levels of digital literacy, work experience, and expectations toward technology. Younger employees may be more comfortable experimenting with new digital tools, whereas older employees may prefer established routines and require more structured support, shaping how different groups respond to the system's introduction.

Attitude toward the system is another crucial factor. Employees who view e-supervision positively — as beneficial, useful, and aligned with organizational goals are more likely to integrate it into their work practices. Conversely, if employees associate the system with increased surveillance, loss of autonomy, or added workload, they may develop negative attitudes that reduce their willingness to use it. These attitudes are shaped by prior experiences with technology, organizational culture, and how management communicates and implements the system.

Against this backdrop, the adoption of e-supervision within the Malaysia Immigration Department is a particularly relevant context. As a frontline agency responsible for border control, immigration services, and

enforcement, the department operates in a highly regulated, security-sensitive environment where effective supervision is critical. The e-supervision system MYIMMS aims to enhance monitoring, coordination and accountability across diverse units and locations. However, the department's workforce is characterized by varying technological readiness, age diversity, and prior experience with digital systems, which may influence how employees perceive the system's complexity, form attitudes toward its use, and ultimately decide whether to use it. Understanding these dynamics can inform more effective implementation strategies for digital supervision initiatives in the public sector.

The objective of this study is to examine how perceived complexity, age diversity, attitude, and e-supervision influence immigration officers' behavioral intention to use MYIMMS. Specifically, the study seeks: (RO1) to examine the relationship between perceived complexity and behavioral intention; (RO2) to examine the relationship between age diversity and behavioral intention; (RO3) to examine the relationship between attitude toward the system and behavioral intention; and (RO4) to examine the relationship between e-supervision and behavioral intention. These objectives are measurable with quantitative survey data using validated scales for each construct and can be tested simultaneously using structural equation modeling (SEM), ensuring alignment between the conceptual framework and methodology.

Background of Study

The increasing digitalization of public services has led governments worldwide to adopt electronic systems to enhance efficiency, transparency, and accountability, including in supervision and performance monitoring. Recent studies in public-sector digital transformation show that employees' behavioral intention to use such systems is a critical determinant of successful implementation, as even well-designed technologies may fail when users perceive them as difficult, misaligned with work practices, or unsupportive of their needs (Johari & Supiandi, 2025; Omer et al., 2022). Behavioral intention is commonly conceptualized as an individual's readiness or plan to use a system, which in turn predicts actual usage behavior (Davis, 1989; Venkatesh et al., 2003). Understanding its determinants is therefore essential to ensure investments in digital tools translate into sustained, effective use.

Perceived system complexity is one factor that can facilitate or hinder intention to use technology-based systems. Studies drawing on TAM and IDT indicate that when users view a system as complex or difficult to use, they form negative beliefs about its usefulness and ease of use, reducing intention to adopt it (Rogers, 2003; Liu et al., 2025). Empirical work in public and quasi-public organizations finds high perceived complexity associated with lower behavioral intention and actual use, particularly when training or support is limited (Nadeem et al., 2022; Liu et al., 2025). In e-supervision, complex interfaces and unclear procedures can increase cognitive load and anxiety, discouraging reliance on the system.

Age diversity within the workforce shapes how different cohorts approach technology adoption. Drawing on UTAUT, several studies highlight that age moderates the relationships between key determinants: effort expectancy, social influence, facilitating conditions and behavioral intention (Venkatesh et al., 2003; Ali et al., 2025). Evidence from Asian public-sector contexts suggests younger employees tend to be more open to experimenting with new systems, while older employees rely on established habits and require more targeted support, leading to generational gaps in adoption (Ali et al., 2025; Nadeem et al., 2022). These differences can influence peer norms and support related to e-supervision, affecting overall behavioral intention.

Attitude toward the system, conceptualized within TAM as a positive or negative evaluative feeling about using a technology, also plays a pivotal role. Employees' attitudes are influenced by perceived usefulness, ease of use, and habit, as repeated exposure to similar systems can strengthen or weaken favorable attitudes (Omer et al., 2022; Ali et al., 2025). In public-service settings, attitudes are further shaped by perceptions of surveillance, workload, fairness, and trust in management; when e-supervision is perceived as supportive rather than punitive, employees are more likely to develop positive attitudes and stronger intentions to use it (Johari & Supiandi, 2025; Omer et al., 2022).

E-supervision systems are increasingly viewed not only as monitoring tools but as platforms supporting learning, feedback, and professional development. When e-supervision integrates clear guidelines, structured training, and ongoing support, users report greater confidence and higher behavioral intention (Johari &

Supiandi, 2025; Nadeem et al., 2022). These benefits depend on alignment between system design, organizational culture, and user characteristics.

Despite growing research on technology acceptance in public-sector organizations, a notable gap remains in empirical studies on behavioral intention to use e-supervision systems within the Malaysian Immigration Department. Existing studies primarily examine general e-government services, HR information systems, or digital reporting platforms without specifically addressing perceived complexity, age diversity, attitude, and e-supervision in the immigration context (Johari & Supiandi, 2025; Omer et al., 2022; Ali et al., 2025), which is significant given the department's frontline role and diverse workforce.

The predictive validity of behavioral intention has been well established with regard to actual usage behavior. Thompson et al. (2025) found behavioral intention toward using artificial intelligence tools to be a significant predictor of actual use, and Park et al., (2025) reported that baseline behavioral intention strongly predicted actual e-commerce platform use across time periods. Ahmed et al. (2022) validated behavioral intention against actual adoption of IoT devices among 450 respondents tracked over 8 months, achieving 78% classification accuracy consistent across demographic groups. These findings are echoed by the meta-analytical work of Toraman & Gecit (2023) and corroborated by Singh et al. (2024), who found predictive validity coefficients consistently exceeding 0.65 in longitudinal technology adoption studies and confirmed that this predictive validity remains consistent across cultural contexts and technology types across 15 countries.

Practically, several factors undermine employees' behavioral intention to use e-supervision systems: perceived complexity from unintuitive interfaces (Nadeem et al., 2022; Liu et al., 2025); an age-diverse workforce responding unevenly to new systems (Ali et al., 2025); attitudes shaped by perceptions of usefulness, fairness, surveillance, and workload (Omer et al.,2022; Johari & Supiandi, 2025); and limited or inconsistent training (Nadeem et al., 2022). TAM, UTAUT, and IDT-based studies confirm ease of use, effort expectancy, and complexity as important predictors of behavioral intention in public-sector ICT initiatives (Venkatesh et al., 2003; Rogers, 2003), yet there is limited integration of these four factors within a single model in a high-stakes enforcement context. This gap underlies the core problem this study addresses: the lack of a comprehensive, empirically grounded understanding of the determinants of behavioral intention to use MYIMMS in this critical public agency (Omer et al.,2022; Johari & Supiandi, 2025; Ali et al., 2025).

2. Literature Review

Overview

This section reviews the literature relevant to the factors that influence immigration officers' behavioral intention to use the system in the Malaysia Immigration Department, discussing the major constructs, theories, and prior research explaining acceptance or rejection of a specific system: perceived system complexity, age diversity, attitude, e-supervision, and behavioral intention. The thematic review moves from general theoretical notions to specific evidence on the determinants of behavioral intention, supporting comparison across studies, identification of gaps, and development of the conceptual framework and hypotheses tested in this study.

Behavioral Intention to Use the System

Behavioral intention is widely defined as an individual's conscious decision or willingness to engage in a specific behavior in the future here, using a specific information system. In technology adoption research it is considered the immediate antecedent of actual use, expressed as a desire to use a technology shaped by positive attitudes, beliefs, and context (Venkatesh et al., 2003). Its significance rests on empirical evidence of reliability in predicting technology use: TAM intention variables explain behavioral intention more consistently than usage itself and intention remains a crucial construct for understanding users' decision-making (Dwivedi et al., 2023).

Empirical studies from 2022–2024 reinforce this role. Chen et al. (2022) found perceived usefulness, ease of use, and hedonic motivation significantly shaped intention to use media kiosks, which in turn predicted further use. Dwivedi et al. (2023) noted that understanding intention is crucial for organizations planning technology interventions, helping predict resistance or underutilization — although intention does not always predict

actual use where structural barriers exist. Accordingly, this study defines behavioral intention as immigration officers' self-reported willingness and plans to use MYIMMS in their daily work, evaluated through survey items on officers' plans to initiate, sustain, or expand their use of the system.

Perceived System Complexity

Perceived system complexity is the extent to which a user believes a system is complex to understand, learn, or operate. Complexity is regarded in the technology adoption literature as a negative attribute of an innovation, consistent with IDT's framing of complexity as affecting adoption rate and probability. Recent reviews highlight that perceptions of effort remain critical in shaping acceptance, especially when users must change existing work practices (Sánchez-Prieto et al., 2023), while public-sector transformation studies show legacy systems, resistance to change, and limited digital skills make new technologies harder to use, negatively affecting adoption outcomes (Rekunenko et al., 2025).

Empirical research from 2024–2026 remains consistent with this negative relationship. A 2024 study of digital technology adoption among innovative SMEs found complexity to have a negative effect on adoption intention (Awa et al., 2024). Rekunenko et al. (2025) found change resistance, legacy systems, and limited digital competence heighten practical complexity and hinder change implementation in government management, while a 2026 study of public-sector AI adoption in the Philippines found complexity continues to influence willingness to adopt technology after implementation (Abenes et al., 2026). These findings apply to immigration officers operating in a structured, high-responsibility environment; perceived complexity is treated here as a critical factor potentially eroding officers' behavioral intention to use MYIMMS.

Age Diversity

Age diversity refers to the presence of individuals across ages or generations within an organization, resulting in differences in experience, digital literacy, learning style, and attitudes toward technological change. Recent studies highlight age as a key factor shaping behavioral intention and actual adoption, not merely a background characteristic (Fazi & Zaniboni, 2025; Morris & Venkatesh, 2000). Younger workers are often more willing to experiment with digital tools, while older workers may prefer familiar processes and structured support; Fazi and Zaniboni (2025) found differences across performance expectancy, effort expectancy, social influence, facilitating conditions, and attitude by age, while Morris and Venkatesh (2000) found that attitude more strongly influences younger workers' adoption decisions, whereas subjective norms and perceived behavioral control more strongly affect older workers.

Literature from 2022–2026 confirms age-related technology readiness remains a significant adoption challenge. A study of older adults' willingness to use digital devices found that facilitating conditions, effort expectancy, and trust — not age alone — determine readiness (Li et al., 2024). Age diversity is particularly relevant to the Malaysia Immigration Department, whose officers have varying digital exposure and confidence with the system; generational differences may shape behavioral intention through varying levels of readiness, acceptance, and dependence on training or organizational support.

User Attitude

User attitude toward technology use is the global positive or negative judgment of using a specific technology, reflecting a cognitive evaluation of whether the system is beneficial, desirable, or burdensome, and serving as a psychological link between technology beliefs and intention to use (Yeng & Phillips, 2023; Miah et al., 2024). Employees develop positive attitudes and stronger intentions when a system is useful, manageable, and fits their jobs, but negative attitudes emerge when the system is associated with stress, over-monitoring, or disruption of routines. A study of public-sector managers' intention to use artificial intelligence found psychological and organizational perceptions significantly influenced intention (Al-Harbi et al., 2024), while studies of mandatory technology adoption found managers' behavioral intention is still influenced by attitude even when adoption is required (Rahman et al., 2024).

Empirical work from 2022–2026 corroborates attitude's impact on intention. Yeng and Phillips (2023) found behavioral factors significantly affected government employees' intention to use e-government services. Rahman et al. (2024) found managers' acceptance of a complex mandatory system was strongly linked to their perception of the technology in practice, and Al-Harbi et al. (2024) found public-sector managers' intention to

adopt AI systems was strongly influenced by human and organizational considerations. Attitude is particularly important for this study: officers who see MYIMMS as useful and supportive are expected to establish a positive attitude that increases behavioral intention, while officers who consider it intrusive or burdensome are expected to develop a negative attitude that reduces willingness to use it.

E-Supervision

E-supervision is the integration of digital technologies to aid supervisory duties such as monitoring work, giving feedback, recording performance, and communicating with employees. It extends beyond observation to developmental aspects such as coaching, learning support, and digital records management; recent literature situates e-supervision within the broader trend toward technology-based supervision that makes tasks more responsive, consistent, and accountable rather than merely watched (Taani et al., 2026; Sulaiman et al., 2024). Research on supervision in the digital age found digital platforms improved supervisory efficiency by supporting real-time feedback, collaboration, and professional development, framing digital supervision as growth rather than merely control (Sulaiman et al., 2024), while studies on electronic performance monitoring found developmental and preventive monitoring practices positively affected employee job performance when framed appropriately (Al-Harbi et al., 2024).

Conceptual and empirical work from 2022–2026 confirms e-supervision's importance in public-sector settings. Taani et al., (2026) described e-supervision as the application of online communication tools and digital platforms to facilitate continuous supervisory interaction. Sulaiman et al. (2024) found technology-based supervision increased supervisory job performance efficiency through communication and feedback loops, while Alharbi et al. (2025) showed electronic performance monitoring positively affects employee outcomes when it has developmental rather than punitive functions. This is especially significant for the department's MYIMMS system, which is designed to standardize monitoring, provide accurate records, and improve communication between officers and supervisors; officers' attitudes toward using it may hinge on whether it is perceived as guidance and performance support or as a negative monitoring tool.

Underpinning Theories

Three theories underpin this study: TAM, UTAUT/UTAUT2, and IDT. These remain widely used because they provide complementary explanations of system adoption — individual beliefs, social and organizational influences, and innovation characteristics — relevant to studies using behavioral intention as the dependent variable in organizational contexts (Alessandro, 2022; Rahman et al., 2024; Yang, Wang, & Liu et al., 2025).

TAM (Davis, 1989) explains user acceptance through two beliefs — perceived usefulness and perceived ease of use — which affect user attitude, which in turn affects behavioral intention and use behavior. Recent studies confirm perceived ease of use, usefulness, and attitude remain key predictors of intention to use work-related technologies (Vui et al., 2022). TAM was selected because perceived system complexity can be regarded as the opposite of ease of use, and attitude is explicitly incorporated as the psychological channel between complexity and behavioral intention.

UTAUT proposes that performance expectancy, effort expectancy, social influence, and facilitating conditions are key determinants of behavioral intention, while UTAUT2 adds hedonic motivation, price value, and habit; both recognize moderators such as age, gender, and experience, making them useful for examining technology adoption in age-diverse workforces (Rahman et al., 2024; Yang et al., 2023). This theory is suitable because age diversity is one of the independent variables; UTAUT/UTAUT2 explains why different age groups may react differently through effort expectancy, facilitating conditions, and habit.

Rogers' IDT examines characteristics of innovation relatively advantage, compatibility, complexity, trialability, and observability that affect adoption likelihood. Complexity is especially relevant since perceptions of complexity and usability influence technology adoption (Alessandro, 2022). IDT is appropriate here because perceived system complexity, one of the key explanatory variables is central to the theory.

Combined, TAM, UTAUT2, and IDT provide a solid theoretical base: TAM explains how perceptions and attitudes influence intention, UTAUT2 captures demographic variables such as age, and IDT explains how complex systems affect adoption decisions.

Empirical Review

Empirical studies from 2022–2026 confirm behavioral intention remains a key determinant in technology adoption, particularly in public-sector contexts where digital transformation success depends on users' willingness to adopt new systems, lending credence to the premise that individual perceptions, age differences, attitude, and supervisory practices can all affect immigration officers' intention to use an e-supervision system (Yeng & Phillips, 2023; Alatawi et al., 2022; Public First, 2026).

Perceptions of ease of use, effort expectancy and technological readiness significantly affect behavioral intention. Alatawi et al. (2022) found UTAUT factors and trust significantly affected both behavioral intention and e-government use behavior, while recent digital government studies found technology readiness, performance expectancy, and effort expectancy to be the most important predictors of public technology use (Abdullah et al., 2024). Yeng and Phillips (2023) demonstrated that government employees' behavioral intention to adopt e-government services is influenced by behavioral and contextual factors, while the Public Sector AI Adoption Index (Public First, 2026) found confidence, access, training, and leadership support to be powerful drivers of employee readiness. Even when employees recognize a system's value, however, lack of training and insufficient organizational support can limit widespread adoption (Abdullah et al., 2024; Public First, 2026). Relatively few empirical studies combine perceived complexity, age diversity, attitude, and e-supervision within a single model in a specialized enforcement environment; this study contributes to that gap by testing the influence of these four factors on immigration officers' behavioral intention to use the system.

Research Gap

Several gaps emerge from the literature. First, most research from 2022–2026 addresses e-government services, digital governance platforms, or citizen-facing technologies rather than internal supervisory tools used by employees of operational public agencies; Malaysian e-government adoption research has examined perceived usefulness, ease of use, and security but not e-supervision systems specific to immigration officers' work (Zubir & Abdul Latip, 2024), and broader public-sector technology adoption studies have not treated supervisory technologies as a distinct category (Frontiers, 2026). Second, prior research generally focuses on one or a small number of adoption variables rather than the combination examined here; most studies concentrate on perceived usefulness, trust, effort expectancy, or facilitating conditions without adequately addressing the interaction of perceived system complexity, age diversity, attitude, and e-supervision, with age diversity in particular rarely treated as an explanatory variable in its own right. Several recent Malaysian studies have found various factors affecting behavioral intention, but none have incorporated complexity, generational diversity, attitude, and e-supervision into a single model (Khan et al., 2026; Zubir & Abdul Latip, 2024).

Third, literature lacks attention to population and institutional context. Adoption studies generally focus on citizens, teachers, or government managers, with few examining immigration officers, who possess high accountability, procedural discipline, and security sensitivity. Recent smart-government research confirms the significant role of institutional determinants in officials' technology adoption but cautions that results cannot be generalized across organizations with different roles and tasks — a significant knowledge gap for the Malaysia Immigration Department. This study addresses that gap by investigating the interaction between perceived system complexity, age diversity, attitude, and e-supervision on immigration officers' behavioral intention, responding to the context-specific research called for by recent scholarship (Khan et al., 2026; Zubir & Abdul Latip, 2024).

Hypotheses Development

This study proposes a model in which perceived system complexity, age diversity, attitude, and e-supervision serve as independent variables, with behavioral intention as the dependent variable, grounded in TAM, UTAUT2, and IDT (Fazi & Zaniboni, 2025; Shareef et al., 2024; Huang et al., 2023).

Perceived system complexity is predicted to negatively affect behavioral intention. Based on IDT, technologies that are difficult to understand, learn, or operate are less likely to be adopted, as they involve more effort, uncertainty, and risk (Shareef et al., 2024).

H1: *There is a significant relationship between perceived system complexity and the behavioral intention to use MYIMMS among immigration officers. H0: There is no significant relationship between perceived system*

complexity and the behavioral intention to use MYIMMS among immigration officers.
Age diversity may affect behavioral intention because employees from different age groups have different technology readiness, effort expectations, learning preferences, and work habits (Fazi & Zaniboni, 2025).
H2: *There is a significant relationship between age diversity and the behavioral intention to use MYIMMS among immigration officers. H0: There is no significant relationship between age diversity and the behavioral intention to use MYIMMS among immigration officers.*

User attitude is expected to have a positive relationship with behavioral intention. TAM proposes that positive attitudes toward a system lead to higher intention to use it, and Huang et al. (2023) found user attitude played a crucial role in intention to join a technology-mediated work arrangement.
H3: *There is a significant relationship between attitude toward the system and behavioral intention to use MYIMMS among immigration officers. H0: There is no significant relationship between attitude toward the system and the behavioral intention to use MYIMMS among immigration officers.*

E-supervision is expected to have a positive relationship with behavioral intention, since supportive supervisory technologies can improve communication, monitoring clarity, and learning opportunities (Shareef et al., 2024; Fazi & Zaniboni, 2025).
H4: *There is a significant relationship between e-supervision and the behavioral intention to use MYIMMS among immigration officers. H0: There is no significant relationship between e-supervision and the behavioral intention to use MYIMMS among immigration officers.*

3. Conceptual Framework

The conceptual framework positions perceived system complexity, age diversity, attitude, and e-supervision as independent variables, with behavioral intention as the dependent variable, built on TAM, UTAUT/UTAUT2, and IDT — indicating that technology adoption is a function of user perceptions, demographic differences, evaluative attitudes, and contextual support mechanisms (Fazi & Zaniboni, 2025; Uzochukwu & Nwoye, 2026; Adewale & Ndwandwe, 2025). Perceived system complexity is hypothesized to negatively affect behavioral intention, consistent with IDT's premise that hard-to-understand technologies are less accepted. Age diversity is included on the assumption that readiness, confidence, adaptability, and technology expectations differ across age groups, affecting how easily officers adjust to the system (Fazi & Zaniboni, 2025).

Attitude is hypothesized to relate positively to behavioral intention, consistent with TAM's contention that positive attitudes increase intention to use technology. E-supervision — the use of the digital system to supervise, monitor, coordinate, provide feedback, and support work-related issues — is also expected to positively affect behavioral intention, as technology is more readily accepted when seen as improving supervisory processes; studies in supervisory and educational e-supervision settings have found acceptance is influenced by perceived usefulness and enabling conditions (Adewale & Ndwandwe, 2025), while research on supervisory agencies suggests institutional support, training, and facilitating conditions play a positive role in technology-related outcomes (Uzochukwu & Nwoye, 2026).

Overall, the framework conveys that behavioral intention to use the system is shaped jointly by technological, demographic, psychological, and supervisory factors, forming a unified foundation for the four hypotheses tested with quantitative data collected from immigration officers of the Malaysia Immigration Department.

4. Methodology

Introduction and Rationale

Research methodology offers a structured system to examine phenomena, test hypotheses, and generate dependable knowledge. Research is a sequence of planned and executed steps aimed at answering a problem of interest to the researcher (Sekaran, 2003), while research design is "a blueprint or plan for the collection, measurement and analysis of data" developed to answer the research questions (Sekaran & Bougie, 2016). Quantitative survey methods, particularly with structural equation modeling, are recognized in methodological literature from 2022–2026 as suitable for studying relationships among latent constructs such as perceived usefulness, complexity, attitude, and behavioral intention, and for drawing generalizable conclusions in public-

sector environments (RMIT University Library, 2019; Taherdoost & Madanchian, 2023). This reflects the rationale for the present study, which applies a structured questionnaire and SEM-based analysis to test relationships among perceived system complexity, age diversity, attitude, e-supervision, and behavioral intention, aligned with recent studies using structured questionnaires and PLS-SEM (Awa et al., 2024; Musa et al., 2025).

Research Design

Following Sekaran (2003), research design decisions rest on six interdependent elements. In terms of purpose, this study combines a descriptive and hypothesis-testing design: descriptive elements profile the characteristics of immigration officers, while hypothesis testing follows a deductive approach to statistically validate propositions derived from TAM, UTAUT, and IDT. The study adopts a correlational design rather than a causal one, consistent with the prevailing approach in organizational and management research where variables cannot ethically or practically be manipulated (Sekaran, 2003; Creswell, 2014).

This study involves minimal researcher interference, as data are gathered from respondents completing questionnaires without manipulation of their natural work environment. The study setting is non-contrived (field), since data collection occurs within the natural environment of the Malaysia Immigration Department. The unit of analysis is the individual employee; although several constructs are organizational in nature, they are operationalized and measured based on individual employees' perceptions, and each respondent represents one unit of analysis. The time horizon is cross-sectional: data are collected once, providing a snapshot of conditions at a given point — the most convenient and economical design for thesis research given time and resource constraints (Sekaran, 2003).

Population, Sample and Sampling Technique

The population comprises all employees from six divisions of the Malaysia Immigration Department — Passport, Visa and Pass, Foreign Worker, Corporate, Enforcement, and Controller, totaling 150 employees (25, 15, 15, 15, 35, and 45 respectively). Based on the Krejcie and Morgan (1970) table for determining sample size, a population of 150 requires a sample size of 108. Using proportionate stratified sampling, the 108 respondents are allocated as 19, 10, 10, 10, 27, and 32 across the same six divisions, respectively.

The sampling technique adopted is probability sampling, specifically proportionate stratified random sampling, in which the total population is divided into strata before sampling. This method is appropriate for a large population of defined size, allowing every element a known, non-zero chance of selection and enabling generalization of findings to the broader population.

Data Collection Method and Instrument

Primary data, raw information obtained first-hand by the researcher (Sekaran & Bougie, 2016) , will be collected using a structured questionnaire comprising six sections. Section A captures demographic background: gender, age, education level, years of service, current position, division/unit, and frequency of system use. Sections B through F each measure one construct using 13 items per section, answered on a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree) (Likert, 1932): Section B measures Perceived System Complexity, Section C measures Age Diversity, Section D measures User Attitude, Section E measures E-Supervision, and Section F measures the dependent variable, Behavioral Intention. Item development draws on established sources aligned with the literature review: Rogers (2003), Moore and Benbasat (1991), and Overbye-Thompson and Hamilton (2025) for perceived complexity; Morris and Venkatesh (2000) and the Central Baltic Program (2023) for age diversity; Davis (1989) and Peng et al. (2022) for user attitude; Venkatesh et al. (2003) and Li et al. (2026) for e-supervision and UTAUT2, Mensah and Khan (2024), for behavioral intention.

Following Sekaran's (2003) guidelines, the instrument emphasizes clarity, avoidance of leading or ambiguous questions, logical sequencing, and protection of respondent anonymity. The Likert scale operates at the interval level, permitting calculation of means and standard deviations, and remains the most widely used scale in management and social science research.

5. Pre-Test, Pilot Test and Validity

The study begins with a pre-test to identify concerns such as ambiguous wording, followed by a pilot study to ensure items are sensitive to respondents' language and culture, particularly for attitudinal measures (Sekaran & Bougie, 2016). The pilot test was conducted with 50 respondents from the banking industry, with data analyzed using SPSS Version 27 to assess Cronbach's Alpha for each construct's 13 items across the four independent variables and the dependent variable. Following George and Mallery (2016), a Cronbach's Alpha closer to 1.00 indicates greater internal consistency, with an acceptable reliability threshold of 0.70; all items in the pilot test were found reliable and suitable for further field data collection.

Validity — the ability of a measuring instrument to measure what it is intended to measure, was assessed with the assistance of a subject-matter expert, the study's supervisor, to ensure questionnaire quality and accuracy (Sekaran & Bougie, 2016; Creswell, 2014). At the full data-collection stage, the measurement model will also be assessed through Cronbach's alpha, composite reliability, convergent validity (average variance extracted), and discriminant validity (HTMT), ensuring each construct is measured consistently with the conceptual framework.

Data Analysis

Data analysis is the process of interrogating, transforming, and modelling data to highlight useful information and support decision-making. This study analyses quantitative data using IBM SPSS Version 27 for frequency, reliability, and descriptive analysis, with each item coded prior to statistical treatment. Frequency analysis provides counts, percentages, and measures of central tendency and dispersion for demographic data. Reliability analysis, via Cronbach's Alpha, determines internal consistency of the instrument; the generally accepted threshold is $\alpha \geq 0.70$, with 0.80 and above considered good and 0.90 and above excellent (Sekaran & Bougie, 2003). Descriptive analysis reports the maximum, minimum, mean, standard deviation and variance to accurately depict respondents ' responses.

Correlation analysis determines the strength of relationships between the independent and dependent variables, interpreted using conventional thresholds ranging from little or no correlation (0.00–0.30) to very high positive correlation (0.90–1.00) (Sekaran & Bougie, 2003). Regression analysis, and ultimately Partial Least Squares Structural Equation Modeling (PLS-SEM), will estimate the relationships between the four independent variables and behavioral intentions, assessing the strength and direction of these effects in testing H1 through H4.

Ethical Considerations

Ethical approval will be sought from UiTM prior to data collection, focusing on informed consent, confidentiality, voluntary participation, and data protection. An information sheet will explain the study's purpose, what participation involves, its voluntary nature, and confidentiality measures. Consent is operationalized through the survey process, whereby submission of the completed questionnaire is treated as evidence of informed consent. No personally identifiable information will be collected; responses will be processed using numerical codes, and participation is voluntary, with respondents free to withdraw at any time without penalty. Electronic data will be stored in a password-protected file accessible only to the research team, while physical data will be kept in secure storage and destroyed in a manner consistent with institutional standards.

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The Impact of Digital Financial Inclusion on Financial Decision-Making and Economic Well-Being

*Azitadoly Mohd Arifin[1], Soo-Cheng Chuah[1], Afiza Azura Mohamad Arshad[1], Roslilee Ab Halim[1], Theng-Huey Goh[2]
[1]Faculty of Business and Management, Universiti Teknologi MARA (UiTM), Puncak Alam Campus, Selangor, Malaysia
[2]Tunku Puteri Intan Safinaz School of Accountancy, Universiti Utara Malaysia, Kedah, Malaysia
Email: *doly@uitm.edu.my, chuahsc@uitm.edu.my, afiza400@uitm.edu.my, roslilee@uitm.edu.my, goh_theng_huey2@tissa.uum.edu.my
Corresponding Author: Azitadoly Mohd Arifin

Abstract: Digital financial inclusion has improved accessibility to financial services, which can improve financial decision-making and economic well-being. DFI lowers traditional barriers to formal finance and fosters broader participation in economic activities, particularly among underserved groups. This study examines the impact of digital financial inclusion on financial decision-making and economic well-being. Data collection was conducted in Klang Valley and analyzed using regression analysis. A total of 265 valid responses were obtained from individuals with experience using digital financial services, including mobile banking, e-wallets, and online payment platforms. Analysis results indicate that higher digital financial inclusion enhances individuals' financial decision-making and economic well-being. The findings suggest that access to digital financial services enables individuals to obtain financial information, monitor transactions, manage spending, support saving and improve financial planning. In addition, digital financial inclusion contributes to financial security and resilience by facilitating easier payments, savings and access to financial services. The findings of this study inform policy by bridging the knowledge gap, enhancing digital and financial literacy, creating robust consumer protection and regulatory frameworks and ensuring universal access to reliable and affordable digital infrastructure.

Keywords: *Digital financial inclusion, Financial decision-making, Economic well-being*

1. Introduction

Digital transformation affects financial services as people manage money, make their own financial decisions, and plan their finances. According to Ozili (2021), digital platforms make financial transactions more convenient and cost-effective and reduce structural barriers as compared to traditional banking models. The adoption of digital technologies such as smartphones and other fintech innovations collectively expands households' access to formal financial products and services, thus increasing financial inclusion and inclusive economic growth (Demirgüç-Kunt et al., 2022). Digital financial inclusion (DFI) enables more people to use and access digital financial services easily and at minimal cost.

Digital financial inclusion influences how people make financial decisions. These decisions include budgeting, savings, borrowing and managing financial risks (Lusardi & Mitchell, 2014). According to Klapper & Ansar (2021), individuals use digital financial platforms to monitor their transaction records, receive reminders, and use automated tools to improve financial decision-making. DFI enhances the cognitive and behavioral processes involving individual financial decision-making as well as the accessibility of financial services.

Being part of economic well-being, financial inclusion comprises income adequacy, financial security, resilience to shocks, and individuals' subjective perceptions of their financial circumstances. (Netemeyer et al., 2018). With digital finance it makes spending smoother, enables faster fund transfers and improves money and income generation (Suri & Jack, 2016). World Bank (2022) recognizes DFI as a tool in reducing poverty and promoting shared prosperity. Nevertheless, besides the advantages, digital finance presents several challenges such as digital disparities, cybersecurity risks and the risk that easy access to digital credit may encourage excessive borrowing and unsustainable debt accumulation (Bazarbash & Beaton, 2020).

Malaysia's financial system and economic life have increasingly integrated with digital finance. Malaysians now incorporate digital technologies into their everyday lives. For instance, 95% of Malaysians utilize e-wallet apps, while 73% of Malaysian consumers have adopted digital banking services. This performance in the digital

economy is supported by strong ICT usage and sophisticated digital infrastructure. DFI in Malaysia has a strong basis in both supply-side and demand-side advancements.

However, despite DFI growth, there are currently insufficient empirical studies on the relationship between DFI and financial decision-making and economic well-being. Fewer studies looking into the aspect of how digital inclusion influences people's financial behavior and well-being because most of the studies focus on adoption factors or macro- level effects. This study aims to investigate whether a higher level of DFI is associated with better financial decision-making and improved economic well-being.

2. Literature Review

DFI impacts economic outcomes by improving financial capabilities. Digital finance enhances individuals' ability to manage resources efficiently by minimizing transaction frictions and expanding choice. DFI enhances progress by extending market reach, augmenting operational efficiency, streamlining transactions, maximizing the value of financial activities, and expanding access to funding (Tandilino et al., 2025). Owning a financial account and using digital payments leads to better money management and more savings (Klapper and Ansar, 2021). Fintech users in Asia demonstrated superior financial management skills and enhanced financial satisfaction (Morgan et al., 2019).

This is supported by Behavioral Finance Theory (Statman, 1999) that explained how individuals make financial decisions under limited knowledge with cognitive constraints and behavioral biases. From the context of DFI, this theory gives insights into how people's financial decision-making may be impacted by digital access to financial services.

Financial digital services can change decision-making contexts. Real-time account balances and transactions can support efficient budgeting (Klapper & Ansar, 2021). Goal-based savings and automated payments can reduce delayed payments and increase self-control (Thaler, 2021). Third, digital records enable people to trace past choices and make future plans.

3. Methodology

This is a quantitative study using a structured self-administered questionnaire by applying non-probability purposive sampling to collect data in Klang Valley. The target population is individuals with experience using digital financial services such as mobile banking, e-wallets, and online payments. A total of 265 valid questionnaires were retained. The questionnaire items were developed based on established literature and were measured on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). Nine DFI measurement items were adopted from Naumenkova et al. (2019). Measurement items for FWB (3 items) and EDM (3 items) were adopted from Al-Afeef and Alsmadi (2025).

Internal consistency reliability of each construct was assessed using Cronbach's alpha as shown in Table 1. All constructs exceeded the recommended threshold of 0.70 as recommended by Hair et al. (2019), supporting content validity. The data analysis technique used was Ordinary Least Squares (OLS).

Table 1: Cronbach Alpha

Construct	Cronbach Alpha
Digital financial inclusion	0.774
Financial decision making	0.816
Economic well-being	0.843

4. Findings and Results

Table 2 presents the demographic characteristics of the respondents in the study. This overview offers a clearer understanding of the participants' background and sample composition.

Table 2: Demographic Analysis (N=265)

	Frequency	Percent (%)
Gender		
Female	149	56.2
Male	116	43.8
Age		
20 - 29 years old	152	57.4
30 - 39 years old	58	21.9
40 - 49 years old	36	13.6
50 - 59 years old	16	6.0
60 years old and above	3	1.1
Education Level		
Primary school	1	0.4
Secondary school	25	9.4
Diploma	53	20.0
Bachelor degree	164	61.9
Postgraduate	22	8.3
Household Monthly Income		
less than RM3000	79	29.8
RM3001 - RM5000	82	30.9
RM5001 - RM7000	37	14.0
RM7001 - RM9000	16	6.0
RM9000 - RM11000	25	9.4
More than RM11000	26	9.8

Table 3 presents the descriptive statistics of the variables in the study. The results indicate that the level of Digital Financial Inclusion is relatively high, suggesting extensive access to and use of digital financial services. There is also considerable variation in the constructs of financial decision-making and economic well-being.

Table 3: Descriptive statistics

	Range	Minimum	Maximum	Mean	Standard deviation
DFI	4.00	1.00	5.00	4.2708	0.56600
EWB	4.00	1.00	5.00	3.8025	0.79561
FDM	4.00	1.00	5.00	3.7887	0.75196

Notes: DFI is digital financial inclusion, EWB is economic well-being, FDM is financial decision-making

The results of the correlation matrix of variables are shown in Table 4. The correlation coefficients between variables are less than 0.8, suggesting no severe multicollinearity.

Table 4: Correlation matrix

	EWB	FDM	DFI
EWB	1	.749**	.510**
FDM	.749**	1	.456**
DFI	.510**	.456**	1

** Correlation is significant at the 0.01 level (1-tailed)

Table 5 presents the results of an Ordinary Least Squares (OLS) regression on the impact of digital financial inclusion on financial decision-making and economic well-being. Financial Inclusion (DFI) has a statistically significant positive impact on Environmental Well-Being and Financial Decision-Making (FDM) with p-value < 0.001.

Table 5: Regression Analysis

Relationship	Std beta	t-value	p-value	CI LB	CI UB	R^2
DFI → EWB	0.510	9.624	p<0.001	0.571	0.864	0.260
DFI → FDM	0.456	8.311	p<0.001	0.462	0.749	0.208

The results show that digital financial inclusion has a significant positive impact on financial decision-making, indicating that well-accessed digital financial services lead to better financial decisions. Digital financial platforms enhance financial decision-making by providing individuals with better access to financial information, making transactions easier, and enabling them to monitor their finances in real time. Digital technologies such as e-wallets and mobile banking can help with budgeting, savings, and spending, improving financial discipline and planning. This can help people become more disciplined and plan better.

The findings also indicate that digital financial inclusion has a significant positive impact on economic well-being. High levels of digital financial inclusion are associated with increased financial security, income sufficiency, and resilience to financial shocks. This means that digital financial services not only change how people handle their money but also improve the economy.

This outcome aligns with the view that digital financial inclusion reduces transaction costs, expands access to savings and payment mechanisms, and enhances financial resilience. By facilitating timely payments, emergency transfers, and savings accumulation, digital financial services contribute to improved financial stability and overall economic well-being.

This supports the idea that digital financial inclusion lowers transaction costs, increases savings and payment options, and boosts financial resilience. Digital financial services improve financial stability and economic well-being by making it easier to make payments on time, transfer emergency funds, and save.

5. Conclusion and Recommendations

The empirical findings show that digital financial inclusion significantly enhances financial decision-making and economic well-being. The results imply that DFI is a tool that can help people better manage their money and feel more secure in their finances. These findings align with theories of financial inclusion and behavioral finance that access to financial resources and information enhances decision-making quality and economic outcomes.

However, the cross-sectional nature of the data limits causal inference. While the results demonstrate strong associations, future research could employ longitudinal data or experimental designs to further validate the causal pathways between digital financial inclusion and economic well-being.

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The Role of Coconut Farming in Supporting Rural Livelihoods and Its Contribution to Poverty Alleviation in Malaysia: A Review

Hashim, R.G.[1], Shakran, M.S.[2], *Janiffa Saidon[3]
[1]Agricultural Biotechnology Research Group, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[2]Perak State Farmers' Association (PPN), Perak, Malaysia
[3]Faculty of Business & Management, UiTM Cawangan Selangor, Puncak Alam, Selangor, Malaysia
Email: *janiffa@uitm.edu.my, 33myresearch@gmail.com
Corresponding Author: Janiffa Saidon

Abstract: In the tropics, coconut cultivation is a critical factor in the development of rural livelihoods, as the crop is well suited to the region. The paper looks at the socio-economic contribution of coconut farming to rural communities in Malaysia, particularly, its potential for poverty alleviation. Based on a systematic synthesis of institutional data and empirical literature, the paper explores the economic advantages of coconut production, its role in income stability and the incorporation of coconut into wider rural development strategies. The findings emphasize the significance of coconut farming as a sustainable livelihood safety net especially for smallholder farmers. However, structural constraints such as market access bottlenecks, aging crops and limited technology adoption constrain their ability to lift households above absolute poverty thresholds. In conclusion, specific policy recommendations implemented in institutional frameworks to improve the contribution of the coconut industry to national poverty reduction and rural development are provided.

Keywords: *Coconut farming, rural livelihoods, poverty alleviation, smallholder farmers, agricultural policy*

1. Introduction

Across Southeast Asian nations, coconut farming has traditionally served as a reliable livelihood for rural communities while contributing significantly to broader agrarian economies (Vista et al., 2012). In Malaysia, coconut cultivation is deeply woven into the fabric of rural life, serving as a steadfast economic anchor and a key driver of socio-economic sustainability for smallholders amid 21st-century economic volatility. In neighboring jurisdictions, agrarian transformations have been driven by shifting socio-economic aspirations and infrastructural upgrades; for instance, Philippine coconut production has been accelerated by improved infrastructure and favorable land environments (Fujii, 2005)while the Indonesian coconut sector has advanced by optimizing supply chain resilience to promote rural well-being (Nabillah et al., 2025).

In the case of Malaysia, coconut is officially listed as the country's fourth most important industrial crop, but it is frequently overshadowed by oil palm in the national policy discourse. Thus, a full socio-economic review is needed to reassess the potential of the coconut industry as a structural safety net for vulnerable rural households. Global food security has become more important, especially after pandemic-related inflation, global supply chain disruptions, and geopolitical volatility that significantly affect agricultural input costs (Malaysia, 2023). The socio-economic benefits of coconut farming in Malaysia need to be sustained and modernized. This review paper therefore assesses the current state of support for rural livelihoods by the Malaysian coconut industry, evaluates its direct contributions to poverty alleviation and informs strategic policy recommendations.

Background: Agricultural History of Coconut Farming in Malaysia

Coconut cultivation in Malaysia has transformed from a subsistence crop in the 19th century to a commercially revived industry of strategic importance, with a shift from traditional copra to high-yield hybrids and value-added downstream exports (Rosli, 2023). Malaysia is one of the top ten coconut-producing countries in the world, and coconut remains one of the important industrial crops together with oil palm, rice and rubber (Omar et al., 2023). Archaeobotanical evidence shows that coconut palms were present in Malaysian coastal areas as early as 9,000 years ago and were domesticated by early peoples for their multiple uses as food and material (Ahuja et al., 2014). In the mid-19th century, smallholders and private planters increased cultivation, with the domestic production area reaching 334,100 ha in the 1980s and then declining to around 85,630 ha in 2020 due to fierce competition for land by oil palm (Nor et al., 2020). Despite a reduction in the acreage, production

grew to 542,000 metric tons in 2020. The increase was primarily driven by smallholder farms, which make up 87% of the total national output (Pakiam, 2017).

Coconuts are an important socio-economic lifeline for an estimated 60,000-100,000 rural families, mostly concentrated in the major traditional "coconut belts" of Johor, Perak and Selangor, where 93% of cultivation is smallholder-led (Nor et al., 2025). For decades these smallholdings have been supporting household schooling, healthcare and daily sustenance, transforming marginal lands into resilient livelihood platforms (Aslinda et al., 2022; Batugal et al., 2012). In the modern agrarian economy, smallholders harvest and sell raw nuts to village collectors or middlemen who feed them to upstream processors or downstream enterprises that specialize in virgin coconut oil, coconut milk (santan), fresh coconut water, desiccated flakes, and coir to export markets such as the United States, Singapore, and China (Purba et al., 2021). However, the value chain from production to final consumption is structurally complex (Kalaipandian et al., 2024). It is therefore necessary to explore the role of coconuts in income generation and poverty alleviation during unstable economic periods so as to inform the national agricultural budgets and re-strategize the rural development masterplans.

Theoretical Framework: The Sustainable Livelihoods Approach (SLA)

In this review, the existing literature is evaluated within the framework of the Sustainable Livelihoods Approach (SLA) of the Department for International Development (DFID) (Easdale, 2026) to assess the active role of coconut cultivation in poverty alleviation. The SLA framework provides a way of exploring analytically how B40 rural households combine livelihood assets, classified as human, social, physical, financial and natural capital, to achieve economic resilience amid changing institutional contexts (Melaku, 2026; Vista et al., 2012).

Academic discourse highlights a unique asset asymmetry in Malaysian agrarian communities. Nor et al. (2020) argue that smallholders possess substantial natural capital through long-term access to land, and social capital through generations of acquired knowledge of community farming. However, the literature indicates a chronic lack of financial capital due to low farmgate prices and a drain on physical capital from under-mechanized harvesting infrastructure and aging, low-yielding palm profiles (Omar et al., 2023). Taking these vulnerabilities into account, the SLA lens accounts for the low technical efficiency scores of raw upstream production in general, despite high market demand (Nor et al., 2020). This review therefore uses the SLA framework to assess how targeted policy changes, modernization frameworks, and downstream market linkages can transform baseline smallholder assets into sustainable, long-term tools for escaping rural poverty traps (Knutsson & Ostwald, 2023; Pujiwati et al., 2025).

2. Literature Synthesis of Core Socio-Economic Variables

To systematically evaluate the capacity of the coconut industry to drive rural development, the existing literature must be unpacked through the primary variables that dictate smallholder technical efficiency, net margins, and subsequent household vulnerability thresholds.

Human Capital: Demographics, Agricultural Expertise, and Age Profiles

Human capital in Malaysia's coconut belts is a major bottleneck for innovation. Empirical evaluations show a clear socio-demographic trend: the average age of coconut smallholders is highly skewed toward the older generations, often over 55 to 60 years. This structural aging is worsened by the migration of young people (pemuda kampung) to urban centers in search of service sector jobs, leaving an aging demographic to manage long-term tree crops (Ahmad et al., 2026; Masran, 2025).

The analysis revealed a positive association between the level of formal education of a farmer, technical experience and allocative efficiency (Tossou et al., 2026). Farmers without higher secondary education or formal technical training are significantly more challenged to address complex agronomic disruptions such as lethal yellowing diseases or widespread Rhinoceros beetle (Oryctes rhinoceros) infestations (Alouw & Hosang, 2025). In contrast, baseline literacy and continuous agricultural experience result in optimized output and better risk-mitigation behaviors. This is because educated smallholders are statistically more likely to adopt modernized crop-protection and intensive farm management systems (Arumugam & Hatta, 2022; Lin, 2011).

Physical Capital: Institutional Extension Services and Technical Efficiency

Smallholder productivity gaps are strongly mediated by physical infrastructure and institutional support mechanisms (Dewi et al., 2026). The main channel for the transfer of technical knowledge in Malaysia is through the agricultural extension agents of the Department of Agriculture (DOA) and the Farmers' Organization Authority (LPP). Quantitative exploratory factor analysis (EFA) reveals that institutional factors, particularly the frequency and quality of extension agent visits, have the single most dominant influence on a smallholder's technical efficiency score (Rozhan & Rohany, 2021).

Extension visits are crucial mechanisms for transforming traditional "business as usual" cultivation into higher-yielding enterprises through specialized agronomic seminars and technical skills-building workshops (Omar et al., 2023). When extension connectivity is strong, smallholders experience rapid gains in localized technical efficiency (Omar & Fatah, 2021). Nonetheless, the general literature confirms the existence of a persisting productivity gap among key states such as Johor, primarily caused by a systemic lack of specialized machinery, erratic application of fertilizer schedules and the lack of modern technical adoption, with an average technical efficiency score that remains at a suboptimal 60% (Nor et al., 2020; Omar & Fatah, 2021).

Financial Capital: Price Volatility, Farmgate Asymmetry, and Profitability Constraints

The most volatile factor influencing absolute household poverty status is financial capital (Ao et al., 2022). Coconut production is an important part of local food security and coconut is still the most consumed fruit category in the national agri-food framework. Yet smallholders remain economically very vulnerable to extreme price volatility and asymmetric supply chain configurations (Timmer, 2025) despite this continuing macro-level demand.

Since about 90% of domestic coconut lands are smallholdings, often with parcels of less than two hectares, individual farmers are strict price takers lacking any market bargaining power (Samarakoon et al., 2023). According to the literature, middleman networks severely limit the profitability of smallholders (Nabillah et al., 2025). Unorganized upstream smallholders are compelled to sell fresh unhusked nuts to localized village collectors at depressed farmgate prices. Downstream processing corporations are almost exclusively pilfering the high-value margins of the commodity value chain (Nabillah & Fawzi, 2025).

Policy Context: The Self-Sufficiency Level (SSL) and Crop Transformation Targets

The coconut industry's broader vulnerability context is determined by national policy benchmarks. The Malaysian government under the National Agrofood Policy 2021–2030 (NAP 2.0) has identified the coconut sector as a strategic sector for national resilience with a clear national Self-Sufficiency Level (SSL) target of 83% by 2030 (Rahman et al., 2026a). However, recent institutional data show a persistent policy-performance gap, with the national coconut SSL underperforming and stagnation hovering at about 70.3%, requiring a rigid 30% structural reliance on imports (Abd Rahman et al., 2025; Rahman et al., 2026b).

System dynamics modeling indicates that this import deficit and the rising rural incomes cannot be resolved by conventional production practices. The policy interventions must be targeted and consistently include three specific elements to address the SSL deficit and increase the B40 smallholder income beyond the poverty line: (i) aggressive dissemination of high-yield hybrid seedlings (e.g., MATAG); (ii) direct financial grants to cover gestation periods; and (iii) institutional structures to maximize social capital between dispersed smallholders and centralized downstream processing networks (Rahman et al., 2026b).

3. Methodology

This paper uses a secondary data review and systematic policy synthesis approach (Aremu, 2024) to assess the socio-economic contributions of coconut smallholders to rural livelihoods and poverty alleviation in Malaysia. This approach seeks to connect macro-level national agricultural indicators with micro-level socio-economic realities reported in academic literature, recognizing that coconut cultivation is predominantly a smallholder activity.

Data Sources and Extraction Matrix

This review is based on the empirical and statistical official secondary data sets published by Malaysian government agencies and agricultural research bodies. Quantitative metrics were obtained from the Department of Statistics Malaysia (DOSM) (DOSM, 2026; DOSM-MOE, 2026) under the Ministry of Economy, and the Ministry of Agriculture and Food Security (MAFS) (Malaysia, 2023). Table 1 provides a structural mapping of the specific reports used, the variables examined and their relevance as livelihood or poverty indicators.

Table 1: Key secondary data extraction matrix from institutional frameworks

No.	Report Type / Source	Issuing Agency	Specific Variable Evaluated	Livelihood / Poverty Indicator
1	Household Income & Expenditure Survey (HIES)	Department of Statistics Malaysia (DOSM)	Mean and median monthly household income; Poverty Line Income (PLI) rates.	Establishes the economic baseline to measure smallholder earnings against national B40 and state poverty thresholds.
2	Supply and Utilization Accounts (SUA)	DOSM / Ministry of Economy	Import Dependency Ratio (IDR), Self-Sufficiency Level (SSL), Per Capita Consumption (PCC).	Measures macroeconomic vulnerability and local market demand for coconut as a staple dietary necessity.
3	National Agrofood Policy 2.0 (NAP 2.0, 2021-2030)	Ministry of Agriculture and Food Security (MAFS)	"New Sources of Wealth" growth targets; Modernization KPIs; Hybrid seedling initiatives.	Evaluates state-level intent and structural interventions designed to transition smallholders into higher income brackets.
4	Industrial Crops Statistics & Agromakanan Reports	Department of Agriculture (DOA) / MAFS	Total planted area (ha) vs. production output (MT) across key state belts (Perak, Selangor, Johor).	Identifies geographic concentrations of smallholder reliance and structural production patterns over time.
5	Economic & Technical Management Review (ETMR)	Malaysian Agricultural Research & Development Institute (MARDI)	Cost of production (RM/ha); Yield potentials of hybrid varieties (e.g., MATAG, MARENA).	Analyzes the profitability margins and efficiency gaps causing smallholder stagnation.

Analytical Framework and Synthesis Process

This paper synthesizes the macro-data extracted using a thematic framework aligned with the Sustainable Livelihoods Approach (SLA) (Morse, 2025) instead of collecting primary raw empirical data. The analysis is operationalized as a three-part synthesis loop:

a. Macro-Trend Identification: Compile DOSM and MAFS production, acreage and trade balance indicators to trace the historical path of domestic coconut production and import dependence.

b. Socio-Economic Triangulation: Cross-referencing institutional output targets with peer-reviewed socio-economic literature (2014-2026) to understand why macro policies succeed or fail at the ground level for B40 rural households.

c. Institutional Expert Verification: To verify the practical and localized dynamics of these data patterns, structural insight and institutional operational views were contributed by co-authors and specialist advisors attached to Perak State Farmers' Association (PPN) and Farmers' Organization Authority (LPP). The expert

vetting helps contextualize the systemic supply chain blockages, middleman frameworks and replanting bottlenecks identified in regional distribution networks.

4. Results and Discussion

Macroeconomic Trends and Supply-Demand Dynamics

Based on data integration of the Ministry of Agriculture and Food Security (MAFS) and the Department of Statistics Malaysia (DOSM), the structural shortfall in the domestic coconut sector is still ongoing. Table 2 summarizes production performance, land utilization and import trends compiled from National Agro Food Statistics.

Table 2: Malaysian coconut production, area and trade balance, 2018–2026. (Source: DOSM, 2026)

Year	Planted Area (Hectares)	Total Production (Metric Tons)	Import Volume (Metric Tons)	Import Dependency Ratio (IDR %)	Average Yield (Tons / Hectare)
2018	81,585	538,685	237,341	30.6%	6.60
2019	86,500	536,000	226,300	29.7%	6.20
2020	85,630	542,000	278,600	34.0%	6.33
2021	84,942	568,110	239,012	29.6%	6.68
2022	83,820	549,204	215,632	28.2%	6.55
2023	85,400	482,801	271,700	30.6%	6.38
2024	80,430	521,100	224,500	30.1%	6.47
2025	80,000	513,000	230,000	30.9%	6.41
2026 (Proj.)	79,500	505,000	235,000	31.7%	6.35

Empirical evidence shows that despite the coconut remaining one of the most consumed fruits in Malaysia with a stable Per Capita Consumption (PCC) of 24.9 kg/year (DOSM, 2026), domestic production is slowly declining. Total area planted is expected to decline to 79,500 hectares in 2026 from 84,942 hectares in 2021. This shrinkage is largely the result of urban encroachment and the conversion of land to oil palm, which provides smallholders with more immediate cash flow. Consequently, the national Import Dependency Ratio (IDR) remains stable at 30.6%, compelling Malaysia to import from Indonesia and the Philippines to meet the local industrial and culinary needs, particularly during peak festival periods such as Hari Raya Aidilfitri when santan consumption rises significantly.

The Smallholder Profitability Gap and Poverty Traps

These macro-level agricultural statistics need to be directly converted into household income measures to understand the real contribution of coconut farming to poverty reduction. The average landholding of the traditional smallholder in the main coconut-growing areas of Perak and Selangor is about 2.0 hectares. Smallholdings that grow old Malayan Tall palms have a low technical efficiency score of about 60% (Nor et al., 2020). This means that the average yield is about 6,000 to 7,000 nuts per hectare per year.

At a standard farmgate price fluctuating between RM 1.00 and RM 1.20 per nut, the gross agricultural income of a typical smallholder is about RM 1,000 to RM 1,400 a month. This income is also far below the national Poverty Line Income (PLI) of RM 2,589, as measured by the DOSM Household Income & Expenditure Survey (HIES) thresholds, thus placing pure coconut smallholders in the lowest rung of the Bottom 40% (B40) rural population.

This quantitative reality highlights the paradox identified in the contemporary literature (Omar & Fatah, 2021) that coconut farming performs well as a livelihood safety net preventing absolute destitution due to low operational maintenance requirements, yet it also acts as an economic constraint that keeps households below the poverty line. But smallholders are structurally alienated from downstream processing and are only able to snatch a fractional sliver of the final value chain. Typically, raw nuts are sold to village middlemen who control the transport logistics, which reduces the farmgate price and negates the potential wealth effects from Malaysia's RM 1.14 billion downstream export market (Rozhan & Rohany, 2021).

Barriers to Technical Modernization

NAP 2.0 (National Agrofood Policy) suggests the introduction of high-yielding hybrid varieties, such as the palms MATAG, MARENA and MYLAG, as structural strategies to exit poverty. These hybrids can double yields to up to 25,000 nuts/ha/year and provide a viable mechanism to lift smallholder incomes well above the PLI barrier.

However, feedback from the Perak State Farmers' Association (PPN) on the ground revealed entrenched barriers to the implementation. For traditional smallholders, there is a steep "gestation gap": cutting down senile palms to plant new hybrids means the household loses its main income source during the 3-to-4-year immature growth phase of the hybrid tree. Moreover, the high initial costs associated with authenticated seedlings, the lack of technical training on intensive fertilizer regimes demanded by hybrids and the aging demographic of farmers (Nor et al., 2025) jointly hinder the adoption of technology at a larger scale.

Limitation of Study

This review offers an in-depth synthesis of policy by reconciling macro-level institutional datasets with historical agricultural literature, but several systemic limitations must be acknowledged. First, the study is highly dependent on aggregated national data from DOSM and MAFS. These macro-level indicators gloss over the important regional differences in farmgate prices, soil suitability and access to infrastructure across specific coconut belts in Perak, Selangor and Johor.

Second, official household income measures (such as the HIES) tend to bundle together rural or agricultural census blocks, making it difficult to disaggregate the exact longitudinal poverty dynamics and micro-level cash flows of pure, coconut-dependent smallholders. Moreover, while the downstream sector holds significant economic potential, there is a dearth of specific quantifications in the current empirical literature regarding the precise percentage of value-added profit that is passed on to B40 smallholders versus the profit margins retained by intermediary collectors and processing corporations. Finally, as a secondary policy synthesis, this paper is not empirically validated by primary smallholder surveys or localized econometric modeling.

5. Conclusion and Policy Recommendations

To conclude, coconut cultivation is an important and viable structural pillar that supports rural livelihoods in Malaysia. But persistent production shortfalls, flat smallholder yields and a static 30.6% import dependency ratio indicate that the poverty alleviation potential of the crop remains largely unrealized. Coconut palm is a robust subsistence crop that protects over 60,000 rural families from absolute poverty. However, these smallholders are restricted to the B40 income bracket because of low technical efficiency and asymmetric value distribution along the supply chain. A shift from generic agricultural subsidies to targeted, ecosystem-wide institutional interventions is needed for a prosperous future in Malaysia's traditional coconut belts.

Based on the evidence synthesized in this review, the following policy interventions are recommended:

- Implement Managed Replanting and Income-Buffer Subsidies: The Ministry of Agriculture and Food Security (MAFS) should develop a phased replanting framework. Smallholders should be encouraged to intersperse replanting over several seasons rather than clear whole plots at the same time. The state should link seedling distribution to direct financial cash transfers or fully subsidized intercropping kits (e.g., short-term cash crops such as cash-crop bananas, pineapples, or ginger) to fill in the 4-year gestation gap of high-yield hybrids such as MATAG and keep household income above the PLI threshold.

- Set up Direct Institutional Procurement Centers: To cut out the exploitative profit margins of the traditional rural middlemen, the Farmers' Organization Authority (LPP) and the local State Farmers' Associations (PPN) should establish decentralized micro-collecting centers in the major kampungs. These institutional hubs can tap local output directly by buying raw nuts from smallholders at a guaranteed floor price, circumventing speculative intermediaries, and channeling the output to high-value downstream processors.
- Speed up Downstream Cooperative Equity Programs: Agricultural policies should allow smallholder cooperatives to acquire equity or operational capacity in downstream value-adding processing units (such as virgin coconut oil extraction or coir processing plants). By capturing a larger share of the RM 1.14 billion downstream export value with rural community cooperatives, coconut farming is no longer a low-margin subsistence activity but a wealth-generating commercial enterprise.

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Developing A Real-Time Happiness Index Dashboard for Staff Happiness Monitoring

*Abdul Kadir Othman[1], Aida Wati Zainan Abidin[2], Wan Ismahanini Ismail[3], Suriani Musa[4], Hendy Mustiko Aji[5], Zarinihasmuna Zakariya[6], Nur Hazwani Binti Pathi[7], Norashfah Al-Haj[8]
[1]Faculty of Business and Management, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[2]Faculty of Mathematics and Computer Science, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[3]Vice Chancellor's Office, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[4]Academy of Contemporary Islamic Studies, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[5]Department of Management, Faculty of Business and Economics, Universitas Islam Indonesia, Yogyakarta, Indonesia
[6]Pharmaniaga Logistics Sdn Bhd, Kaw Perindustrian Bukit Raja Selatan, Shah Alam, Selangor, Malaysia
[7]International Islamic College, Greentown Business Centre, 30450 Ipoh, Perak, Malaysia
[8] Professor and Director of AMANAH, KPJ Healthcare University, Nilai, Negeri Sembilan, Malaysia
Email: *abdkadir@uitm.edu.my, aida018@uitm.edu.my, wanismahanini@uitm.edu.my, surianimusa@uitm.edu.my, hm.aji@uii.ac.id, zhmz87@gmail.com, nurhazwanipathiiic@gmail.com, norashfah@kpju.edu.my
Corresponding Author: Dr Abdul Kadir Othman

Abstract: Happy employees influence an organization's performance, employee retention and engagement. Therefore, it is important for the organisation to evaluate, monitor and improve its employees' happiness level. However, traditional methods of assessing employee happiness fundamentally rely on performing periodic surveys, a procedure that delays feedback and prevents organizations from promptly addressing new workplace issues. This conceptual paper introduces UiTM7.0, a real-time employee happiness dashboard that can continuously monitor employees' emotional states and provide timely input and feedback so that management can make timely decisions. This paper also examines the relationship between employee happiness and performance, emphasizes the need to continuously monitor employee well-being and explores the advantages of using a real-time happiness dashboard. These advantages include the early detection of employee dissatisfaction, higher levels of engagement, data-driven decision-making, better support for remote and hybrid working arrangements, and a stronger organizational culture. This paper also considers the concerns associated with implementation, such as privacy issues, data accuracy, employee trust, system integration, and ethical issues. UiTM7.0 provides a practical solution for improving both employee well-being and organizational effectiveness through real-time monitoring and timely intervention strategies.

Keywords: *Employee happiness, employee performance, dashboard, monitoring*

1. Introduction and Background

Employee performance is critical to many organisations because it influences organisational competitiveness, employee happiness, and well-being. These are among the factors that influence organisational performance. Research has proven that employees who are happier and in a better state are more likely to be engaged, committed and high-performing, while those who are unhappy tend to be less productive and less committed to the organisation (Shi et al., 2024; Fang et al., 2025). Employee happiness is constantly linked to higher productivity, better employee retention, and improved organisational effectiveness.

Because of the importance of employee happiness, many organisations have introduced employee engagement surveys, well-being assessments, and sentiment analysis programmes to monitor and improve employees' emotional states. However, a significant problem concerning the timing of data collection, analysis, and reporting persists. Using conventional survey methods takes longer to gather the data, process it, and send the results, which creates delays when taking action and thus reduces the effectiveness of addressing employees' concerns (Lutchyn et al., 2015). Moreover, surveys are less effective at detecting short-term fluctuations, and the survey results may not match employees' current experiences.

Although many organizations can measure employee happiness, it is still unclear whether the measurements and the actions taken based on them are timely enough to cope with newly arising problems. This is because employees' emotions are dynamic and constantly changing, and so frequent assessments are not enough to capture their real emotional state at any one time. Research into emotional dynamics shows that emotional

states are temporary and vary depending on the situation and context (Gutentag et al., 2022).

The most recent technological advances show the advantages of real-time monitoring systems and dashboards in helping with organizational decision-making, which is why these real-time dashboards have become widely adopted in the areas of business intelligence, customer relationship management, and social listening. This is because they allow organizations to detect problems quickly and respond to them more effectively (Sultana, 2023). Yet relatively little research has been carried out into the real-time monitoring of employees' emotional states, even though it is well established that human capital should be seen as a strategic resource. As current studies have shown, continuous emotion-monitoring systems can give managers current information about the well-being of their staff and allow them to take proactive action to improve employee satisfaction and performance (Lutchyn et al., 2015; Kadoya et al., 2024).

In response to this, a real-time dashboard is proposed that monitors the emotional states of employees and provides management with pertinent results whenever they are needed. The real-time university happiness dashboard, UHI7.0, is proposed to get rid of the delays that occur with traditional methods of data collection and reporting—delays that generally cause the findings to become outdated and, as a result, prevent timely corrective actions. By providing management with current information on employees' well-being, UHI7.0 will help ensure that decisions are made in a timely manner and thus improve organizational performance. This conceptual paper examines the advantages, the challenges, and the technical features connected with the development of the dashboard to offer a clearer understanding of how it will be implemented and of its possible impact.

2. Literature Review

Employee Happiness and Organizational Outcomes

Employee happiness means the general level of satisfaction, engagement, and well-being that employees experience in their jobs and in the workplace; it includes emotional well-being, job satisfaction, meaningful work, supportive relationships, recognition, and a balance between work and personal life. In the field of organizational psychology and human resource management, employee happiness is increasingly being seen not just as a desirable outcome of a well-managed workplace but as a strategic asset. It has been consistently shown by research that employee happiness makes a significant contribution to both individual and organizational performance (Lyubomirsky et al., 2005; Fang et al., 2025).

Several studies have shown that employees who are happy are more productive, more committed, and more engaged, and at the same time have lower rates of absenteeism and turnover. They are also more likely to take an active part in teamwork, to provide better customer service and to show greater resilience when facing work-related challenges. A comprehensive review carried out by Lyubomirsky et al. (2005) found that the positive effects are linked to better work performance, stronger interpersonal relationships and improved problem-solving skills. Likewise, Oswald et al. (2015) provided experimental evidence that happier workers are about 12% more productive than their less-happy counterparts.

The latest evidence shows a positive link between happiness and productivity. A study conducted by the Saïd Business School at Oxford University found that happy employees are roughly 13% more productive, mainly because of their higher level of motivation, energy, concentration, and engagement at work. Employees who have a positive attitude toward their jobs tend to be proud of the work they do, and as a result make fewer mistakes, demonstrate better attention to detail, and show more creativity when dealing with work-related problems (Bellet et al., 2024).

Employee happiness also has a major impact on employee retention since content employees are less likely to quit their jobs or to take excessive sick leave, thereby reducing the costs involved in recruiting, onboarding, training, and absenteeism. Furthermore, happy employees contribute to a more positive workplace atmosphere, which then promotes effective communication, collaboration, and teamwork. As a result, the organisation achieves better overall performance and sees increased unity (Shi et al., 2024).

One of the key effects of happy employees is their influence on customer satisfaction. When employees are

satisfied and emotionally involved, they usually provide better service and create positive customer experiences, which in turn can result in greater customer loyalty, an enhanced image of the organization, and a stronger competitive position. Research has consistently demonstrated that organizations with employees who are highly engaged and satisfied achieve higher levels of customer satisfaction and better business results (Harter et al., 2002).

In the current dynamic work environment, employee happiness is linked to both their resilience and adaptability; employees who are able to maintain positive emotions cope more effectively with stress, uncertainty, and change within the organisation. This ability is especially important in knowledge-intensive and service-oriented sectors since innovation, adaptability, and continuous learning are necessary for success (Lyubomirsky et al., 2005).

Companies can increase employee happiness by introducing fair remuneration and reward schemes, offering employees chances for professional development and growth, adopting supportive leadership methods, promoting a positive workplace culture, providing work-life balance arrangements, and ensuring that there are open channels of communication. Yet, carrying out these measures may still not be enough. As employees' emotions are continually changing, businesses must constantly monitor their emotional states to identify any emerging problems and act quickly. Through real-time monitoring, managers can get current information about employees' well-being and then implement more effective interventions that address workplace issues before they have a detrimental effect on both employee happiness and organizational performance (Lutchyn et al., 2015).

UiTM Happiness Index

The university's senior management developed the UiTM Happiness Index (UHI) to assess staff happiness across six dimensions: positive emotions, engagement, relationships, meaning, achievement, and infrastructure. The university first introduced it in 2016, when it selected staff members to take part in nationwide Focus Group Discussions (FGDs). The university used comments from these FGDs to develop the research framework and the tool as a means of collecting data on staff happiness.

Since then, the university has gathered data every two years through both physical and online means from approximately 18,000 academic and non-academic staff members nationwide. The university then presented the results at its management meeting and shared them with relevant departments, faculties, and campuses nationwide. The aim is to use the findings to improve adverse working conditions in those respective departments, faculties, and campuses.

From the beginning, UHI has played a significant role in assessing staff happiness, improving working conditions, and encouraging positive emotions through various programmes and activities. It is featured in the university's strategic objectives, with the staff happiness index set at 80 percent. However, current achievements fall short of this target, likely because addressing staff concerns has taken time.

From Periodic Measurement to Continuous Monitoring of Employee Happiness

Monitoring the level of happiness of employees helps ensure that the workforce stays healthy, productive, and resilient. As the moods and attitudes of employees are likely to change over time, companies need up-to-date and accurate information regarding their employees' well-being if they are to deal effectively with new problems that arise in the workplace. By constantly keeping an eye on their employees, organisations can be aware of the emotional climate within their workforce and take preventive action to address any concerns before they have a detrimental effect on organisational performance (Lutchyn et al., 2015).

A major advantage of regularly monitoring employees' happiness is that it enables companies to pick up on any issues relating to employees' well-being at an early stage. By carrying out frequent evaluations, businesses can spot the early signs of dissatisfaction, stress, burnout, or disengagement before these problems turn into absenteeism, lower productivity, workplace conflicts, or staff turnover. As research has shown, employee well-being is closely linked to job performance and organizational commitment; organizations must act early to maintain an effective workforce (Shi et al., 2024). Once organizations have identified possible problems, they can then introduce specific interventions and support measures to prevent them from worsening.

Employee retention is the outcome of continuous monitoring. When employees perceive that management is aware of their views, concerns, and emotional well-being, they are more likely to feel greater commitment and loyalty toward the organisation. When the company provides regular feedback, it shows that it cares about its employees and is committed to improving their workplace experience. Due to this perception, employee engagement increases, and this in turn helps to reduce the high costs associated with employee turnover, recruitment, and training (Harter et al., 2002).

A major benefit of monitoring employee happiness is that it leads to improved performance and increased productivity. There is a significant connection between employee happiness and motivation, engagement, creativity, and work performance. Employees who have positive emotional states are better at concentrating, solving problems, and being more willing to go the extra mile by performing beyond their official job responsibilities. Past research has demonstrated that employees who are happier are more productive than those who are less satisfied (Oswald et al., 2015; Fang et al., 2025). If managers continuously monitor employee happiness, they can detect trends that show declining morale and then take timely corrective action to maintain high levels of engagement and performance.

Data from the monitoring of employee happiness can also be employed to support evidence-based decision-making. Instead of relying on guesses or on results from occasional surveys, leaders can use real-time or near-real-time data to spot emerging issues in the workplace and to assess the effectiveness of current policies and practices. The insights provided by the happiness data can help leaders make decisions about workload management, employee benefits, leadership development, workplace flexibility, organisational culture, and employee support programs. As a consequence, management interventions can become more focused, timely, and effective.

Continuous monitoring is especially useful when changes occur, such as during an organizational realignment, in the case of technological changes, when there is a change in leadership, or when moving to remote and hybrid working arrangements. Organizational change usually makes employees feel uncertain and anxious; it has a serious effect on their morale and productivity. By monitoring employees' levels of happiness during these times, organisations can identify any problems and provide the kind of support that is required. Using this proactive strategy can minimise resistance to change, improve employee trust, and increase the chances of successfully carrying out organisational initiatives.

Moreover, continuous monitoring helps develop a positive organisational culture. By regularly assessing employee well-being and gathering employee feedback, organisations can build a culture characterized by openness, transparency and mutual trust. Employees will be more willing to share their problems and provide useful feedback if they believe that management genuinely cares about their well-being; such an environment encourages psychological safety, promotes collaboration, and leads to stronger relationships between employees and management.

The approach that an organisation uses to monitor employee happiness has an effect on employer branding and on the organization’s image; happy employees are likely to become ambassadors for the organisation and create a positive image both inside and outside the workplace. Those organisations that truly care about the well-being of their employees are more likely to be perceived as attractive places to work, which in turn helps them attract and retain highly qualified staff. In addition, a good employee experience usually leads to a better customer experience, resulting in higher customer satisfaction, loyalty, and long-term business performance (Harter et al., 2002).

Continuous monitoring can also support employee mental health and well-being. Employees who work in customer-facing roles or those in high-demand positions often encounter stressors that are detrimental to their emotional well-being. If regular monitoring is performed, the root causes of workplace stress can be identified, and human resources departments can create tailored wellness programmes, counseling services, stress-management measures, and other types of interventions to address the specific employee requirements. By taking these proactive measures, organisations can establish healthier working environments and promote long-term sustainability.

To enjoy these advantages, organisations should establish systematic ways of continuously monitoring employee happiness and well-being. Through today's achievements in digital technologies, analytics platforms, and real-time dashboards, organisations are able to collect, analyze, and display employee sentiment data more efficiently than could be done using conventional surveys. Using these technologies, organisations can enhance employee well-being, strengthen their organisational culture, improve performance, and enjoy a sustainable competitive advantage.

3. Proposed Real-Time UHI Dashboard

Conceptual Transition

The real-time UHI dashboard that has been proposed is an extension of the existing UHI measurement process. The basic logic is presented below.

The current UHI dimensions allow data to be collected more frequently, after which it is processed and analyzed, presented on dashboards, interpreted by management, action is taken, and then monitoring takes place. The six UHI dimensions form the basis for the exercise; the indicators in question could be measured using short questionnaires sent out through a web or mobile interface, and where appropriate, open-ended comments should be included in order to provide extra context.

The data could be brought together and presented on a dashboard, which would show the current levels, the changes over time, and the differences between various organisational units. The dashboard could likewise include relevant organisational information from the existing systems, provided that it complies with the data governance and privacy requirements. The process must not include the constant supervision of individual employees; rather, its primary objective should be to identify patterns at the right level of aggregation and to provide management information that enables the organization to be improved.

Potential Dashboard Functions

A dashboard might provide various kinds of information in real time or almost real time. It could be used to illustrate the current overall level of happiness across the six UHI dimensions, and at the same time it could show trends over time, allowing management to decide whether an indicator is improving, worsening, or staying the same.

The dashboard could provide organisational-level comparisons—for instance, those between faculties, campuses, or departments—as long as the number of responses is enough to guarantee confidentiality. Such information would aid in spotting areas that require further investigation without revealing any details about individual employees.

The system must produce alerts each time it identifies certain predefined changes or thresholds. Yet, the fact that an alert has been issued should not be taken as evidence of a workplace problem; it should indicate that further investigation might be needed. Qualitative comments could also be included in order to provide context for the quantitative results, since a numerical score by itself is not enough to explain why employees report a particular experience.

Feedback-to-Action Cycle

The proposed dashboard should be designed around a feedback-to-action cycle. Below is the flow of the processes involved in designing the dashboard. It starts with data collection, analysis, data visualization, management review, intervention, and ends with follow-up measurement.

The cycle addresses a limitation of conventional survey systems in that these systems do not provide a clear method for obtaining an organisational response. The dashboard is therefore capable not only of displaying information but also of aiding management. When a potential problem is identified, the concerned organizational unit could look into the underlying causes and decide on an appropriate response; management could then use the information from the dashboard to determine whether the situation has changed.

The quality of the system would then be determined by the quality of the organization's response; if

management does not have the necessary processes, resources, and authority to deal with the concerns that have been identified, more frequent data collection would be of little value.

4. Benefits of a Real-Time Employee Happiness Dashboard

A real-time employee happiness dashboard offers a number of advantages to any company that wants to improve its employees' well-being, engagement, productivity, and retention. Unlike traditional employee satisfaction surveys that are conducted at certain intervals, a real-time dashboard enables managers to obtain continuous insights into employee sentiment and thus allows organizations to identify emerging problems and promptly take action. If employee feedback is turned into practical insights, organisations are then able to create a more responsive and supportive working environment while at the same time enhancing their overall performance.

The main benefit of establishing a real-time employee happiness dashboard is that it offers specific insights for each department. Managers can use the dashboard to segment data according to department, division, location, job category, or work team to detect trends and problems within certain employee groups. This capability permits companies to move beyond relying just on general company averages and instead concentrate on local issues that need immediate action. For instance, management can identify departments that are under high pressure, experiencing low morale, or having low engagement, and then introduce targeted interventions before these problems start to adversely affect the entire organization’s performance. This kind of focused oversight allows resources to be allocated in a more effective manner, and more individualized support can be given to different employee groups.

Another advantage is the presence of a continuous feedback loop. Unlike traditional employee surveys, which are usually conducted once a year or every six months and result in delayed feedback and a slower response from the organization, a real-time dashboard offers continuous employee sentiment data and promotes more agile human resource management. Through continuous monitoring, leaders can consistently evaluate the effectiveness of workplace policies, employee support programs, and organisational initiatives, act promptly to make corrections, and thereby promote continuous improvement and greater employee satisfaction (Lutchyn et al., 2015).

A real-time employee happiness dashboard also fosters a sense of accountability at all levels of the organisation. Because leaders are provided with regular updates regarding employee sentiment, engagement, and well-being indicators, they are more responsible for their teams’ workplace experiences. Using the information from the dashboard, leaders can alter their leadership style, improve their communication, address employee concerns, and strengthen the relationships between team members. Greater transparency demonstrates that employee well-being is a responsibility shared by the entire organisation and not something that should be the exclusive concern of the human resources department.

The dashboard is especially beneficial for facilitating remote and hybrid work arrangements. As organisations move toward more flexible working patterns, it has become more difficult to keep employees engaged and to support their well-being when face-to-face interaction deteriorates. Remote workers can feel isolated, create a weaker sense of affiliation with the organisation, and have limited access to support services. Organizations can monitor employee well-being in real time using an employee happiness dashboard, through which remote and hybrid workers can remain visible and be included in well-being programs. This ensures that employees are managed properly and leads to stronger relationships between employees and the organisation. According to Social Exchange Theory, employees will show greater commitment, engagement, and performance when they feel that the organisation is supporting them.

A further significant advantage is that the dashboard can illustrate how employee happiness relates to organisational performance. At present, dashboard systems are often capable of bringing together productivity figures, attendance records, customer satisfaction data, and other key performance indicators. By combining these various elements, organisations can make use of real data to examine the connection between employee well-being and the organisation's outcomes. Earlier research has demonstrated that employee happiness is positively linked to productivity, job performance, and organisational effectiveness (Oswald et al., 2015; Fang

et al., 2025). When these relationships are shown in real time, managers are able to gain a better understanding of the return on investment from their employee well-being initiatives and thus have a stronger basis for continuing to invest in employee development, wellness programs, and improvements to the workplace.

A real-time employee happiness dashboard improves strategic decision-making by giving managers evidence-based insights into how the workforce is operating. Instead of relying entirely on guesses or earlier survey results, leaders are able to obtain up-to-date information about employee sentiment and working conditions. They can therefore make better decisions about the distribution of workloads, organisational policies, leadership practices, employee recognition schemes, and the measures taken to enhance workplace culture. It can therefore be concluded that the organization's interventions become more proactive, focused, and effective.

The dashboard can also foster a positive organisational culture because when employees' opinions and well-being are constantly monitored, it proves that the organization takes them seriously. When employees see that their feedback is being collected, analyzed, and acted on, they are more likely to trust management and to play an active role in improving the organisation. This will promote transparency, enhance psychological safety, and create a culture rooted in continuous improvement and mutual respect.

A dashboard that presents information about employee happiness in real time promotes better organisational resilience and sustainability. When it continuously monitors employees' well-being, organisations can identify early symptoms of stress, burnout, disengagement, and turnover. Once these risks have been identified early, steps can be taken promptly to keep the workforce stable, retain institutional knowledge, and sustain long-term performance. Nowadays, in this constantly changing business environment, these capabilities provide organisations with a valuable strategic competitive advantage.

To recap, a real-time employee happiness dashboard is a powerful management tool that enables the continuous monitoring of employees' well-being, aids decision-making based on data, fosters organisational accountability, boosts employee engagement, and results in improved organisational performance. Once organisations have real-time insights into employee sentiment, they can establish healthier workplaces, improve employee experience, and ensure a sustainable competitive advantage.

Challenges in Implementing a Real-Time Employee Happiness Dashboard

Although a real-time employee happiness dashboard provides many benefits for both employees' well-being and organisational performance, there are still some challenges to be addressed when implementing it. To ensure employee acceptance and to obtain real results, organisations must address a number of technical, organisational, ethical, and behavioral problems. If these challenges are not addressed, employee trust could be ruined, participation might decrease, and the system's effectiveness would eventually be restricted.

It is hard to keep data private and maintain data confidentiality. Because employee happiness dashboards generally collect sensitive data about employees' emotions, attitudes, and experiences in the workplace, employees may find the monitoring intrusive and might worry that the responses they provide could be used to evaluate their performance, influence decisions on promotions, or lead to adverse outcomes. These perceptions can result in discomfort, anxiety, and a lack of trust in management. Moreover, the mishandling of sensitive employee data can also cause the organisation to face legal difficulties and ethical problems, which harm its reputation. Research into workplace emotion-monitoring technologies recommends the need for transparency, clearly defined governance policies, and effective communication in order to address employees' concerns about privacy and surveillance (Piispanen & Rousi, 2024).

Privacy has a strong relationship with the authenticity of the responses. If employees fear that their identities might be disclosed or that management might use their personal information, they might give answers that are socially acceptable instead of giving their genuine opinions. This kind of response bias can seriously and adversely affect both the reliability and validity of the data on the dashboard, leading to incorrect conclusions and ineffective interventions. To encourage honest participation, organisations are required to establish procedures that promote anonymity, confidentiality, and psychological safety, and employees should be informed that the aim of the dashboard is to improve workplace well-being, not to find fault in individual performance.

Another concern is opposition to change and reluctance to accept new technology; both managers and employees might resist accepting new monitoring systems, particularly when they view them as leading to micromanagement or as tools of organisational control. Employees could worry about losing their independence, while managers might be afraid of greater accountability or of having to take on more responsibilities due to the monitoring of employee sentiment. To address this resistance, effective change management techniques should include inviting stakeholders to participate, providing training programmes, running communication campaigns, and getting leadership support. Trust should be established and acceptance promoted by clearly explaining the purpose, benefits, and intended use of the dashboard.

It is difficult to get the new employee happiness dashboard to fit with the organization's current systems. As most organizations use a number of digital platforms—such as Human Resource Information Systems (HRIS), performance management systems, communication tools, and employee engagement software—linking a real-time employee happiness dashboard to these can be a challenge due to compatibility problems, concerns regarding data ownership, security requirements, and limitations in resources. In most cases, successful integration requires a great amount of investment in technology infrastructure, software development, and ongoing technical support. Smaller organizations may face additional difficulties due to tight budgets, a lack of technical knowledge, or an absence of sufficient IT resources.

Another important challenge is the availability of financial and organisational support. The numerous steps involved in developing, operating, and maintaining a real-time dashboard involve costs related to software development, system integration, employee training, cybersecurity measures, and change management programs. Organisations that do not have adequate resources may find it difficult to keep the system going over time. Due to this, management should carefully weigh the expected benefits against the return on investment before proceeding with the implementation.

Another challenge occurs when businesses gather employee feedback but fail to take any obvious actions as a result of the insights obtained. Employees are more likely to provide their feedback if they notice that management is addressing their problems and making real improvements. Conversely, if an organisation consistently gathers feedback without taking any action on it, employees may become disengaged and start to lose confidence in the system. For a real-time employee happiness dashboard to operate successfully in the long run, organisations must establish an effective feedback-to-action cycle that allows employee concerns to be identified, communicated, and addressed. All research into employee engagement stresses the need for responsiveness and organisational support to maintain trust and participation.

Interpreting emotional data remains very challenging because human emotions are complex, subjective, and affected by personal, social, and organisational variables that make emotional reactions vary from person to person and from one culture to another, as well as depending on the work environment. It follows that simple interpretations of emotional data could result in incorrect conclusions, inappropriate interventions, or excessive reactions from a managerial standpoint. Organisations must therefore treat emotional data within the proper contextual framework and, if needed, support it with professional expertise.

Another concern is overreliance on quantitative indicators. Most employee happiness dashboards show employees' emotional states as numerical scores, sentiment ratings, or visual symbols such as emojis and color-coded figures. These indicators do provide a quick summary and tend to oversimplify the complex experiences of employees and are unable to pinpoint the reasons for their dissatisfaction or stress. In order to get clearer insight into employee well-being, organizations should combine quantitative measures with qualitative approaches, including open-ended comments, interviews, focus groups, and employee discussions. The combination of both quantitative and qualitative data provides more thorough insights and enables more informed decision-making.

Further operational difficulty consists in ensuring that the data is not only high in quality but also current. Since the effectiveness of a real-time dashboard depends on continuous employee involvement and on the timely updating of the data, the dashboard may go out of date and stop showing what is actually happening in the workplace if employee participation drops or if they stop providing regular feedback. Organizations therefore need to keep employees engaged by employing well-designed methods of participation, for instance by offering

user-friendly interfaces, sending out regular reminders, giving meaningful feedback, and making sure that employees' concerns are clearly taken into account. It is essential to maintain this degree of engagement if the data shown on the dashboard is to remain accurate, relevant, and actionable.

Lastly, organizations must carefully consider the ethical issues at every stage of implementation; they should strike a suitable balance between paying attention to the well-being of their employees and respecting their autonomy, dignity, and privacy. The dashboard has to be presented as a supportive tool for improving the employee experience and not as a device for surveillance. It is possible to help ensure a responsible and sustainable implementation by establishing clear ethical guidelines, adopting transparent data governance policies, and involving the employees in the design of the system.

To recap, even though real-time employee happiness dashboards offer good chances of improving both employee well-being and organisational performance, their introduction involves a number of challenges related to privacy, trust, data quality, technology integration, the use of organisational resources, employee participation, and ethical governance. To ensure long-term success, acceptance, and effectiveness, organisations must actively address these challenges. Organisations that are able to overcome these challenges are more likely to secure the full benefits of real-time employee well-being monitoring and to create a more engaged, productive, and resilient workforce.

5. Conclusion

It is evident that happy employees have an effect on organisational performance, employee engagement, productivity, retention, and overall well-being in the workplace. Many studies have discovered that employees who are happier tend to be more motivated, committed, resilient, and productive, which in turn results in better organisational outcomes. Organisations should therefore understand the significance of employee happiness and develop effective methods for continuously monitoring and managing it.

Standard methods for measuring employee satisfaction, such as those that depend on annual or periodic surveys, usually do not provide timely information about employees' changing emotional states because emotions are dynamic and are influenced by many workplace factors; therefore, delayed feedback is unable to recognise problems as they are emerging before they develop into more serious organisational issues. Because of this, employee happiness dashboards that offer real-time data are a promising solution since they enable continuous monitoring, timely feedback, and decisions based on data.

The suggested happiness dashboard shows how technology can allow managers to obtain a comprehensive view of their employees' well-being. It can detect dissatisfaction at an early stage, enabling specific interventions and aiding in the development of a culture characterized by openness and responsiveness, thereby improving both the employee experience and organisational effectiveness. The problem is that, in order to get the system working successfully organizations have to carefully take into account questions concerning privacy, data security, employee trust, system integration, the interpretation of the data, and the need to maintain ongoing participation.

To conclude, a real-time employee happiness dashboard is successful not only because of the technology involved but also because the organisation is committed to acting on the insights it offers. As long as the organisation maintains open lines of communication, treats the data ethically, and has responsive leadership, the dashboard can serve as a valuable strategic resource for producing a happier, healthier, and more productive workforce and, at the same time, contribute to the organisation's long-term sustainability and success.

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Digital Transformation in Shariah-Compliant Agri-Fintech: A Case Study of The Bagh EPlatform

*Nur Amirah Borhan[1], Ruhaini Muda[2], Afiqah Mohd Bakri[3]
[1]Universiti Pendidikan Sultan Idris, Malaysia
[2]Universiti Teknologi MARA, Malaysia
[3]University Poly-Tech Malaysia, Malaysia
Email: *amirah.borhan@fpe.upsi.edu.my, ruhaini@uitm.edu.my, afiqah_bakri@uptm.edu.my
Corresponding Author: Nur Amirah Borhan

Abstract: Agricultural finance in developing markets faces systemic bottlenecks, including collateral dependencies, information asymmetry, and a lack of Shariah-compliant alternatives. Grounded in the Three-Dimensional Fintech Framework and Agency Theory, this study employs a qualitative, desk-based documentary single-case study design to evaluate how the digital architecture of the Bagh eplatform modernizes traditional ethical contracts. The findings demonstrate that Bagh-e automates classical risk-sharing and asset-backed instruments, specifically *Salam* (forward sales) for working capital and *Murabahah* (cost-plus) for physical inputs, by integrating cloud databases, predictive AI risk engines, and closed-loop digital voucher routing. This infrastructure satisfies constructive possession (*qabd*) requirements and systematically mitigates principal-agent conflicts, including moral hazard and greenwashing, without requiring physical property collateral. Ultimately, this study demonstrates how digital agri-fintech aligns with the objectives of Shariah (*Maqasid al-Shariah*) and Bank Negara Malaysia's Value-Based Intermediation (VBI) framework, harmonizing commercial viability with social equity and ecological resilience.

Keywords: *Fintech, Agriculture, Digital Financing, Financial Inclusion.*

1. Introduction and Background

The global agricultural sector is undergoing a structural transformation due to digital technology and financial intermediation. Agriculture remains a vital economic engine in developing countries. It contributes around 13% to the gross domestic product (GDP) in regional hubs such as Indonesia and employs over 28% of the workforce (Luís et al., 2024). Nonetheless, Benni et al. (2025) mentioned that smallholders in these regions remain disproportionately underserved, with up to 66% of agricultural SME financing needs going unmet. This represents an annual "credit gap" of USD 54.1 billion. The gap persists mainly due to high transaction costs, climate vulnerability, and a lack of physical collateral required by most traditional financial institutions (Kashid et al., 2026; Khandker & Yamano, 2025).

To integrate these unbanked farmers into the formal financial system, digitizing cash-based agricultural payments will provide the tools essential to stabilize their seasonal incomes (Klapper et al., 2025). By leveraging technologies such as cloud computing and big data analytics, digital platforms can bypass geographical constraints and significantly lower operational costs. Ultimately, this helps to expand financial access and usage to marginalized people living in rural areas (Zhou et al., 2024). Nevertheless, in Muslim-majority countries and key Islamic finance regulatory hubs (such as Malaysia and Indonesia), these digital solutions must also consider the demand for Shariah-compliant frameworks. Conventional interest-based loans can be replaced with Islamic Fintech to help align agricultural development with religious values through ethical, asset-backed, and risk-sharing financial structures (Al-Daihani et al., 2024).

Through automated smart contracts and AI-driven Shariah verification, financial terms can now be programmed and executed automatically (Basit et al., 2026). The agricultural sector will benefit substantially from this capability. Historically, asset-backed instruments like *Salam* (forward financing) and *Murabahah* (cost-plus financing) involved heavy operational overhead. In this context, digital execution of these contracts removes that barrier (Al-Daihani et al., 2024; Khandker & Yamano, 2025). Unlike conventional interest-based debt, which imposes rigid payment deadlines regardless of harvest outcomes, structured Islamic finance instruments align directly with the volatile cash flows inherent to seasonal farming.

This study examines empirical execution through the case of Bagh-e, an agricultural fintech platform operating in Pakistan and South Asian smallholder markets. Smallholders in this region face three structural hurdles simultaneously, i.e., acute climate vulnerability, lack of documented land collateral, and reliance on predatory local moneylenders. Bagh-e bypasses these hurdles by embedding predictive analytics into a mobile platform that issues Shariah-compliant financing, specifically *Salam* for pre-harvest liquidity and *Murabahah* for critical input supplies (Harvard Innovation Labs, 2025). This operational model gained international validation after winning the Climate Resilience Track at Bank Negara Malaysia's 2025 MIFC Global Impact Challenge. This competition was an initiative organized by BNM to identify impact-driven Islamic fintech innovations globally (Bank Negara Malaysia, 2025).

Therefore, Bagh-e provides a compelling and revelatory case study for this paper because it bridges operational field deployment in developing smallholder markets with regulatory benchmarking within Malaysia's global Islamic financial framework. By analyzing Bagh-e as the primary unit of analysis, this paper evaluates how digital infrastructure modernizes Shariah mechanics, resolves agency conflicts, and advances financial inclusion in alignment with Bank Negara Malaysia's Value-Based Intermediation (VBI) and the higher objectives of Islamic law (*Maqasid al-Shariah*).

2. Literature Review

The Agricultural Credit Gap and Smallholder Vulnerability

Globally, agriculture is a vital sector, employing 25% of the world's population (Luís et al., 2024). However, despite the importance of this sector, economically disadvantaged, small-scale farmers consistently face a variety of complex challenges, primarily driven by severe capital constraints that prevent them from investing in essential productive technologies, chemical fertilizers, and high-yield hybrid seeds (FAO & IPA, 2024; Khandker & Yamano, 2025; Mapanje et al., 2023; The Farmtopia Project, 2024). Furthermore, they operate in highly vulnerable environments where they must navigate unpredictable seasonal production cycles, fluctuating agricultural prices, and sudden environmental shocks such as droughts, floods, and crop diseases (Al-Daihani et al., 2024; Mapanje et al., 2023; Touch et al., 2024).

Formal financial institutions regularly fail to serve smallholder farmers, leaving a massive credit gap fueled by mismatched expectations on both sides (FAO & IPA, 2024; Khandker & Yamano, 2025; Sharma et al., 2025). On the supply side, commercial banks demand documented credit histories and physical collateral that smallholders simply do not own (Kashid et al., 2026; Khandker & Yamano, 2025; Mahboob et al., 2025). On the operational side, debt service structures are fundamentally misaligned because regular monthly installments are incompatible with the seasonal, volatile liquidity of crop farming (Morley, 2024; Sarfo et al., 2021). In addition, smallholders also lack access to risk management products and harbor persistent distrust toward institutional lenders. Thus, the formal credit market remains practically inaccessible (FAO & IPA, 2024; Khandker & Yamano, 2025; Köster et al., 2025).

Pre-season liquidity constraints leave smallholders unable to purchase essential inputs during critical planting windows (Zewdu & Mengist, 2026). Post-harvest cash shortages then compel growers into immediate distress sales at low spot prices, forfeiting the substantial margin gains that post-harvest storage would otherwise offer (Albuquerque et al., 2024; Cardell & Michelson, 2023). Digital financing mechanisms interrupt this cycle. By injecting liquidity at key phases of the agricultural calendar, these platforms enable farmers to secure high-quality inputs, allocate field labor more efficiently, and obtain meaningful gains in both crop yield and net margins (Mapanje et al., 2023; Vasudevan et al., 2025).

Digital Inclusive Finance and the Rise of Agri-Fintech

By substituting branch infrastructure with cloud computing, mobile wallets, and big data analytics, digital inclusive finance fundamentally alters rural banking economics (Jiang et al., 2026; Mühl & de Oliveira, 2026; Pal, 2025). The shift addresses a long-standing market failure. Physical branch networks are simply too costly to sustain in low-density, remote agrarian zones (Aruwajoye & Coetzee, 2025). Modern fintech platforms circumvent these distribution barriers, aligning directly with broader United Nations Sustainable Development Goals by extending baseline financial services to unbanked rural populations at scale (Rafiuddin & Mohnot, 2026).

Digitizing financial touchpoints fundamentally changes this cost calculus. Handset-based workflows such as instant loan requests, peer-to-peer (P2P) transfers, and remote account management drive marginal servicing costs toward zero (Aruwajoye & Coetzee, 2025; Pal, 2025). Beyond lowering overhead, mobile delivery allows providers to stretch credit and savings mechanisms around actual crop calendars rather than rigid monthly schedules (Mhando, 2026). Importantly, the absence of prior credit records no longer blocks access. Platforms substitute traditional credit scores with alternative digital footprints such as mobile airtime purchases, transaction histories, and peer references to securely integrate previously excluded farmers into the formal financial system (Jiang et al., 2026; Pal, 2025).

Principles and Contracts of Shariah-Compliant Agricultural Finance

In Islamic commercial law (*Fiqh al-Muamalat*), financial transactions must adhere to core ethical precepts which are the strict prohibition of interest (*Riba*), excessive uncertainty (*Gharar*), and gambling (*Maysir*) (Iqbal, 1997; Maghrebi & Mirakhor, 2015). Conventional debt instruments, which charge compound interest regardless of crop success or failure, place an asymmetrical burden on vulnerable smallholders (Adesiyan, 2025; Orivri, 2025). Islamic finance counters this through asset-backed, ethical risk-sharing structures that align the financial returns of the funder directly with the physical yield and enterprise of the farmer (Abid & Jie, 2023; Mu'id et al., 2026).

In agricultural finance, two classical Islamic contractual structures offer distinct functional advantages:

***Salam* (Forward Sales Contract):** Under this structure, the financier provides full advance cash payment for a predetermined quantity and specification of crops to be delivered at a future harvest date. Because capital arrives prior to sowing, farmers secure essential working liquidity for seeds and fertilizers without taking on debt-servicing stress (Kalimullina & Orlov, 2020; Shaikh, 2024).

***Murabahah* (Cost-Plus Sale):** This framework substitutes cash lending with asset procurement. The institution purchases required inputs (machinery, fertilizers, or seed stock) from commercial suppliers and transfers title to the producer at acquisition cost plus a transparent markup, with settlement deferred to post-harvest installments (Abd Rahman et al., 2022).

To satisfy Shariah validity and eliminate *Gharar* (uncertainty), contracts like *Salam* mandate exacting verification of crop grades, quantities, and delivery milestones (Al-Daihani et al., 2024; Mahboob et al., 2025). Managing these conditions manually across thousands of remote, fragmented smallholders, however, generates prohibitive operational overhead for institutional banks (Kashid et al., 2026). Possession presents an even steeper logistical hurdle. Traditional lenders struggle to verify physical asset existence and establish valid legal ownership (*qabd*) at reasonable cost. In traditional *Murabahah*, this requirement is uncompromising as the financier must assume actual physical custody (*qabd haqiqi*) of the inputs before transferring title to the farmer.

Three digital interventions resolve these operational and jurisprudential bottlenecks. To replace physical collateral, alternative credit algorithms evaluate borrower solvency directly from agronomic performance, satellite weather tracking, and historic yield records. Contractual compliance is delegated to software. By deploying blockchain smart contracts, disbursement and settlement occur autonomously upon verified receipt of goods, cutting out intermediary settlement delays (Benni et al., 2025; Kashid et al., 2026; Zhang, 2024). Crucially, this infrastructure reconciles Shariah custody rules. Platforms fulfill the mandate of constructive possession (*qabd hukmi*) by acquiring enforceable legal title through digital registries and tokenized, closed-loop voucher mechanisms rather than expensive physical storage (Basit et al., 2026; Mahboob et al., 2025).

Fostering Sustainable Agriculture and Economic Resilience

Green Islamic fintech merges digital delivery rails with ethical Shariah standards and ESG metrics, rechanneling institutional capital toward climate-resilient farming (Widiastuti et al., 2026). The theological justification is clear. Rather than treating agriculture solely as an extractive venture, Islamic economic philosophy designates food production as a collective societal duty (*fardu kifayah*) bound to active stewardship. Because Shariah doctrine strictly forbids waste and ecological destruction of natural habitats, its underlying principles align seamlessly with modern biodiversity conservation (Zaina et al., 2024). Pairing this legal tradition with institutional ESG criteria enables financial intermediaries to screen and deploy capital toward sustainable rural farming at scale (Widiastuti et al., 2026; Zaina et al., 2024).

Real-time data streams translate these theological stewardship principles into measurable field practices. By combining Internet of Things (IoT) soil-moisture probes and localized weather stations with satellite imagery, platforms track crop development and microclimate volatility continuously (Aruwajoye & Coetzee, 2025; Rana et al., 2025). This data enables smallholders to transition to precision agriculture, optimizing the application of water and fertilizer with pinpoint accuracy. Empirically, precision farming technologies have been shown to cut chemical inputs by 15% to 20% and reduce resource wastage without compromising crop yields (Aruwajoye & Coetzee, 2025).

Agri-fintech platforms reinforce these practices financially via dynamic eco-credit scoring. Rather than relying solely on static solvency checks, underwriting algorithms tie interest markups, borrowing ceilings, and repayment terms directly to verified environmental stewardship, granting preferential capital access and rates to sustainable producers (Tinsley & Agapitova, 2018). Linking credit pricing to continuous field data converts ecological compliance from an overhead burden into a direct balance-sheet advantage, buffering vulnerable producers against escalating climatic shocks.

Theoretical Framework

To capture the structural complexity of agri-fintech, this study combines two complementary perspectives namely the Three-Dimensional Fintech Framework by Fethallah (2025) and classical Agency Theory. Fethallah's model approaches fintech not as an isolated tool, but as the convergence of three distinct operational domains. The first, Finance, governs contract structuring, capital allocation, and transactional clearing. The second, Technology Management, oversees foundational technical architecture, such as cloud-hosted applications and distributed database systems. Finally, Innovation Management addresses organizational engineering, designing collaborative business models that align dispersed supply chain actors and foster institutional trust in unbanked rural markets. By evaluating Bagh-e through this three-dimensional lens, we can analyze how its Finance dimension (executing Shariah-compliant contracts like *Salam* and *Murabahah*) is successfully automated by its Technology Management dimension (utilizing cloud computing and big data), and scale-optimized by its Innovation Management dimension (integrating isolated rural smallholders, input providers, and investors into a single, cohesive and collaborative digital value chain).

Agency Theory provides a suitable lens for evaluating default risk and contractual breakdown in smallholder finance (Chien et al., 2025; Mhlongo et al., 2025). Agency Theory models the relationships, misaligned incentives, and conflicts of interest that emerge between principals (such as financial lenders or investors) and agents (such as borrowing farmers) under conditions of information asymmetry. In sustainable finance, this friction manifests as greenwashing in which producers misstate their ecological practices to access subsidized credit. Agri-fintech platforms solve this agency problem through end-to-end value chain visibility. By encoding Shariah stipulations into blockchain-based smart contracts, execution occurs automatically against verified, third-party triggers like electronic warehouse receipts or satellite-validated harvests. Automating these milestones eliminates discretionary enforcement, curbing opportunistic defaults while independently confirming sustainability claims.

3. Research Methodology

Research Design

This study employs a qualitative, desk-based documentary single-case study design (Yin, 2018) to analyze the Bagh-e platform. A descriptive-interpretive documentary case study approach is appropriate for evaluating fast-evolving, proprietary fintech platforms where direct primary field access is constrained, relying instead on the systematic qualitative triangulation of public corporate disclosures, regulatory records, and third-party industry whitepapers (Mahboob et al., 2025; Pal, 2025). Recent methodological literature underscores that desk-based documentary case studies offer a rigorous, objective framework for examining how digital architectures operationalize complex financial and legal structures across emerging markets without introducing primary field respondent bias (Mu'id et al., 2026; Luís et al., 2024; Pal, 2025).

Nonetheless, this study recognized a limitation of potential for self-reporting and social desirability biases inherent in platform-disclosed materials, which naturally emphasize operational success and technological optimization while downplaying ground-level friction. To mitigate this issue, we employ rigorous documentary

triangulation (Yin, 2018). Platform claims are systematically cross-verified against third-party regulatory evaluations (notably Bank Negara Malaysia's MIFC challenge criteria), independent fintech market monitors (such as the Global Islamic Fintech Report), and empirical benchmarks documented in multilateral agrarian development literature (Benni et al., 2025; Khandker & Yamano, 2025).

Case Selection and Justification

The Bagh-e platform was selected as the unit of analysis using purposive, revelatory case sampling based on its geographic relevance, digital architecture, regulatory significance, and high data transparency.

Geographically, Bagh-e's ground-level operational deployment targets smallholder agrarian communities in South Asia (specifically Pakistan), a market characterized by severe structural financial exclusion where over 80% of smallholders operate without formal bank accounts, face recurring extreme climate hazards such as devastating floods and droughts and remain trapped in predatory informal credit cycles due to a lack of physical land titles as collateral. This specific operating market serves as a critical empirical context for agri-fintech intervention because it exhibits acute pre-harvest liquidity shortages and an urgent demand for non-exploitative, Shariah-compliant alternatives (Adesiyan, 2025; Klapper et al., 2025; Shaikh, 2024). Second, it explicitly embeds traditional Islamic agricultural contracts, specifically *Salam* for advance working capital and *Murabahah* for asset input procurement, directly into its digitized mobile architecture (Al-Daihani et al., 2024).

Third, the platform's operational model has been externally validated by major regulatory bodies, notably winning the Climate Resilience Track of the Malaysia International Islamic Financial Centre (MIFC) Global Impact Challenge in 2025, organized by Bank Negara Malaysia (2025). This award directly connects Bagh-e's field deployment in South Asian smallholder markets with Malaysia's global Islamic finance regulatory and Value-Based Intermediation (VBI) framework. Lastly, it offers an extensive and transparent public audit trail, including operational whitepapers, app interface workflows, and verified regulatory filings (Harvard Innovation Labs, 2025). While recognizing that secondary materials originating from pitch environments are designed to demonstrate commercial viability and scalability, cross-referencing these artifacts against external regulatory filings provides an empirical baseline to evaluate the platform's architecture without requiring primary field access.

Secondary Data Corpus

The analysis evaluates a systematic corpus of secondary qualitative data, detailed in Table 1 below:

Table 1: Secondary Data Corpus Analyzed

Data Category	Document / Source Type	Specific Artifacts & Scope	Purpose in Analysis
Platform Artifacts	Primary disclosures by Bagh-e	Bagh-e app architecture specifications, user interface workflows, whitepapers, press releases (Harvard Innovation Labs, 2025).	Evaluating the Finance, Technology, and Innovation dimensions (Fethallah, 2025).
Regulatory Records	Central Bank & Industry Reports	Bank Negara Malaysia (BNM) MIFC Challenge 2025 listings; Global Islamic Fintech Report 2025/26 (Basit et al., 2026).	External validation of compliance, climate resilience, and governance.
Macro Data	Multilateral Institutions	Food and Agriculture Organization reports (Benni et al., 2025), World Bank Findex (Klapper et al., 2025), ADB agricultural reports (Khandker & Yamano, 2025).	Contextualizing agrarian credit gaps and smallholder demographics in Southeast Asia.
Academic Literature	Peer-reviewed Journals	Studies on *Salam*, *Murabahah*, and VBI frameworks (Al-Daihani et al., 2024; Mu'id et al., 2026).	Theoretical pattern-matching and construct triangulation.

Analytical Protocol and Coding

Documentary evidence underwent qualitative content analysis and deductive pattern matching to reconcile operational platform data with theoretical assumptions (Mahboob et al., 2025; Pal, 2025). Analysis proceeded through a three-stage sequence:

Stage 1 (Structural Coding): Extracting all functional and financial features of the Bagh-e platform (e.g., crop-specific funding, risk assessment, digital credit) from platform-specific materials.

Phase 2 (Theoretical Pattern-Matching): The Three-Dimensional Fintech Framework and Agency Theory are used to map the extracted features.

Phase 3 (Triangulation and Verification): The analysis cross-examined platform performance metrics against external benchmarks, triangulating self-reported claims with Bank Negara Malaysia's (BNM) climate resilience evaluations and established Shariah auditing criteria.

4. Findings

Analyzing the Bagh-e platform through the lens of qualitative content analysis (Mahboob et al., 2025; Pal, 2025) reveals that its digital transformation of agricultural lending operates as a cohesive socio-technical system. The platform's architecture structurally aligns with the three core dimensions of the Three-Dimensional Fintech Framework: (1) Shariah-compliant financial contracts, (2) advanced technology and risk management databases, and (3) collaborative value-chain innovation management.

The Finance Dimension: Shariah-Compliant Structural Alignment

The first dimension of the platform concerns the creative adaptation of classical Islamic contracts (*Fiqh al-Muamalat*) to fulfill the specific working capital and asset-acquisition requirements of smallholders (Al-Daihani et al., 2024; Kalimullina & Orlov, 2020). Traditional rural credit programs frequently fail because rigid, interest-based repayment schedules clash with the volatile, seasonal nature of crop yields. Bagh-e replaces this with two primary Shariah-compliant structures:

Digital *Salam* Contracts (Forward Sales) Workflow: To supply critical upfront working capital for planting, Bagh-e facilitates digital Salam agreements. Under this framework, investors purchase a predetermined portion of the farmer's expected harvest at an agreed-upon, discounted price, with the cash disbursed immediately to fund pre-harvest preparations. This upfront liquidity solves the severe resource crunch farmers experience at the start of the planting season without trapping them in interest-based debt (Harvard Innovation Labs, 2025; Kalimullina & Orlov, 2020; Shaikh, 2024).

Digital *Murabahah* (Cost-Plus) Workflow: When farmers require physical capital assets such as tractors, certified seeds, or specialized fertilizers, the platform arranges a *Murabahah* structure. To avoid selling goods before ownership, the platform establishes constructive possession (*qabd hukmi*) and ownership risk transfer through a sequential four-step execution:

Step 1 - Promise to purchase (*wa'd*): The farmer submits an input financing request via the mobile app, executing a unilateral promise to purchase the required items.

Step 2 - Platform procurement and constructive possession (*qabd hukmi*): Bagh-e acquires the specified asset from a trusted supplier. Digital inventory allocation and voucher generation establish the platform's legal title, disposition rights, and initial ownership.

Step 3 - Murabahah execution: Bagh-e formally executes the sale with the farmer at cost plus a disclosed mark-up which will be paid post-harvest, thereby issuing a restricted closed-loop voucher to the farmer's dashboard.

Step 4 - Physical delivery and risk transfer (*qabd haqiqi*): The farmer redeems the voucher at the trusted supplier's vendor. Physical possession (*qabd haqiqi*) is transferred to the farmer, which then triggers an automated financial settlement to the vendor (Basit et al., 2026; Harvard Innovation Labs, 2025; Kalimullina & Orlov, 2020).

The Technology Management Dimension: AI Risk Analytics and Digital Vouchers

The second dimension of Bagh-e is its advanced digital infrastructure, which automates and secures the execution of these Shariah contracts at scale. Traditional banks avoid rural agricultural lending because manual

monitoring of thousands of geographically dispersed, unbanked smallholders creates excessively high transaction and screening costs (Kashid et al., 2026; Khandker & Yamano, 2025). Bagh-e overcomes these brick-and-mortar limitations through two integrated technology systems:

AI Agronomic Risk Engine: Bagh-e leverages a cloud-hosted, predictive AI data engine that integrates real-time satellite imagery, localized weather station feeds, and historical crop yield analytics. This system constructs dynamic credit profiles based on verified agronomic capacity rather than physical property titles, allowing smallholders who used to be excluded to access formal finance. During the cultivation cycle, the AI continuously monitors vegetation health and pest threats. Proactive alerts are then sent to protect the farmer's yield and the investor's capital (Benni et al., 2025; Harvard Innovation Labs, 2025; Pal, 2025).

Closed-Loop Digital Voucher System: To ensure funds are only used for its intended purposes, Bagh-e manages disbursement through a closed-loop digital voucher system. Approved financing is issued as restricted digital vouchers directly to the farmer's mobile dashboard. The farmer redeems these vouchers with verified suppliers, and Bagh-e automatically settles the payment with the supplier once the delivery is verified (Basit et al., 2026; Harvard Innovation Labs, 2025; Nielsen et al., 2026). From a *Fiqh* perspective, this architecture provides a guarantee of real-asset backing. As the capital is locked within a verified merchant network, the voucher ensures that credit is converted into tangible productive inventory, directly honoring the Islamic finance tenet that money must serve as a medium of exchange rather than a commodity (Mu'id et al., 2026).

The Innovation Management Dimension: Value-Chain Integration and Socio-Technical Trust

The final dimension of Bagh-e's operational success is its innovative value-chain business model, which coordinates diverse ecosystem stakeholders and actively builds user trust. Because smallholder communities often exhibit low initial trust toward digital financial systems and formal banking institutions, technological access alone is insufficient. Bagh-e addresses this structural barrier through two key trust-building innovations:

Embedded Agronomic Advisory Services: Bagh-e directly integrates real-time agronomic consulting into its mobile platform, providing farmers with free, continuous access to certified agricultural officers and automated, localized soil-management guides. This pairing of agronomic training with financial credit ensures that farmers possess the practical capabilities necessary to convert capital into optimized yields (Harvard Innovation Labs, 2025; Vasudevan et al., 2025).

Ecosystem Disintermediation: Bagh-e constructs a unified digital marketplace that directly connects smallholder producers, input suppliers, and ethical investors. By facilitating transparent, direct-to-market sales connections, the platform prevents price exploitation by local agricultural brokers, allowing smallholders to capture the true market value of their harvest (Harvard Innovation Labs, 2025; Mapanje et al., 2023).

Discussion

Bagh-e's operational model demonstrates that Shariah compliance and predictive data systems can actively reinforce each other rather than trade off against operational speed. The platform moves beyond theoretical intent. It puts Malaysia's Value-Based Intermediation (VBI) framework into direct practice, steering Islamic finance away from tick-box, form-over-substance compliance toward tangible triple-bottom-line impact (Bank Negara Malaysia, 2019; Miras, 2025). Analyzing this implementation through the synthesized theoretical framework illuminates the platform's real-world socio-technical performance, exposing systemic frictions alongside its potential for global scalability.

Alignment with Maqasid al-Shariah and Bank Negara Malaysia's VBI

Bagh-e challenges the prevailing assumption that financial viability requires compromising on social safeguards. Instead of pursuing rapid portfolio expansion through indiscriminate loan volume, the platform calibrates facility sizes directly to the seasonal capacity of rural farmers. This operational discipline brings the foundational VBI principle of "attaining benefit and preventing harm" to life, subordinating short-term margin maximization to non-exploitative financing terms (Bank Negara Malaysia, 2019; Miras, 2025; Shafruddin & Shahimi, 2025). That distinction is critical for agrarian policy. Without deliberate risk-mitigation buffers,

unrestricted commercial microfinance has historically trapped unbanked farming families in severe, recurring debt distress (Duggan, 2016; van Rooyen et al., 2012).

By substituting conventional interest-based debt with equity-like *Salam* and asset-backed *Murabahah* contracts, Bagh-e demonstrates how digital platforms operationalize the core goals of Islamic law (*Maqasid al-Shariah*) and Bank Negara Malaysia's Value-Based Intermediation (VBI) initiative.

Table 2: Bagh-e Alignment with *Maqasid al-Shariah* and VBI

Maqasid Dimension	Operationalization in Bagh-e Platform	Aligned VBI Underpinning Thrust
Preservation of Wealth (*Hifz al-Mal*)	Replaces interest-based debt with equitable risk-sharing (*Salam*) and cost-plus sales (*Murabahah*), successfully dismantling predatory rural lending structures (Mu'id et al., 2026).	Entrepreneurial Mindset & Best Conduct (Shafruddin & Shahimi, 2025)
Preservation of Livelihood (*Hifz al-Nafs*)	Combines crop financing with AI agronomic advisory to shield smallholders from catastrophic yield losses, preserving rural household incomes and supporting local food security (Benni et al., 2025).	Community Empowerment (Shafruddin & Shahimi, 2025)
Promotion of Well-being (*Maslahah*)	Democratizes financial access for underserved populations, actively mitigating regional wealth disparities and supporting long-term economic resilience (Mu'id et al., 2026).	Inclusive Growth (Shafruddin & Shahimi, 2025)

Most importantly, the realization of these *Maqasid* dimensions and VBI thrusts is not an automatic outcome of deploying the Bagh-e platform. In field operations, translating ethical intent into genuine welfare protection (*Hifz al-Mal* and *Hifz al-Nafs*) is highly dependent on the realities on the ground level. If operational failure points to disrupt platform execution, the intended risk-sharing benefits can quickly revert into default distress.

Mitigating Principal-Agent Conflicts and Environmental Risks

Under traditional financing models, severe information asymmetry between lenders (principals) and borrowing farmers (agents) regarding crop health and creditworthiness leads to moral hazards, default risks, and high interest rates (Khandker & Yamano, 2025). This information barrier poses a distinct threat to green finance because it enables greenwashing, allowing producers to capture preferential green capital through unsubstantiated environmental claims.

The Bagh-e architecture neutralizes this agency friction at the data layer. By replacing titled land requirements with AI credit profiling driven by satellite crop telemetry, underwriting transitions from subjective gatekeeping to objective agronomic scoring (Nielsen et al., 2026). Deployed IoT field sensors close the monitoring loop. Tracking resource consumption and canopy development in real time produces auditable proof of sustainable management, shielding ESG-oriented capital from false compliance claims while maintaining a reliable operational ledger (Aruwajoye & Coetzee, 2025).

Operational Vulnerabilities, Failure Points and Policy Scalability Pathways

A rigorous critique must look past curated platform metrics to confront operational realities on the ground. The rural digital divide remains a primary vulnerability. Because low financial literacy and unfamiliarity with smartphone operating systems prevent many older farmers from navigating digital applications independently, theoretical disintermediation breaks down in practice. Without dedicated field staff to guide profile registration and input voucher processing, digital financial inclusion fails to materialize for the exact marginalized populations it targets (FAO & IPA, 2024). Second, remote-sensing data transmission can be disrupted by heavy cloud cover during the monsoon season, while weak rural internet connections can affect the real-time transmission of soil-sensor data (Aruwajoye & Coetzee, 2025). Third, moral hazard may still

happen when input suppliers and farmers collude to exchange digital vouchers for cash at a discount without providing the actual farm inputs. Even with digital restrictions, input voucher systems remain vulnerable to diversion and secondary market leakage (Jayne et al., 2018; Ricker-Gilbert et al., 2013). Beyond logistical friction, climate shocks represent a profound systemic blind spot. Because severe droughts or flash floods destroy yields on a macro scale, smallholders face involuntary default, unable to fulfill contracted crop quantities under a classical *Salam* contract. Unless the platform embeds micro-Takaful underwriting to cover catastrophic harvest failures, severe weather anomalies can rapidly compromise their balance-sheet stability.

Beyond localized operational failure points, scaling Bagh-e's digital architecture across ASEAN (such as Malaysia and Indonesia) and other OIC markets requires overcoming regulatory fragmentation and divergent Shariah interpretations of classical agricultural contracts (Basit et al., 2026). To address these hurdles and facilitate regional scalability, central banks should establish tailored regulatory sandboxes that permit the testing of digital risk-sharing models under proportional capital requirements (Chien et al., 2025). Furthermore, standard-setting bodies such as AAOIFI and IFSB must develop standardized, digitized Islamic contract templates across ASEAN and OIC states to minimize compliance friction, facilitate cross-border capital flows, and unlock institutional investment for rural resilience (Basit et al., 2026).

5. Conclusion

Analyzing the operational architecture of Bagh-e reveals how Shariah-governed agri-fintech bypasses the structural frictions that have long entrenched rural credit deficits. The empirical evidence indicates that the historical barrier to deploying contracts like *Salam* and *Murabahah* at scale was administrative rather than conceptual. When executed through predictive data analytics, cloud infrastructure, and self-enforcing smart contracts, these asset-backed instruments transition from operationally cumbersome ideals into efficient, scalable financial products. Replacing physical collateral with continuous agronomic scoring and programmable voucher routing resolves core principal-agent dilemmas without alienating non-literate borrowers. Ultimately, this integration charts a workable path away from interest-based credit models toward an asset-anchored ecosystem capable of buffering smallholders against escalating market and climatic volatility.

These findings address a persistent disconnect in emerging-market finance, i.e. the rift between classical *Fiqh al-Muamalat* jurisprudence and scalable digital execution. By examining Bagh-e through the Three-Dimensional Fintech Framework, this study illustrates how the Technology Management dimension operationalizes complex risk-sharing. Where commercial banks perceive prohibitive credit exposure, automated workflows transform cumbersome *Salam* and *Murabahah* structures into viable, low-cost instruments. The research further refines Agency Theory in sustainable finance. Rather than demanding physical property titles to secure compliance, the model demonstrates that pairing satellite imaging and predictive AI scoring with closed-loop voucher routing eliminates information asymmetries. This programmatic transparency directly curtails moral hazard, capital diversion, and greenwashing at the source.

These findings translate into concrete operational pivots for Islamic Financial Institutions (IFIs) and agri-fintech engineers. Cash micro-lending should be removed in favor of closed-loop digital vouchers. Restricting capital redemption strictly to authorized input vendors enforces authentic asset-backing and eliminates diversion risks before they occur. Underwriting frameworks require an equivalent overhaul. By replacing immovable property collateral with alternative data footprints, platforms can accurately profile unbanked smallholders. Lastly, liquidity alone is insufficient. Project managers must bundle credit facilities and Takaful coverage directly with real-time agronomic advisory feeds, as financial access translates into regenerative practice only when producers receive ongoing technical guidance.

Across ASEAN and wider OIC jurisdictions, translating these findings into real-world resilience requires dismantling legacy regulatory friction. Financial watchdogs and agricultural ministries should begin by establishing sector-specific regulatory sandboxes. Providing controlled testing environments with proportional capital adequacy rules allows digital *Salam* frameworks and P2P risk-sharing platforms to prove operational stability without being crushed by commercial banking mandates. In parallel, multilateral standard-setting bodies, specifically AAOIFI and the IFSB, must establish standardized digital Shariah

governance templates. Uniform contract protocols compress legal due diligence expenses across borders, reassuring institutional ESG allocators seeking compliant rural deployments. Crucially, software cannot outrun its physical rails. State planning must reclassify rural telecommunications and mobile broadband as non-negotiable public utilities rather than discretionary market luxuries.

These conclusions must be interpreted within clear methodological and geographic limitations. The qualitative single-case design anchors the findings to Pakistan's specific agrarian economy, where unique land-tenure patterns and informal credit monopolies shaped platform adoption; immediate transferability to other regulatory or macroeconomic environments remains unproven. Methodologically, reliance on secondary documentation and award evaluations introduces potential survivorship bias, offering limited visibility into ground-level operational breakdowns or localized user resistance. Subsequent scholarship can address these limitations through two distinct empirical routes. First, researchers should execute quantitative impact evaluations that measure farm-gate productivity, household income volatility, and repayment default over consecutive crop cycles. Second, comparative policy inquiries are needed across ASEAN jurisdictions to determine how varying sandbox stringencies and Shariah governance frameworks dictate the international scalability of digital agricultural platforms.

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Narrative Review of Ambidexterity and Dynamic Capabilities in Digital and Green Transformations: Pathways to Innovation and Firm Performance

Hardi Emrie Rosly[1], *Junainah Junid[1], Balqis Mohd Sharif[1], Syahrina Abdullah[2], Maulida Nurul Innayah[3], Zalina Noor Mohd Ali[4]
[1]Faculty of Business and Management, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[2]School of Business Management, Universiti Utara Malaysia, Sintok, Kedah, Malaysia
[3]Universitas Muhammadiyah Purwokerto, Central Java, Indonesia
[4]Independent Researcher, Ipoh, Perak, Malaysia
Email: hardi@uitm.edu.my, *junainahjunid@uitm.edu.my, balqis641@uitm.edu.my, syahrina@uum.edu.my, maulidanurul@ump.ac.id, zafinarnoorlyn@gmail.com
Corresponding Author: Dr Junainah Junid

Abstract: This study examines how dynamic capabilities and related organizational capabilities shape firms' management of exploration and exploitation during digital and green transformation. The evidence base was drawn from 144 Web of Science records; 113 studies were retained as relevant, and 64 formed the principal evidence base for thematic synthesis. The review is structured around three questions: how capability foundations and dynamic capabilities enable innovation ambidexterity; why ambidexterity appears in different theoretical and empirical roles; and what contextual or methodological conditions influence its relationship with organizational outcomes. Across studies, ambidexterity is rarely associated with a single capability. Digital capability, knowledge management, strategic flexibility, learning, leadership and organizational design tend to work together, although exploration and exploitation do not always respond in the same way. The evidence also shows that operational, financial and sustainability outcomes can diverge even when firms pursue both innovation modes. The review therefore separates the theoretical meaning of ambidexterity from the statistical role assigned to it and uses an integrated capability pathway linking capability foundations, dynamic capabilities, innovation ambidexterity and organizational outcomes. It identifies boundary conditions including firm size, governance, environmental turbulence, strategic fit and measurement choice. The review concludes by identifying priorities for longitudinal, configurational, comparative and multilevel research.

Keywords: *Ambidexterity, Dynamic capabilities, Digital transformation, Green ambidextrous innovation, Industry 4.0, Entrepreneurial orientation, Circular economy.*

1. Introduction and Scope

Digital and green transformations force firms to renew existing capabilities without losing the operational discipline needed to exploit what they already know and do well. Digital technologies can change how firms process information, coordinate activities, and develop products and services, while green transformation pushes them to reconsider resource use, environmental impact and longer-term sustainability. The difficulty is that firms need to search for new opportunities without abandoning the refinement and effective use of existing capabilities (Lu et al., 2023; March, 1991).

Given its emphasis on pursuing both exploratory and exploitative innovation at the same time, innovation ambidexterity offers a useful lens through which to view this difficulty. Exploration encompasses experimentation, inquiry, and the creation of novel insights, while exploitation focuses on enhancement, execution, and the amplification of established skills (He & Wong, 2004; March, 1991). Organizational ambidexterity is broader than innovation ambidexterity, as it concerns the organizational arrangements and capabilities through which competing demands for adaptation and alignment are managed (Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2008).

Recent research, however, does not position ambidexterity consistently within explanations of organizational transformation. Li et al. (2025), for example, examine innovation ambidexterity as an outcome of digital platform capability operating through strategic flexibility, whereas Ahmad (2025) positions innovation ambidexterity as an intervening mechanism between AI capability and digital transformation. Gupta et al. (2023), by contrast, investigate innovation ambidexterity as a moderator in the relationship between cognitive computing capability and entrepreneurial quality. These different empirical positions raise an important

conceptual issue: variations in statistical model specification may reflect different questions about capability development and deployment rather than fundamentally different meanings of ambidexterity.

Dynamic capabilities theory provides a useful basis for organizing these relationships. Teece et al. (1997) conceptualize dynamic capabilities as the ability of firms to integrate, build and reconfigure internal and external competences in response to environmental change, while Teece (2007) subsequently distinguishes the processes of sensing opportunities and threats, seizing opportunities and reconfiguring organizational resources. O'Reilly and Tushman (2008) further position ambidexterity as a dynamic capability through which firms manage the competing requirements of exploration and exploitation. Taken together, these perspectives suggest that capability renewal and ambidextrous innovation are closely related, although the precise position of ambidexterity within the capability process requires clearer specification.

Evidence from digital transformation research reinforces the importance of organizational mechanisms that translate technological resources into ambidextrous innovation. Digital platforms, analytics and AI can expand firms' information-processing capacity, but their effects on ambidexterity depend on complementary organizational capabilities. Li et al. (2025) identify strategic flexibility as an intermediary between digital platform capability and innovation ambidexterity, while Liao et al. (2023) highlight the role of dynamic decision-making capability and cross-functional integration in connecting big-data analytics capability with ambidextrous innovation. Ahmad (2025) similarly shows that the relationship between AI capability and innovation ambidexterity depends partly on strategic fit. These studies indicate that technology acquisition alone does not explain how firms develop the capacity to pursue exploration and exploitation simultaneously. Comparable patterns are evident in the green transformation literature, although the relevant capability combinations and outcomes are not identical. Vesal et al. (2022) link innovation ambidexterity with environmental sustainability practices and show that leadership and senior managers' environmental attitudes condition this relationship. Nguyen-Van et al. (2025) report differentiated relationships between green intellectual capital and exploratory and exploitative green innovation, while Duong (2026) identifies relationships among digital platforms, AI capability, green ambidextrous innovation, circular economy practices and sustainable performance. These findings suggest that the contribution of ambidexterity to environmental transformation depends on the foundation of capability supporting it and on the particular organizational outcome under consideration.

Accordingly, this review addresses three questions. RQ1 asks how organizational capability foundations and dynamic capabilities enable innovation ambidexterity across digital and green transformation contexts. RQ2 examines how the theoretical and empirical role of ambidexterity varies across the reviewed literature and what explains these differences. RQ3 investigates the contextual and methodological conditions that shape the relationship between ambidexterity and organizational outcomes. These questions reflect the need to move beyond a catalogue of antecedents and examine the mechanisms and boundary conditions underlying capability-ambidexterity relationships (O'Reilly & Tushman, 2008; Saleh et al., 2023).

This review contributes by clarifying where ambidexterity sits within a wider capability process and by separating its theoretical meaning from the statistical role assigned to it in individual empirical models. It also compares evidence across digital, green, knowledge-based and strategic settings to identify convergence, divergence and contextual dependence. The aim is not simply to ask whether ambidexterity contributes to innovation and performance, but to explain how capability foundations are converted into ambidextrous action and why similar capability investments can produce different outcomes across contexts (Li et al., 2025; Nguyen-Van et al., 2025; Tran et al., 2025).

2. Review Methodology

Review approach and scope

This study conducts a structured narrative review to explore the association of innovation ambidexterity with dynamic capabilities and other organizational capabilities in digital and green transformation. A narrative approach is appropriate because literature does not have one common model or research design. Some studies consider ambidexterity as an outcome of capability development, others as a mediator, moderator or antecedent of performance. Existing reviews also consider the topic from different angles, including multilevel

determinants of innovation ambidexterity, broader organizational ambidexterity and Industry 4.0 adoption (Chakma et al., 2024; Oduro & De Nisco, 2024; Saleh et al., 2023).

The main evidence base was the Web of Science (WoS). The search was conducted for studies related to ambidexterity and the key capability domains reviewed here: dynamic capabilities, digital transformation, green ambidextrous innovation, Industry 4.0 readiness, entrepreneurial orientation, and the circular economy. These domains represent major streams linking ambidextrous innovation with technological, strategic, and sustainability-related transformation (Li et al., 2025; Nguyenvan et al., 2025; Oduro & De Nisco, 2024).

The recovered WoS dataset included 144 records. Screening was focused on studies substantively dealing with organizational or innovation ambidexterity, i.e. the simultaneous pursuit of exploration and exploitation in an organizational setting. This is consistent with the well-known distinction between exploration as the search for new knowledge and exploitation as the refinement and extension of existing knowledge and capabilities (He & Wong, 2004; March, 1991).

After screening, 113 studies were retained as relevant to the wider domain of review. 31 records were excluded as they did not provide a sufficiently direct connection to the scope of the paper. Of the retained studies, 64 formed the core evidence base for the thematic synthesis, with the remaining 49 used as supporting evidence where they helped to clarify particular constructs, contexts or methodological issues. The distinction between core and supporting studies is based on relevance to the capability-ambidexterity relationships explored in this review and not based on any judgement of methodological superiority.

Foundational works were treated separately from the contemporary WoS evidence base. This includes studies that established the exploration-exploitation distinction, the dynamic capabilities perspective and the major conceptualizations of organizational ambidexterity (Gibson & Birkinshaw, 2004; March 1991; O'Reilly & Tushman, 2008; Teece et al., 1997). Keeping these sources separate prevents the theoretical foundations of the paper from being confused with the screened contemporary evidence.

Evidence organisation and synthesis

The retained studies were organized in an evidence matrix that recorded the main bibliographic details, research context, focal constructs, form of ambidexterity, empirical role of ambidexterity, methodological approach and principal findings. Particular attention was given to whether studies treated ambidexterity as an outcome, mediator, moderator or predictor because this model position often reflects different questions about the same broader capability process (Ahmad, 2025; Gupta et al., 2023; Li et al., 2025).

Rather than organizing the study by study, the synthesis groups it around recurring capability domains. These include dynamic capabilities, digital transformation and AI, green transformation and sustainability, knowledge and learning, entrepreneurial orientation, leadership and organizational design, and organizational outcomes. This approach reflects the way recent studies increasingly examine capability combinations rather than isolated resources (Liao et al., 2023; Shafique et al., 2022; Yoshikuni et al., 2025).

When comparing the studies, three patterns were used. Convergence refers to findings that point to a similar mechanism even when the samples or measures differ. Divergence refers to differences in direction, significance or interpretation that cannot reasonably be treated as the same result. Boundary conditions refer to factors such as firm size, governance, turbulence or resource constraints that alter how a relationship works in a particular setting (Guffler et al., 2023; Li et al., 2025; Ng & Ahmed, 2025).

Not every difference between studies was treated as a contradiction. A positive operational effect and a non-significant financial effect, for instance, concern different outcomes. In the same way, a capability may support exploration without having the same effect on exploitation. The comparison therefore considers what was measured, where the relationship was tested and which outcome was involved before judging the findings as inconsistent (Ceptureanu et al., 2026; Islam & Munir, 2023; Nguyen-Van et al., 2025).

A related issue is the position given to ambidexterity in empirical models. Some studies treat it as a dependent variable, others as a mediator, moderator, or predictor. In this review, those statistical positions are not taken to mean that the construct itself has changed. The broader theoretical concern remains how firms manage

exploration and exploitation, even when researchers place that capability at different points in their models (Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2008).

The review aims to integrate theory rather than calculate a common effect size, so the studies are not combined statistically. Systematic reviews and meta-analyses are used where they help explain a wider pattern, but they are not counted as though they were equivalent to individual empirical samples (Chakma et al., 2024; Oduro & De Nisco, 2024; Saleh et al., 2023).

Table 1: Domains and Studies covered by the Review

Domain	Core studies (n)	Role in the review
Performance, resilience and competitive advantage	32	Comparison of organizational outcomes
Green transition, sustainability and circularity	29	Principal transformation domain
Digital transformation, AI and analytics	26	Principal transformation domain
Dynamic capabilities	25	Primary theoretical lens
Knowledge, learning and absorptive capacity	23	Capability conversion mechanisms
Leadership, culture and organizational design	12	Coordination and organizational context
Entrepreneurial orientation and strategic entrepreneurship	7	Strategic direction and initiative
Industry 4.0	5	Digital adoption and readiness context
Internationalization, export and born-global context	2	Contextual extension

3. Ambidexterity and Dynamic Capabilities: Theoretical Integration

Capability foundations and processes of renewal

The dynamic capabilities perspective provides the primary theoretical lens because digital and green transformation require more than the possession of useful resources. Teece et al. (1997) define dynamic capabilities as the ability to integrate, build and reconfigure competencies, while Teece (2007) develops the idea through sensing, seizing and reconfiguring. Complementary theories address different parts of the same problem: resource-based theory explains why resource differences matter, the natural-resource-based view adds environmental constraints and opportunities, and information processing theory highlights the coordination demands created by uncertainty (Barney, 1991; Galbraith, 1974; Hart, 1995; Teece, 2007).

These perspectives are useful for different reasons and should not be treated as interchangeable. Technology, knowledge, human resources and relational capital give firms something to work with, but having them does not automatically mean that renewal is taking place. A digital platform or an AI system may increase information capacity, yet the firm still needs learning, decision, and coordination mechanisms before that capacity becomes innovation activity (Ahmad, 2025; Liao et al., 2023). The same applies in green transformation, where environmental knowledge and green intellectual capital need managerial direction and organizational processes before they contribute to exploratory and exploitative innovation (Nguyen-Van et al., 2025; Vesal et al., 2022).

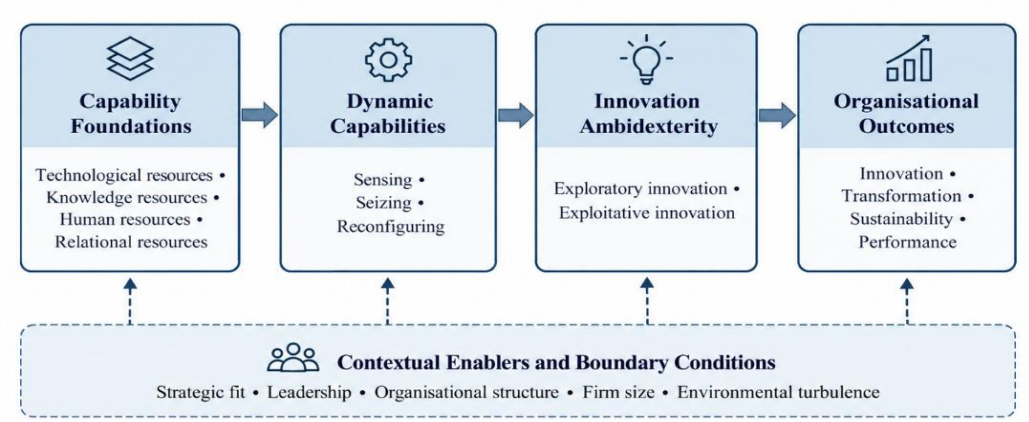
Positioning ambidexterity within the capability process

O'Reilly and Tushman (2008) explicitly describe ambidexterity as a dynamic capability for managing exploration and exploitation. This review keeps that theoretical position but separates it analytically from the broader processes through which resources are renewed. Here, innovation ambidexterity refers to the firm's ability to coordinate exploratory and exploitative innovation, while sensing, seizing and reconfiguring describe how resources are identified, mobilized and changed over time (He & Wong, 2004; March, 1991; Teece, 2007). This distinction becomes useful once the empirical studies are compared. Li et al. (2025) place ambidexterity as an outcome of digital platform capability through strategic flexibility. Ahmad (2025) places it inside the pathway from AI capability to digital transformation, while Gupta et al. (2023) use it as a moderator. The models are different, but they can still be read as addressing different points in the same broader problem: where and how the coordination of exploration and exploitation matters.

Integrated capability pathway

The framework that follows is intentionally simple. Capability foundations provide the resources and established abilities available to the firm. Dynamic capabilities concern how those foundations are mobilized and reconfigured. Innovation ambidexterity concerns how exploration and exploitation are coordinated, while the eventual organizational outcomes depend on context and on the way the capabilities are combined. The sequence should not be read as a fixed causal chain because innovation can feed back into later capability development and some outcomes take longer than others (Qin et al., 2024; Teece, 2007; Tran et al., 2025).

Figure1: Innovation Ambidexterity Sequence



Note. Capability foundations include technological, knowledge, human and relational resources. Dynamic capabilities refer to the processes through which firms sense opportunities, seize them and reconfigure existing resources. Innovation ambidexterity represents the coordination of exploratory and exploitative innovation. Contextual enablers and boundary conditions may influence different stages of the pathway. Accordingly, the arrows represent an organising logic rather than a fixed causal sequence (Teece, 2007; O'Reilly & Tushman, 2008).

Ambidexterity Constructs and Measurement

Ambidexterity is measured in several ways, and these differences matter when studies are compared. Structural ambidexterity separates exploration and exploitation across organizational units, whereas contextual ambidexterity relies more on a work setting that allows people to balance alignment and adaptability within the same organisation (Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2008). Studies also distinguish balanced ambidexterity, which focuses on the relative alignment of exploration and exploitation, from combined ambidexterity, which focuses on the overall intensity of both (He & Wong, 2004; Nofiani et al., 2021).

More recent work extends this logic into specific domains, including green ambidextrous innovation and combinations of technological and business-model innovation. These measures can make the construct more relevant to a particular setting, but they are not directly interchangeable because the activities and outcomes being captured are different (Nguyen-Van et al., 2025; Zhao & Gao, 2024). The same caution applies to empirical role: a study may place ambidexterity as an outcome, mediator, moderator or predictor without changing its theoretical meaning (Ahmad, 2025; Gupta et al., 2023; Li et al., 2025).

Table 2: Ambidexterity Constructs

Distinction	Core meaning	Main implication for comparison	Representative sources
Structural ambidexterity	Exploration and exploitation are separated across organizational units or structures.	Appropriate when organizational design is the main concern	O'Reilly and Tushman (2008)
Contextual ambidexterity	Individuals balance alignment and adaptability	More appropriate for behavioral and	Gibson and Birkinshaw (2004)

	within an enabling organizational context	managerial-context studies	
Balanced ambidexterity	Emphasizes similarity or alignment between exploration and exploitation	Equal low activity should not be confused with strong ambidexterity	He and Wong (2004); Nofiani et al. (2021)
Combined ambidexterity	Captures the joint magnitude of exploration and exploitation	Sensitive to how the two activities are aggregated	Nofiani et al. (2021)
Domain-specific ambidexterity	Exploration and exploitation are applied within a particular innovation domain	Green, technological and business-model innovation should not be treated as identical.	Nguyen-Van et al. (2025); Zhao and Gao (2024)
Empirical model role	Ambidexterity appears as an antecedent, mediator, moderator or dependent variable	Statistical positions do not define a new theoretical form	Ahmad (2025); Gupta et al. (2023); Li et al. (2025)

Measurement can also change the story that a study tells. A balance score may look favorable even when both exploration and exploitation are low, while a combined or multiplicative measure can hide which side is driving the result. For questions about fit, imbalance or nonlinear combinations, polynomial, response-surface and configurational approaches can therefore be more informative than a simple main-effect model (Duong, 2026; Nofiani et al., 2021).

Ambidexterity, Digital Transformation and AI

From digital capability to ambidextrous innovation

Digital transformation has become one of the main settings in which innovation ambidexterity is examined because firms increasingly need to use digital technologies for both new opportunity development and improvement of existing operations. However, the evidence does not support a simple assumption that greater digitalization automatically produces greater ambidexterity. What appears more consistently is the need for organizational mechanisms that translate technological capability into coordinated exploratory and exploitative activity (Li et al., 2025; Liao et al., 2023).

Li et al. (2025), using evidence from Chinese manufacturing firms, show that digital platform capability contributes to innovation ambidexterity through strategic flexibility. This is important because the platform itself is not treated as sufficient. Firms need the ability to adjust strategic choices and redeploy resources before digital capability can be converted into exploratory and exploitative innovation. The finding therefore fits the capability pathway discussed earlier: technological resources provide possibilities, but organizational processes determine how those possibilities are used (Li et al., 2025).

A similar pattern appears in research on big-data analytics. Liao et al. (2023) identify dynamic decision-making capability as an important mechanism connecting analytics capability with innovation ambidexterity, while cross-functional integration influences the relationship. The implication is fairly practical: generating more information does not necessarily improve innovation if the organisation cannot interpret the information, coordinate decisions across functions and act on it. In this sense, digital capability increases the firm's information capacity, while organizational capability determines whether the information becomes useful for exploration and exploitation (Liao et al., 2023).

AI capability and the role of organizational fit

Research on artificial intelligence extends this issue because AI can support both experimentation and operational improvement, but its effects are highly dependent on how it is embedded within the organisation. Ahmad (2025), studying family-owned small hotels, reports that innovation ambidexterity forms part of the relationship between AI capability and digital transformation. More importantly, strategic fit strengthens the relationship between AI capability and ambidexterity, suggesting that the usefulness of AI depends partly on whether technological capability is aligned with organizational priorities and resources (Ahmad, 2025).

In their comparative study of firms in India and China, Gupta et al. (2023) provide a different view of the same broader issue. They examine innovation ambidexterity as a moderator between cognitive computing capability and entrepreneurial quality and report that the moderating effect is not identical across the two national settings. This suggests that ambidexterity cannot be assumed to play the same role in every institutional or organizational environment. It is also a useful reminder that Ahmad (2025) and Gupta et al. (2023) should not be cited as if they tested the same mechanism; one examines an intervening pathway, while the other examines whether ambidexterity changes the strength of a relationship.

Digitalization does not affect exploration and exploitation equally.
One of the more striking results in recent studies is that digitalization does not necessarily have a simple linear relationship with ambidextrous innovation. Using panel data from Chinese high-technology SMEs, Qin et al. (2024) report a U-shaped relationship between digitalization and innovation ambidexterity, with performance feedback changing the shape of that relationship. This suggests that the benefits of digitalization may change as firms move through different levels of digital development rather than increasing steadily from the beginning (Qin et al., 2024).

Duan et al. (2024) provide another indication that the two innovation modes can respond differently. Their study of knowledge-intensive business service firms reports a positive relationship between digital transformation and radical innovation, but an inverted U-shaped relationship with incremental innovation. Although radical and incremental innovation are not perfect substitutes for exploration and exploitation, the findings still show that digital transformation can have different implications for different forms of innovation (Duan et al., 2024).

This distinction becomes even clearer when innovation configurations are examined rather than individual dimensions. Zhao and Gao (2024) find that different combinations of technological and business-model exploration and exploitation are associated with different performance outcomes under digital transformation. Some configurations are more favorable than others, which means that the value of ambidexterity depends partly on where exploration and exploitation take place, rather than simply on whether both are present (Zhao & Gao, 2024).

Industry 4.0 as readiness and adoption context
Industry 4.0 research provides a related but slightly different perspective because some studies examine the organizational capabilities needed to adopt advanced digital technologies, while others examine the consequences of adoption. Oduro and De Nisco (2024), using meta-analytic structural equation modelling, identify innovation ambidexterity as part of the relationship between Industry 4.0 adoption and firm performance. Their findings support the view that technology adoption may create value partly through the firm's ability to pursue both exploratory and exploitative innovation (Oduro & De Nisco, 2024).

Hashem (2024) approaches Industry 4.0 readiness by examining how absorptive capacity, learning capability and innovation ambidexterity relate to adoption. The study reports different patterns for exploration and exploitation, suggesting that readiness is better understood as a set of organizational conditions that shape how firms absorb new technologies and translate them into innovation activity rather than as another label for ambidexterity.

Overall, digital evidence shows a fairly consistent pattern at the level of mechanism: technology creates new informational and operational possibilities, but complementary organizational capabilities shape whether those possibilities are converted into ambidextrous innovation. The effects are not uniformly linear, and exploration and exploitation do not always respond in the same way. Digital transformation is therefore better understood as a capability-development process than as a technological input that automatically improves innovation and performance (Liao et al., 2023; Qin et al., 2024; Zhao & Gao, 2024).

4. Green Ambidextrous Innovation and Circular Transition

Green transformation as a capability problem
Despite having underlying objectives being different, green transformation creates a similar exploration-

exploitation tension just as digital transformation. In trying to face the daunting task of improving innovation and productivity, firms would also have to deal with environmental pressures, resource constraints and sustainability expectations. The value of ambidexterity therefore depends on whether exploratory and exploitative innovation can be directed towards environmental goals rather than treated as general innovation activity (Hart, 1995; Nguyen-Van et al., 2025).

One useful example is by Vesal et al. (2022) which linked innovation ambidexterity with environmental sustainability practices and showed that leadership and senior managers' environmental attitudes condition the relationship. Suggesting that opportunities for more sustainable practices may be created through ambidextrous innovation, managerial interpretation and commitment still shape how the opportunities are realized (Vesal et al., 2022).

This matters because the presence of green innovation should not automatically be treated as evidence of improved sustainability performance. Studies use different outcomes, including environmental practices, operational efficiency, perceived sustainability, circularity and financial performance. These measures capture different stages or consequences of green transformation and should not be bundled into a single claim about sustainable performance without qualification (Ceptureanu et al., 2026; Duong, 2026; Vesal et al., 2022).

Green intellectual capital and leadership

According to a report by Nguyen-Van et al. (2025), it is suggested that knowledge resources may be especially relevant for identifying and developing new environmental opportunities, but less decisive for improving established operations. Their report found that there is an association between green intellectual capital and exploratory green innovation, but the relationship becomes weaker and non-significant with exploitative green innovation. This report presents a good example that green intellectual capital can serve as a capability foundation that can affect the two innovation modes differently.

Leadership also matters because environmental innovation requires firms to support experimentation while maintaining operational discipline. Nguyen-Van et al. (2025) report that green ambidextrous leadership is associated with green innovation and sustainable performance, while Vesal et al. (2022) show that leadership conditions the relationship between innovation ambidexterity and sustainability practices. Taken together, the findings suggest that leadership does more than sit alongside other antecedents; it can shape how existing capabilities are directed towards environmental objectives.

Digital capability and green ambidexterity

The relationship between digital capability and green transformation is becoming increasingly important because digital technologies can support information exchange, resource tracking, optimization and coordination across sustainability-related activities. Duong (2026) examines this relationship directly by linking digital platform capability and AI capability with green ambidextrous innovation, circular economy practices and sustainable performance in SMEs.

This relationship also supports the argument made in the previous section: digitalization does not automatically generate ambidexterity. In the green context, technological capability still needs to be complemented by knowledge, leadership and organizational processes that give environmental direction to innovation. A digitally capable firm may therefore be better positioned to support green transformation, but digital capability alone does not guarantee that it will pursue both exploratory and exploitative environmental innovation effectively (Duong, 2026; Nguyen-Van et al., 2025).

Circular economy and the limits of balance

Circular economy research adds another layer to the ambidexterity discussion because it makes the consequences of innovation configuration more visible. Duong (2026) reports that balanced green innovation is associated with stronger circular economy practices, while some imbalances are linked to different performance effects. The configuration that supports circularity may therefore not be the same configuration that maximizes another organizational outcome.

Ceptureanu et al. (2026) provide a related example. Their study of Romanian manufacturing SMEs reports a

positive relationship between eco-innovation ambidexterity and operational performance, but no significant relationship with financial performance. This distinction matters because an innovation capability can improve operations without producing an immediate financial return (Ceptureanu et al., 2026).

Resource constraints and green transformation

Green transformation often requires investment in technology, knowledge and new processes at the same time, making resource constraints particularly relevant for SMEs. This creates a more difficult trade-off between experimentation and efficiency. Duong (2026) shows that digital and green capabilities can support circular and sustainable outcomes, but the benefits depend on how resources are configured across exploratory and exploitative innovation.

The SME context also highlights the danger of treating ambidexterity as a simple recommendation to 'do both.' Firms with limited resources may not be able to sustain exploration and exploitation at the same intensity at all times. The more realistic question is whether they can allocate resources in a way that allows necessary experimentation without undermining operational stability (Ceptureanu et al., 2026; Duong, 2026).

Synthesis of the green evidence

Across the green literature, environmental outcomes depend on more than innovation activity alone. Knowledge resources, leadership, digital capability and organizational conditions influence whether exploratory and exploitative green innovation can be developed and whether those activities translate into circularity, operational improvement or broader sustainability gains (Duong, 2026; Nguyenvan et al., 2025; Vesal et al., 2022).

The evidence is not uniform. In some settings, green intellectual capital appears to favor exploration more than exploitation; balanced innovation may support circular practices but not every performance outcome, and operational gains may emerge without corresponding financial improvements. These differences suggest that green ambidexterity is better treated as a context-dependent capability than as a universally favorable organizational condition (Ceptureanu et al., 2026; Duong, 2026; Nguyenvan et al., 2025).

Entrepreneurial Orientation, Knowledge and Organizational Enablers

Entrepreneurial orientation and learning

Entrepreneurial orientation can direct attention towards new opportunities, but it does not by itself establish ambidexterity. Nofiani et al. (2021) show that the EO-performance relationship depends on how exploration and exploitation are configured, while Ritala et al. (2021) show that entrepreneurial behavior in digital strategy implementation is also shaped by relational capital. Strategic learning provides a further mechanism: Islam and Munir (2023) find that it mediates the relationship between strategic entrepreneurship and exploratory innovation but not exploitative innovation, indicating that the two innovation modes may require different forms of organizational support.

Knowledge capability and transformation

Knowledge management capability is rarely sufficient on its own; what matters is whether the organisation has mechanisms for sharing and recombining knowledge. Shafique et al. (2022) show that connectedness strengthens the relationship between knowledge management capability and ambidexterity, while centralization weakens it. Zhou et al. (2025) similarly link platform governance with ambidexterity through knowledge transformation. The point is simple but important: knowledge creates little innovation value if the organisation cannot move, interpret and recombine it.

The evidence also cautions against treating knowledge capability as a single homogeneous construct. Erhan et al. (2024) show that different knowledge processes can have different indirect relationships with ambidexterity, while Hashem et al. (2024) report different effects across exploratory and exploitative dimensions in digital supply-chain adoption. This suggests that particular learning and knowledge mechanisms matter at different stages of innovation.

Leadership, structure and relational coordination

Leadership and organizational design shape the conditions under which other capabilities can be used. Duan

et al. (2022) show that transactional leadership can weaken the relationship between knowledge redundancy and innovation ambidexterity, while Shafique et al. (2022) identify opposite effects for connectedness and centralization. Xia et al. (2024) further show that high ambidexterity can emerge through different configurations of leadership, digitalization and institutional conditions, suggesting that there is no single organizational formula for supporting both exploration and exploitation.

EO, learning, knowledge management, leadership, structure and relational capital therefore make more sense as a connected set of enablers than as separate predictors. Their value depends on how firms combine them and on whether the organisation allows enough room for experimentation without losing the coordination needed to implement what works (Ritala et al., 2021; Shafique et al., 2022; Xia et al., 2024).

Cross-Study Synthesis and Boundary Conditions

Convergence and divergence across the evidence

After extensive work on the literature, one common thread emerges. That is, ambidexterity is rarely the result of a single capability. Digital capability, knowledge management, leadership and organizational structure appear to work through complementary mechanisms. Li et al. (2025), Liao et al. (2023) and Shafique et al. (2022), for example, point to strategic flexibility, decision capability, integration and connectedness as mechanisms that help explain how broader capabilities are converted into ambidextrous innovation.

As a result, technology-centered explanations have a limit on ambidexterity. AI, analytics and digital platforms can widen what a firm is able to do, but they do not by themselves create ambidexterity. Ahmad (2025) points to strategic fit, while the green studies by Vesal et al. (2022) and Nguyen-Van et al. (2025) bring leadership and knowledge into the picture. A more compelling conclusion is not that technology is irrelevant when it comes to ambidexterity, but that its value depends on the organizational conditions through which it is used.

The trickier task is dealing with findings that look inconsistent at first glance. Qin et al. (2024) report a nonlinear, U-shaped relationship between digitalization and ambidexterity; Duan et al. (2024) report different patterns for radical and incremental innovation; and Ceptureanu et al. (2026) find operational gains without a corresponding financial effect. Going through the literature suggests that the differences are partly due to measurement choices, outcomes and sectoral settings rather than simple disagreement. Forcing them into a single positive-versus-negative conclusion would oversimplify how ambidexterity works in practice.

Firm context and environmental boundaries

Although not always in the same direction, the context of the firm changes particular parts of the capability pathway. SMEs often face tighter resource constraints, which can make the simultaneous pursuit of exploration and exploitation more difficult, while larger firms may have greater scope for reconfiguration (Duong, 2026; Ng & Ahmed, 2025). Family firms increase another layer of interaction because governance, cohesion and strategic alignment shape how competing innovation demands are handled. Guffler et al. (2023) emphasize paradoxical tensions and family cohesion, while Ahmad (2025) highlights strategic fit in family-owned small hotels. This shows that the type of firm does not necessarily give an automatic advantage or liability whenever ambidexterity is pursued but it does change the conditions under which it is practiced.

The external environment is equally difficult to generalize. Li et al. (2025) find that market turbulence strengthens the relationship between digital platform capability and strategic flexibility, whereas Yoshikuni et al. (2025) report insignificant moderating effects for environmental uncertainty in parts of the analytics-ambidexterity relationship. Crisis and internationalization studies add useful process details, but they are less represented in the core evidence and are better treated as contextual extensions than as major streams (Misbauddin et al., 2024).

Integrated interpretation

Overall, the literature shows that there is no universal relationship between organizational capabilities and ambidexterity but rather points towards a contextual relationship between them. Technology, knowledge and human capital provide a foundation, while strategic flexibility, learning, decision-making and reconfiguration help firms use those resources. Ambidexterity revolves around how exploration and exploitation are managed within that process, and the eventual outcome depends on context, firm configuration and measurement. This

interpretation also helps explain why empirical studies place ambidexterity in different statistical positions without assuming that each position represents a different construct (Ahmad, 2025; Li et al., 2025; Teece, 2007).

Table 3: Areas of Convergence and Divergence

Area	Evidence of convergence	Main divergence	Key boundary conditions
Digital capability	Organizational mechanisms are needed to convert technology into ambidexterity	Linear and nonlinear effects differ across studies	Strategic fit, flexibility, turbulence, integration
AI and analytics	Technology value depends on complementary organizational capabilities	Ambidexterity appears as mediator, moderator or outcome	National context, strategic alignment, decision capability
Green transformation	Knowledge, leadership and digital capability support green innovation	Exploration and exploitation respond differently; operational and financial outcomes diverge	Resource constraints, leadership, circularity goals
Knowledge and learning	Knowledge processes support ambidextrous innovation	Different knowledge processes affect exploration and exploitation differently	Connectedness, centralization, learning capability
Leadership and structure	Organizational design shapes capability use	Leadership effects are not uniformly positive	Governance, structural configuration, institutional setting
Performance outcomes	Ambidexterity can contribute to organizational value	Effects vary across operational, financial, sustainability and resilience outcomes	Firm size, flexibility, context and time horizon

Methodological and Measurement Patterns in the Reviewed Literature

Research design and causal interpretation

Survey-based quantitative research is common in this literature, but it is not the only approach. The evidence also includes panel studies, qualitative cases, configurational analysis, and meta-analytic work. Cross-sectional surveys are useful for showing associations, but they are less convincing when the argument depends on sequence or causality. Panel studies by Qin et al. (2024) and Zhao and Gao (2024), configurational work by Xia et al. (2024), and the qualitative study by Misbauddin et al. (2024) offer useful alternatives for questions that require change over time, combinations of conditions or process detail.

Measurement and level-of-analysis issues

Measurement varies almost as much as research design. Some studies keep exploration and exploitation separate, while others use balanced or combined indices, and still others focus on domain-specific forms such as green ambidextrous innovation. The capability side is also diverse: digital platform capability, AI capability, analytics, knowledge management and strategic learning are related, but they are not the same mechanism. Direct comparison therefore becomes difficult when the operationalization is ignored (Ahmad, 2025; Li et al., 2025; Nofiani et al., 2021).

Another issue is the level of analysis. Much of the literature reports firm-level outcomes even when the underlying mechanism involves employees, teams or managers. Individual entrepreneurial orientation, leadership and knowledge sharing may contribute to organizational ambidexterity, but that movement from individual behavior to firm-level capability should not be assumed. Multilevel designs could help make that link more explicit (Ritala et al., 2021; Saleh et al., 2023).

Contextual concentration and methodological opportunities

The geographical spread of the evidence is uneven, with many studies coming from Asian and emerging-market settings. Cross-country work already shows that similar capabilities can behave differently across national contexts, so institutional conditions should be examined explicitly rather than treated as background context (Gupta et al., 2023; Yoshikuni et al., 2025). Method should also follow the question: longitudinal designs are better for sequencing, configurational approaches for capability combinations, and qualitative or multilevel designs for process and cross-level explanation (Qin et al., 2024; Xia et al., 2024).

5. Research Gaps and Future Directions

Future research first needs greater conceptual clarity about where ambidexterity sits in the capability process. Empirical models should state whether they are explaining how ambidexterity develops, using it as a mechanism that connects capabilities with outcomes, or examining it as a condition that changes another relationship. Longitudinal designs would be especially useful because they can test feedback between capability development, ambidextrous innovation and organisational transformation rather than forcing these relationships into a one-way sequence (Ahmad, 2025; Li et al., 2025; O'Reilly & Tushman, 2008).

Researchers should also resist combining exploration and exploitation too quickly. The evidence shows asymmetric and nonlinear patterns associated with strategic learning, green intellectual capital and digitalisation. Composite measures can hide those differences, so polynomial, response-surface and configurational approaches may be useful where the research question concerns balance, imbalance or multiple pathways (Islam & Munir, 2023; Nguyen-Van et al., 2025; Qin et al., 2024; Xia et al., 2024).

The same should also be considered when it comes to capabilities. Digital, knowledge, leadership and relational capabilities often work in combination, and Xia et al. (2024) show that different configurations can lead to high ambidexterity. This makes configurational thinking particularly useful when comparing SMEs, family firms and larger organisations because their resource bases and governance arrangements are not the same (Gaffer et al., 2023; Ng & Ahmed, 2025; Xia et al., 2024).

Finally, digital and green transformation need to be examined together more directly. Digital infrastructure, while it competes for attention and precious limited organisational resources, can support green exploration, process optimisation and circular economy practices. Comparative and multilevel studies could help identify when digital and green capabilities reinforce one another and when trade-offs emerge, especially in resource-constrained SMEs and volatile emerging markets (Duong, 2026; Nguyen-Van et al., 2025; Yoshikuni et al., 2025).

Theoretical, Managerial and Policy Implications

Theoretical implications

From a theoretical standpoint, the main contribution is the way the review places ambidexterity inside a wider capability process rather than treating it as a stand-alone organizational attribute. The distinction between theoretical meaning and statistical position is important because exploration and exploitation may rely on different capability foundations. It also means that firm size, governance, strategic fit and turbulence are better treated as conditions attached to particular relationships than as general background variables (Islam & Munir, 2023; Li et al., 2025; O'Reilly & Tushman, 2008).

Managerial implications

For managers, the practical message is fairly straightforward: technology or knowledge investment on its own is unlikely to produce ambidextrous innovation. Firms still need strategic flexibility, learning, cross-functional integration and an organizational design that allows those resources to be used effectively. For SMEs, this may also mean sequencing exploration and exploitation or relying on external networks instead of trying to sustain high levels of both internally at the same time (Liao et al., 2023; Ng & Ahmed, 2025; Shafique et al., 2022).

Policy implications

For policymakers, the same argument suggests that support for digital and green transformation should not stop at technology adoption. SME programs may be more useful when finance or infrastructure is combined

with learning, knowledge management, coordination and network support. The design also needs to recognize that family firms, manufacturing SMEs and service firms do not face the same governance or resource constraints (Chakma et al., 2024; Guffler et al., 2023; Nguyen-Van et al., 2025).

Conclusion

This review sets out to understand how dynamic capabilities and related organizational capabilities support ambidexterity during digital and green transformation. Across the evidence, one point comes through quite clearly: ambidexterity is rarely the product of a single capability. Technology, knowledge, learning, leadership and organizational structure usually work together as firms try to turn resources into exploratory and exploitative innovation (Liao et al., 2023; Shafique et al., 2022; Teece, 2007).

The main contribution of this review is to clarify where ambidexterity fits within organisational capability processes. When researchers model ambidexterity as an outcome, mediator, moderator or predictor, they may be examining different stages of capability development and deployment rather than different constructs. Ambidexterity also does not produce identical outcomes in every setting: exploration and exploitation can respond differently to particular antecedents, while operational, financial and sustainability outcomes may diverge (Ahmad, 2025; Ceptureanu et al., 2026; Li et al., 2025).

The findings should also be read against the review's limitations, including reliance on Web of Science, uneven geographical coverage, and the continued use of cross-sectional designs and heterogeneous measures. These limitations strengthen the case for longitudinal, configurational, comparative and multilevel research. Within those boundaries, the review offers a capability-based explanation of how ambidexterity develops, where it operates within transformation processes and why its effects differ across organisational contexts (Saleh et al., 2023; Xia et al., 2024; Yoshikuni et al., 2025).

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Hybrid Face Detection for Business Access Control: A Conceptual Implementation Framework

Wan Zulaikha Wan Yaacob[1], *Noor Faizah Mohd Lajin[2], Nur Ain Ahmad Yatim Mustafa[1], Zulkarnaen Bin Mohd Lajin[3]
[1]Universiti Kuala Lumpur Business School, Universiti Kuala Lumpur, Kuala Lumpur, Malaysia
[2]Faculty of Business and Management, Universiti Teknologi MARA, Malaysia
[3]Politeknik Sultan Idris Shah, Selangor, Malaysia
Email: wanzulaikha@unikl.edu.my, *noorfaizah@uitm.edu.my, ain.mustafa@unikl.edu.my, zulkarnaen.lajin@staff.psis.edu.my
Corresponding Author: Dr Noor Faizah Mohd Lajin

Abstract: Business access control decides who may enter which part of an organization's premises, under what conditions, and with what record, and organizations increasingly turn to biometric technology to make it more secure and less dependent on transferable credentials. Face detection is the first step of any facial access-control pipeline, and earlier research developed a hybrid Viola-Jones and Multi-Block Local Binary Pattern (MB-LBP) detector that copes better with faces rotated at several angles. Technical accuracy alone, however, does not show that such a detector can be introduced responsibly into a business. This paper therefore proposes a conceptual implementation framework for applying the hybrid detector to employee access control. Drawing on literature on face detection, biometric access control, technology adoption, privacy and employee acceptance, the framework identifies six dimensions: business need alignment, technical readiness, organisational readiness, security and privacy governance, employee acceptance, and business value. Together they shape implementation readiness, the outcome that determines whether an organization should proceed to a controlled pilot. A five-stage implementation process and seven propositions are offered for future empirical testing. No new face-detection experiment is reported. The paper links an established technical capability to the organizational conditions of its use and gives managers a structured basis for deciding whether, where and how to pilot facial access control.

Keywords: *Hybrid Face Detection, Viola-Jones, Multi-Block LBP, Business Access Control, Implementation Readiness, Biometric Technology*

1. Introduction

Business access control is the combination of policies, hardware and software that decides who may enter an organisation's buildings, rooms and information-bearing areas, records when they do so, and withdraws permission when roles change. It protects people, physical assets, confidential information and operating continuity, and it now overlaps with information security because door controllers, identity databases and audit logs are networked. Conventional credentials such as keys, PINs and proximity cards are easy to administer, but they can be lent, lost, copied or stolen, which loosens the link between the credential and the person who presents it (Lee et al., 2020; Temoshok, Proud-Madruga, et al., 2025).

Biometric systems address this weakness by verifying people through physical or behavioural characteristics. Facial technology is an especially visible example because it needs little physical contact, can run on inexpensive cameras and fits naturally into entrance routines. Reviews describe its use in attendance recording, entry to secured areas, payment and identity verification (Lazarini et al., 2022; Li et al., 2020) and studies in Malaysia have examined workplace attendance tracking (Khan et al., 2023) and facial payment (Lim et al., 2025). For businesses, the practical question is no longer only whether faces can be processed by a computer, but whether a facial system can improve access control without creating new security, privacy and organisational problems (Downie et al., 2025; Guleria et al., 2024).

Face detection differs from face recognition. Detection decides whether a face is present in an image and where it is, whereas recognition decides whose face it is (Hjelmås & Low, 2001; Li et al., 2020). A facial access-control transaction therefore passes through image capture, face detection, face recognition, identity verification, authorisation checking and an access decision. Errors made at the detection stage are carried into every later stage, so detection quality is a precondition of reliable recognition (Hasan et al., 2021; Li et al., 2020). Detection methods are usually grouped into feature-based approaches, which look for edges, facial parts, skin colour or

texture, and image-based approaches, which rely on statistical models, machine learning and neural networks (Hasan et al., 2021; Hjelmås & Low, 2001). Whatever the approach, rotation, lighting variation, noise, blur, cluttered backgrounds and occlusion remain persistent difficulties.

The Viola-Jones detector remains one of the most widely used methods because Haar-like features, integral images, AdaBoost and a cascade of classifiers together deliver fast detection (Viola & Jones, 2001). It works best on frontal faces and becomes less dependable when faces are rotated, partly covered, poorly lit or captured at low quality (Obaida et al., 2022; Taunk et al., 2020). Multi-Block Local Binary Pattern (MB-LBP) adds a texture description based on the intensity relationships between rectangular blocks (Zhang et al., 2007). Ali et al. (2025) combined the two methods into a hybrid detector for faces rotated through multiple angles and evaluated it experimentally using image-quality and detection measures.

A technically successful detector, however, is not yet a working business access-control system. An organisation must still ask whether the technology solves a real security or operational problem, whether its cameras, network and databases can support it, whether biometric data can be protected, whether employees will accept it, and whether the benefits justify the cost. This is the technology-to-business implementation gap. Technical studies show whether a method can perform its computational task; they say little about whether a business is technically, operationally, financially, legally and socially prepared to use it.

This paper therefore aims to develop a conceptual implementation framework for the hybrid Viola-Jones and MB-LBP method in business access control. Two research questions guide the work. First, which organisational conditions should be examined before the hybrid detector is introduced into an employee access-control environment? Second, how can those conditions be arranged into a staged process that leads to a justified decision to pilot, redesign or discontinue? Business access control is the focal domain of the study. Implementation readiness, meaning an organisation's preparedness to move from assessment to a controlled pilot, is the outcome that the framework seeks to explain.

The paper does not propose a new detection algorithm and does not repeat the earlier experiments. It treats the hybrid method as an established technical capability and examines what must be in place for that capability to be used responsibly. Section 2 reviews the literature on business access control, face detection, the hybrid method, organisational adoption and the research gap, and then develops the conceptual framework and propositions. Section 3 explains the research approach. Section 4 sets out the implementation process. Sections 5 to 9 present the discussion, theoretical contribution, managerial implications, limitations and conclusion.

2. Literature Review

Business Access Control

Access control can be described as four linked functions: identifying a person, authenticating the claimed identity, authorising the person for a specific location or resource, and keeping an auditable record of the event. Digital identity guidance treats these as separate assurance questions and stresses that the strength of each depends on the technical and management controls around it (Temoshok, Fenton, et al., 2025; Temoshok, Proud-Madruga, et al., 2025). In businesses, physical and logical access are increasingly managed through the same identity infrastructure, so a weakness at the door can become a weakness in the information system and the reverse.

The effectiveness of an access-control system is multidimensional. Security effectiveness concerns how rarely unauthorised people are admitted. Usability concerns how rarely authorised people are rejected and how long entry takes. Auditability concerns whether events can be reconstructed. Cost and compliance concern the full cost of ownership and the legal duties attached to the data processed. The trade-off between acceptance and rejection errors is central to biometric access control, and reported error rates depend strongly on lighting, distance, user cooperation and population (Grother et al., 2019; Lee et al., 2020).

Biometrics change this picture in two ways. They tie the credential to the person, which reduces card sharing and loss, but they also create sensitive, hard-to-replace data and probabilistic decisions that can fail for legitimate users. Digital identity guidance therefore treats biometric comparison as a probabilistic process and

generally pairs it with another authenticator in digital authentication (Temoshok, Fenton, et al., 2025). These characteristics explain why the introduction of facial technology cannot be judged by detection accuracy alone, and why this paper treats the preparedness of the organisation, rather than the accuracy of the algorithm, as the outcome of interest.

Face Detection

Face detection locates human faces in an image and is the entry point to facial recognition, identity verification and authentication (Hasan et al., 2021; Hjelmås & Low, 2001; Li et al., 2020). At an employee entrance, the system captures an image, finds the face region, passes it to a matching module, verifies the employee's identity, checks authorisation and either releases the door or refuses entry. Poor localisation reduces the quality of the features available for matching, and a face that is not found cannot be matched at all.

Techniques are commonly divided into feature-based methods, which detect facial parts, skin regions, boundaries and texture, and image-based methods, which use statistical classification, neural networks and other learned representations of image regions (Hjelmås & Low, 2001; Li et al., 2020). Practical performance is affected by facial rotation, which shifts the positions of landmarks, by illumination, which changes brightness and contrast, by noise and motion blur, and by occlusion from masks, glasses or hair. These problems intensify when a system moves from controlled laboratory photographs to real entrances where people approach at different speeds, distances and angles (Lazarini et al., 2022; Lee et al., 2020).

Viola-Jones Algorithm

The Viola-Jones algorithm combines four ideas: Haar-like features that measure intensity differences between adjacent rectangles, integral images that make these features cheap to compute, AdaBoost selection of the most discriminative features, and a cascade that rejects non-face regions early (Viola & Jones, 2001). Its low computational cost is valuable in access control, where employees should not wait at a door while an image is analysed, and it is still widely used as the detection stage in attendance and access systems (Lazarini et al., 2022).

Its weakness is sensitivity to pose and image quality. Detection performance falls when faces are rotated, taken from unusual angles, poorly lit, partly obscured or captured at low resolution (Ali et al., 2025; Obaida et al., 2022; Taunk et al., 2020). Employees cannot be expected to stand squarely in front of a camera, so this limitation has direct operational consequences.

Multi-Block Local Binary Pattern

The Local Binary Pattern (LBP) describes texture by comparing each pixel with its neighbours, and its rotation-invariant and multiresolution forms made it a standard texture descriptor (Ojala et al., 2002). Applied to faces, LBP histograms proved to be a compact and effective description for face recognition (Ahonen et al., 2006), and comparative studies continue to include LBP among the established local descriptors (Kortli et al., 2018).

Multi-Block LBP extends the idea from single pixels to rectangular blocks. Zhang et al. (2007) compare the average intensity of a block with that of its neighbouring blocks, encode the result as a compact code and compute it quickly with integral images, so that features describing larger local structures can be used inside a boosted cascade for face detection. Later work applied multi-scale block LBP to face recognition (Liao et al., 2007). The practical significance of MB-LBP is that it supplies local texture and structure information that does not depend entirely on the large contrast patterns captured by Haar-like features. That information is useful when pose and illumination vary, which is precisely where the original Viola-Jones detector is weakest.

Hybrid Viola-Jones and MB-LBP Face Detection

The hybrid method integrates two complementary strengths. Viola-Jones contributes efficient cascade-based localisation, and MB-LBP contributes richer local texture information. In the processing flow described by Ali et al. (2025), the input image is preprocessed, for example resized and converted to grayscale; MB-LBP features are extracted to describe local texture; and the Viola-Jones cascade then determines the probable face region, which is passed on to recognition or authentication.

Ali et al. (2025) showed that the combination is technically feasible and evaluated it on faces rotated through different angles. Their evaluation concerned detection and image-quality measures, not the conditions of a working business entrance. The present study therefore takes the hybrid architecture as given and does not claim it as new. Its contribution lies in examining what must happen after technical development before the method can reasonably be considered for organisational use.

Impact of Hybrid Face Detection on Business Access Control

Because the available experimental evidence is technical, the effect of hybrid face detection on business access control has to be reasoned from how the detection stage interacts with the rest of the access-control system. Four channels can be distinguished. These are conceptual expectations to be tested, not established findings. The first channel is capturing tolerance and throughput. A detector that finds faces at several rotation angles should reduce failed captures when people approach a camera without perfect alignment. Fewer failed captures mean fewer repeated attempts and shorter queues, which matters because user cooperation and lighting are known constraints on standalone access-control devices (Lee et al., 2020). The benefit is expected to be greatest at busy entrances and in walk-up situations where people cannot be asked to pose.

The second channel is the quality of what is passed downstream. Detection errors propagate to recognition (Lazarini et al., 2022; Li et al., 2020), so better localisation of rotated faces can improve the crop and alignment supplied to the matcher. This is an indirect effect: the hybrid detector does not itself identify anyone, and any gain in false rejection depends on the recognition module that follows it. The third channel is computational footprint. The cascade structure keeps Viola-Jones inexpensive (Viola & Jones, 2001), and MB-LBP features are computed from integral images (Zhang et al., 2007). A hybrid of the two is therefore a plausible candidate for edge devices at doors, where processing power and network connectivity are limited (Lee et al., 2020). Whether the added MB-LBP processing remains within the latency tolerated at a particular entrance is an empirical question for each site.

The fourth channel concerns what the hybrid detector does not change. It does not provide identity matching, and it does not by itself resist photographs, videos or masks presented to the camera, which are assessed through presentation-attack testing (ISO/IEC, 2023; Temoshok, Fenton, et al., 2025). It does not remove differences in error rates between demographic groups that have been documented for face recognition algorithms (Grother et al., 2019). And because capturing and processing facial images can already involve personal data, governance duties begin at capture rather than at matching (Government of Malaysia, 2024).

Taken together, these channels suggest that hybrid face detection can improve the usability and robustness of facial access control at the front of the pipeline, but that the effect on security, cost and employee experience at enterprise level is mediated by infrastructure, integration, governance and acceptance. This is the reasoning on which the framework in Section 2.10 is built.

Facial Technology in Business Environments

Facial technologies have been proposed for many organisational activities. In attendance management they can reduce reliance on cards, badges or manual registers (Khan et al., 2023; Lazarini et al., 2022). In physical access control they can help decide whether an employee may enter offices, server rooms, laboratories, warehouses, financial processing areas or other restricted facilities (Lee et al., 2020). They can support visitor management, although the governance of visitor data differs from that of employee data, and they have been studied for identity verification and payment (Lim et al., 2025; Shiau et al., 2024).

These applications also raise concerns that go beyond technical performance. The literature identifies privacy, fairness, transparency, trust, organisational justice, surveillance and acceptance as recurring issues (Ciftci et al., 2024; Downie et al., 2025; Fu & Lyu, 2025; Guleria et al., 2024). Introducing facial technology into a business therefore has both technological and organisational consequences, which is the premise of the framework developed here.

Organisational Adoption of Biometric Access Control

Whether a business can use a technology successfully depends on more than the technology. The Technology-Organisation-Environment (TOE) perspective captures this by distinguishing the technological context (for

example compatibility, complexity and infrastructure), the organisational context (for example management support, skills and financial resources) and the environmental context (for example regulation, competition and external partners). A recent meta-review of more than 80 information systems studies that used TOE found that factors are often placed in different contexts from study to study and that some sub-categories are poorly measured (Thomas & Yao, 2023). This argues for defining each factor carefully rather than relying on the three headings alone. Recent applications of TOE to artificial intelligence adoption consistently find that readiness, top-management support, human and financial resources, technical compatibility and external conditions influence implementation (Badghish & Soomro, 2024; Hughes et al., 2026; Yang et al., 2024). These findings support the claim that a technically functioning detector is not automatically ready for organisational use. TOE is nonetheless a general adoption perspective. Biometric access control involves identifiable individuals and sensitive data, so the framework in this paper extends TOE with security and privacy governance, employee acceptance and business value.

Security and privacy are central because a face is linked to a person's identity and cannot be reissued like a card. An organisation must decide why it collects facial data, how much it needs, where it is stored, who may access it, how long it is kept and when it is deleted. The security architecture must also address unauthorised access, administrator privileges, network protection, incident response and attempts to deceive the system. Digital identity guidance and presentation-attack testing standards emphasise that biometric systems need technical and management controls because biometric measurements vary and can be attacked (ISO/IEC, 2023; Temoshok, Fenton, et al., 2025; Temoshok, Proud-Madruga, et al., 2025), and AI risk-management guidance adds that governance should cover the whole system life cycle (Tabassi, 2023). In Malaysia, the Personal Data Protection (Amendment) Act 2024 expressly includes biometric data within sensitive personal data (Government of Malaysia, 2024), so accountability and privacy governance must be addressed from the start of design.

Employee acceptance is the human side of the same problem. Workers may ask why facial data is collected, whether it will be used for purposes beyond access, who can see it and whether the system will increase monitoring. Studies of employee reactions to biometric and facial technologies point to trust, organisational justice, perceived benefit, transparency and privacy concern as influential factors (Carpenter et al., 2018; Ciftci et al., 2024; Downie et al., 2025; Fu & Lyu, 2025). A survey of employees in Malaysia found generally favourable views of the usefulness and ease of use of facial attendance tracking, together with concerns about privacy, data security and accuracy (Khan et al., 2023). Acceptance therefore depends not only on ease of use but also on whether employees consider the system necessary, proportionate, secure and fairly governed.

Combining these strands, an enterprise access-control system is best understood as a socio-technical system. A detector affects the organisation through its fit with infrastructure and existing systems, through the capability of the people who operate it, through the legal and security obligations attached to the data it handles, through the reactions of the people who pass through the door, and through its cost relative to the value it adds. Table 1 maps these channels to the framework dimensions developed in Section 2.10.

Table 1: Mapping of TOE contexts and biometric-specific considerations to the framework dimensions

Framework Dimension	TOE context/extension	Illustrative focus	Key sources
Business needs alignment	Technological context (relative advantage)	Whether facial access control is better than cards, PINs or mobile credentials for the identified problem	(Guleria et al., 2024; Lee et al., 2020; Lim et al., 2025)
Technical readiness	Technological context (compatibility, complexity, infrastructure)	Cameras, lighting, processing location, integration, site testing	(Ali et al., 2025; Grother et al., 2019; Lee et al., 2020; Zhang et al., 2007)
Organisational readiness	Organisational context (support, skills, resources)	Management commitment, IT and security skills, budget, training	(Badghish & Soomro, 2024; Hughes et al., 2026; Weiner, 2009; Yang et al., 2024)

Framework Dimension	TOE context/extension	Illustrative focus	Key sources
Security and privacy governance	Environmental context (regulation, standards), extended	Lawful purpose, data minimisation, retention, presentation-attack testing, accountability	(Government of Malaysia, 2024; ISO/IEC, 2023; Tabassi, 2023; Temoshok, Proud-Madruga, et al., 2025)
Employee acceptance	Human extension to the organisational context	Trust, transparency, perceived fairness, surveillance concerns	(Carpenter et al., 2018; Ciftci et al., 2024; Downie et al., 2025; Fu & Lyu, 2025; Khan et al., 2023)
Business value	Outcome of technology and organisation together	Security, operational and economic value against total cost	(Downie et al., 2025; Lim et al., 2025; Shiau et al., 2024)

Research Gap

Existing literature falls into two streams. The first examines the technical development and evaluation of face detection and recognition, including algorithm performance, feature extraction, image quality, detection accuracy, efficiency and robustness (Ali et al., 2025; Hasan et al., 2021; Hjelmås & Low, 2001; Kortli et al., 2018; Li et al., 2020; Obaida et al., 2022; Taunk et al., 2020; Viola & Jones, 2001; Zhang et al., 2007). The second examines technology adoption and its organisational consequences through readiness, management support, acceptance, privacy, trust, organisational justice, governance and business performance (Badghish & Soomro, 2024; Ciftci et al., 2024; Downie et al., 2025; Fu & Lyu, 2025; Guleria et al., 2024; Hughes et al., 2026; Lim et al., 2025; Shiau et al., 2024; Yang et al., 2024).

Little work connects the two. Technical studies, including the earlier hybrid Viola-Jones and MB-LBP study (Ali et al., 2025), ask whether a method can detect rotated faces effectively and contribute mainly to computer vision research. Adoption studies ask what influences willingness to adopt a technology, usually without reference to a specific detection capability. Businesses, however, need a structured way to decide whether and how an established detection capability can be introduced into access control.

The present paper addresses this gap by proposing a conceptual implementation framework for hybrid face detection in business access control. It takes the earlier algorithm as an existing capability, does not reproduce its experimental results, and asks a different question: what is required for responsible organisational implementation. In doing so it moves the contribution from computer vision towards technology management, organisational readiness, biometric governance and business access control.

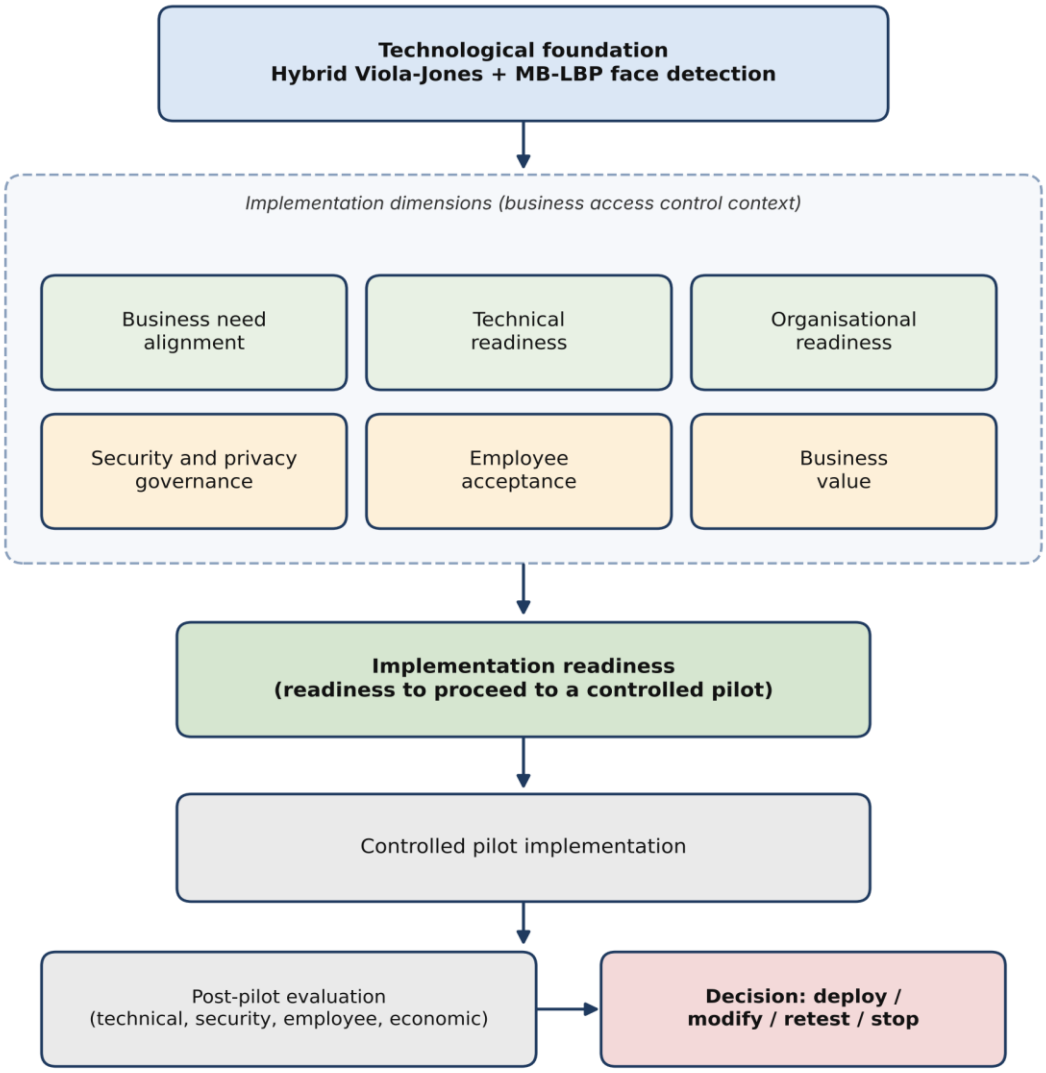
3. Proposed Conceptual Framework

Overview of the Framework

The framework starts from the technical capability established in earlier work, namely hybrid Viola-Jones and MB-LBP detection of faces at multiple rotation angles (Ali et al., 2025). Implementation requires further assessment along six dimensions. Business needs alignment asks whether the technology solves a real organisational problem. Technical readiness asks whether the technical and physical environment can support it. Organisational readiness examines the financial, managerial, technological and human resources available. Security and privacy governance asks whether biometric data can be handled and protected responsibly. Employee acceptance examines the attitudes, trust and concerns of the people affected. Business value asks whether the expected benefits outweigh the cost, risk and organisational burden.

Together these six dimensions shape implementation readiness, defined as the organisation's preparedness to move from conceptual evaluation to a controlled pilot. The pilot produces technical, organisational, user, security and economic evidence on which a later decision to deploy, modify, retest or stop is based. Figure 1 presents the framework.

Figure 1: Conceptual Framework Diagram



Business Need Alignment

Business needs alignment concerns how well facial access control addresses a specific organisational problem, such as securing entry to a building, restricting access to sensitive areas, preventing card sharing, simplifying attendance procedures or reducing repeated manual identity checks. Implementation should start from the problem, not from the technology. Studies of facial technology adoption stress perceived benefit and need as influences on acceptance and use (Downie et al., 2025; Lim et al., 2025), and standalone facial access systems have been justified by specific weaknesses of cards and PINs (Lee et al., 2020).

The organisation should compare facial technology with alternatives such as cards, fingerprints, mobile credentials, QR codes or manual checks (Guleria et al., 2024). If an existing method gives adequate security at lower cost and with fewer privacy concerns, adopting facial technology is not justified. Where secure facilities need stronger identity assurance, it may be. Business need alignment is therefore the first decision gate in the framework.

Technical Readiness

Technical readiness is the extent to which the physical and information-technology environment supports facial access control. Image quality depends on camera resolution, angle, placement, frame rate and capture distance. Lighting, shadows, movement, face direction, occlusion and background complexity affect detection (Lazarini et al., 2022; Lee et al., 2020). The organisation must also decide where processing takes place, whether on the device, at the edge or on internal servers, and whether processing power, memory, network capacity and availability can support that choice.

Integration is equally important. The detector must interface with recognition software, identity databases, employee records, authorisation rules, door hardware and security logs. Laboratory results such as those reported by Ali et al. (2025) evidence technical capability, but they cannot be assumed to transfer to every site, and demographic and environmental variation in performance has been documented for face recognition systems (Grother et al., 2019). Technical readiness therefore implies site testing, not reliance on published results alone.

Organisational Readiness

Organisational readiness is the enterprise's capability to implement, operate and sustain the technology. Readiness has been described as members' shared commitment to change and shared belief in their collective capability to carry it out (Weiner, 2009), and studies of AI adoption identify management support, skills and resources as consistent contributors (Badghish & Soomro, 2024; Hughes et al., 2026; Yang et al., 2024). Management support matters because implementation may require policy change, cross-department cooperation, new security procedures and employee communication.

Information technology capability is also required, covering installation, software administration, database maintenance, cybersecurity, performance monitoring, failure handling and updating of access rights. Human resource capability matters because IT staff, security officers, HR personnel, facility managers and administrators each have a role and need training. The organisation must also be able to meet the full cost of cameras, servers or edge devices, integration, security, networking, maintenance, training, upgrades and governance.

Security and Privacy Governance

Security and privacy governance refers to the policies and controls used to protect facial and identity data. Organisations should define the purpose of collecting biometric data, limit collection to what is necessary, restrict access to authorised personnel, apply cybersecurity controls, and set retention and deletion rules (Government of Malaysia, 2024; Temoshok, Proud-Madruga, et al., 2025). Responsibility should be assigned for system administration, privacy compliance, incident handling, employee queries and access authorisation. Testing against presentation attacks and a risk-management approach covering the system life cycle further strengthen governance (ISO/IEC, 2023; Tabassi, 2023).

In Malaysia, biometric data is treated as sensitive personal data under the Personal Data Protection framework (Government of Malaysia, 2024), so privacy and security requirements should be satisfied before a pilot begins. Employees' privacy concerns about biometric systems are themselves a reason for visible governance (Carpenter et al., 2018).

Employee Acceptance

Employee acceptance is the willingness of employees to use the system and their views on its necessity, legitimacy, usefulness, security and privacy. Workers may fear surveillance beyond access control, and may worry about where data is kept, who sees it, how long it is retained and what happens after a breach (Carpenter et al., 2018; Khan et al., 2023). Perceived fairness and organisational justice have been shown to shape reactions to facial recognition in organisational settings (Downie et al., 2025; Fu & Lyu, 2025), and privacy attitudes can shift with the context of use (Ciftci et al., 2024).

Employees may also worry about errors. If the system repeatedly fails to recognise legitimate users, it will be experienced as inconvenient and may be rejected. Communication is therefore part of implementation: the organisation should explain why it is introducing facial access control, what data is collected, how it is used and

protected, who can access it and what happens when authentication fails. Feedback gathered during a pilot can reveal usability, trust, fairness and privacy concerns before wider rollout.

Business Value

Business value assesses whether the benefits of facial access control justify its cost. Security value includes better identity verification, less unauthorised entry, tighter control of restricted areas and the removal of transferable credentials. Operational value includes less manual identification, faster entry, more efficient attendance processing and better records. Economic value requires comparing these benefits with total cost, including acquisition, infrastructure, integration, cybersecurity, maintenance, training, governance and replacement (Lim et al., 2025; Shiau et al., 2024).

Business value is not only a matter of cost saving. A high-cost system can be justified when the assets protected are valuable enough, and an advanced system can be unjustified when it offers few advantages over existing access procedures. Studies of facial technology adoption likewise treat perceived benefits and risks together rather than separately (Downie et al., 2025; Lim et al., 2025; Shiau et al., 2024).

Implementation Readiness

Implementation readiness is the framework's integrating outcome. It refers to the organisation's preparedness to move from concept-level assessment to pilot implementation, in line with the view that readiness concerns capability and commitment rather than certainty (Weiner, 2009). It does not mean that all risk has been removed. It means that the organisation has recognised an appropriate business need, judged the technical feasibility, secured the necessary resources, put security and privacy arrangements in place and considered employees' views. The concept separates technical capability from operational deployment: the existence of a functioning detector does not imply that an organisation is ready to deploy it.

Conceptual Propositions

Seven propositions are derived from the framework for future empirical testing.

The first concerns business need. When facial access control addresses a clearly identified security or operational requirement, organisations are more likely to allocate resources and obtain management support.

P1: Greater business need alignment is positively associated with implementation readiness.

The second concerns technical readiness. Suitable infrastructure, environmental conditions, processing capacity and integration capability should lower technical uncertainty and raise confidence in a pilot.

P2: Greater technical readiness is positively associated with implementation readiness.

The third concerns organisational readiness. Management support, technical capability, financial resources, trained personnel and operating procedures should leave an organisation better prepared.

P3: Greater organisational readiness is positively associated with implementation readiness.

The fourth concerns governance. Strong security and privacy governance should reduce uncertainty about biometric data handling and increase confidence that implementation can be conducted responsibly.

P4: Stronger security and privacy governance is positively associated with implementation readiness.

The fifth links governance to acceptance. Employees are expected to be more confident when organisations explain purpose, processing, security controls, retention and accountability transparently.

P5: Stronger security and privacy governance is positively associated with employee acceptance.

The sixth concerns acceptance and readiness. An organisation with adequate technical and financial capability may still struggle if employees regard the system as intrusive, unnecessary, unfair or insecure.

P6: Greater employee acceptance is positively associated with implementation readiness.

The seventh concerns business value and progression beyond the pilot. Even when a pilot is technically successful, organisation-wide deployment requires evidence that the benefits justify the financial and organisational burden.

P7: Greater anticipated business value is positively associated with the decision to progress from a controlled pilot towards broader organisational deployment.

4. Methodology

Research Design

This study adopts a conceptual framework-development approach. It does not conduct another experimental comparison of Viola-Jones and MB-LBP face detection. It uses the existing hybrid method as the technological foundation and integrates it with literature on business access control, organisational technology adoption, biometric implementation, organisational readiness, security, privacy, employee acceptance and business value.

A conceptual approach is appropriate because the research questions concern the conditions an organisation should examine before deployment, not the accuracy a newly developed algorithm achieves. The study therefore extends from technical feasibility to organisational implementation, and its outputs are a framework, an implementation process and testable propositions.

Framework Development Process

The framework in Section 2.10 was developed in four stages. The first stage identified the technical foundation established in the earlier hybrid Viola-Jones and MB-LBP research, including preprocessing, texture feature representation, face localisation and the place of detection in a wider facial authentication process. The second stage separated technical performance from organisational implementation. Factors not normally part of computer vision evaluation, such as management support, infrastructure readiness, system integration, privacy governance, employee acceptance and economic justification, were treated as candidate implementation requirements.

The third stage integrated these factors with the literature reviewed in Section 2. The sources comprised peer-reviewed studies of face detection and recognition, studies of technology adoption using the TOE perspective, studies of biometric privacy and employee acceptance, and standards and legislation relevant to biometric data. The resulting considerations were organised into six dimensions. The fourth stage specified relationships between these dimensions and implementation readiness and linked implementation readiness to controlled pilot deployment and post-pilot evaluation rather than to immediate full deployment.

Scope of the Framework

The framework concerns employee physical access management in corporate settings. The hybrid Viola-Jones and MB-LBP method supplies only the face-detection component of a larger biometric identification architecture.

A complete access-control system needs further components. Once a face has been found, a recognition or identity-matching module is needed to identify the employee. The identity must be linked to an employee repository holding access rights, and an authorisation engine must decide whether the person may enter the requested location. Door-control hardware, system management, security and audit recording, incident handling, privacy controls and fallback procedures for failed authentication are also required. The framework therefore does not claim that Viola-Jones and MB-LBP alone provide a complete access-control solution.

Proposed Technology Implementation Process

The framework is operationalised as a five-stage process that moves from assessment to a deployment decision. Each stage produces evidence for the next, and the process can stop at any stage.

Business Assessment

The process begins with a business assessment. The organisation identifies the specific security or operational problem the technology is expected to address, where it would be deployed, which employees would be affected, which access-control mechanism is currently used and what improvement is expected. Alternative technologies should be considered at this stage, because the purpose is not to justify facial technology automatically but to test whether it is a suitable response to the problem (Guleria et al., 2024). The output is a documented business case covering the problem, intended use, potential advantages, major risks and alternatives.

Readiness Assessment

The second stage assesses technical, organisational, security, privacy and employee readiness. The technical assessment examines camera infrastructure, lighting, computing capacity, the physical environment, networking, software compatibility and integration requirements. The organisational assessment examines budget, management support, technical expertise, security resources, maintenance capability and staff availability (Weiner, 2009).

The security and privacy assessment examines what biometric information would be processed, how it would be protected, how long it would be kept, who may access it and which unit would be accountable (Government of Malaysia, 2024; Temoshok, Proud-Madruga, et al., 2025). Employee considerations should begin in this stage: employees should be told the proposed purpose, and major concerns should be identified before installation. The combined output indicates whether the organisation has sufficient implementation readiness to proceed.

System Design and Integration

The third stage integrates the hybrid detector into a complete employee access-control architecture. An employee approaches the camera, an image is captured and preprocessed, MB-LBP processes local facial texture and Viola-Jones identifies the facial region (Ali et al., 2025). The detected region is supplied to a separate recognition or identity-matching system. The identity is compared with an employee database, and an authorisation engine decides whether the employee may enter the requested location.

If authorisation is confirmed, the door device allows entry. If recognition or authorisation fails, access is denied or an alternative verification process starts. Every transaction is recorded in the security and audit systems. The architecture shows that hybrid detection is one component of a wider business system and not the access-control application as a whole.

Controlled Pilot Implementation

The fourth stage is a controlled pilot, not immediate organisation-wide implementation. A pilot may involve a single entrance, one restricted room, one department or a limited group of participants. Its purpose is to learn whether the system performs satisfactorily in real operating conditions before large investment is made.

The pilot should collect technical and non-technical information. Technical monitoring covers missed detections, processing time, availability, camera performance and behaviour in difficult conditions. Organisational monitoring covers staff workload, integration problems, security incidents and maintenance. Employee experience should also be documented, including feedback on usability, privacy, trust, waiting time, false rejection and inconvenience, because these issues may not appear in technical indicators (Khan et al., 2023).

Post-Pilot Evaluation

After the pilot, the organisation evaluates whether broader deployment is justified. Technical evaluation considers detection performance, processing time, false detections, reliability and availability, and environmental assessment examines lighting, facial position, movement, camera distance and partial obstruction. Security evaluation considers unauthorised access attempts, spoofing or presentation attacks, unauthorised access to biometric records, vulnerabilities and incidents (ISO/IEC, 2023). Employee evaluation examines acceptance, perceived usefulness, privacy concerns, trust, complaints and experience of failed authentication. Operational evaluation examines entry processing time, administrative and security workload, failed access events and integration with existing processes.

Economic evaluation compares implementation and operating costs with the security and operational benefits. The resulting evidence should support one of four decisions: wider deployment, modification followed by further testing, continuation of a limited pilot, or discontinuation.

Discussion

From Technical Performance to Organisational Viability

The framework argues that technical feasibility and organisational viability are different dimensions of technology implementation. The earlier hybrid study addressed whether the combination improves detection

of rotated faces, which is an image-processing question (Ali et al., 2025). The present study addresses what should be considered before an established technical method is transferred into a business. A technically effective detector can still be unsuitable if infrastructure is inadequate, integration is difficult, privacy risks are poorly managed, employees reject it or costs exceed expected value. Technical capability is therefore a necessary but insufficient condition for deployment.

Organisational Context and Implementation

Organisations differ substantially in what implementation requires. A small business with one secure entrance may need little infrastructure, whereas a large organisation with several buildings may need many cameras, centralised identity management, complex access privileges, high availability and integration with several systems. Industry context matters as well: a data centre, laboratory, financial institution, warehouse, university and general office have different security requirements. The business case for facial access control therefore cannot be judged independently of its environment, and the framework avoids assuming one configuration suits all organisations.

Employee Acceptance as an Implementation Requirement

Facial technology differs from conventional access technologies because it uses characteristics that belong to the employee. A card can be cancelled and replaced, but a face cannot. This may heighten sensitivity about the collection, storage and use of biometric information, especially if the purpose is unclear or employees suspect that access data could later be used for unrelated monitoring (Carpenter et al., 2018; Downie et al., 2025). Acceptance therefore requires transparency about purpose, data processed, security controls and procedures for errors. Strong communication and credible governance may raise confidence and reduce resistance, although this relationship needs empirical validation.

Privacy by Design

The framework supports a privacy-by-design approach in which privacy is considered during business assessment, architecture, database design, operating policy and pilot evaluation, not added after implementation. The organisation first defines the purpose of processing, then determines the minimum data required, designs security controls, restricts access, and sets retention and deletion rules (Government of Malaysia, 2024; Tabassi, 2023). This sequence of purpose definition, data requirement, data minimisation, protection, access control, retention and deletion is particularly relevant to biometric information because unauthorised disclosure creates risks different from those of conventional credentials.

Security Considerations

Business access control should not be evaluated by detection accuracy alone. A complete security evaluation should eventually include false acceptance, false rejection, attempts to deceive the system, unauthorised access to biometric information, authentication fallback, logging, system failure and identity management (ISO/IEC, 2023; Temoshok, Fenton, et al., 2025). High-security environments may combine facial verification with another factor instead of relying on it alone, and the appropriate architecture depends on the organisation's risk and business requirements.

Business Value and Technology Selection

The framework does not assume that facial technology should replace existing systems. For some organisations, cards, mobile credentials or fingerprints may give sufficient security at lower cost and with fewer privacy implications. In others, stronger identity verification may justify the added complexity of facial authentication. The decision should begin with the business problem and end with an assessment of business value, which prevents adoption from being driven by technological novelty.

Moving from Pilot to Wider Deployment

A pilot is an important intermediate stage between conceptual readiness and organisation-wide deployment. It tests actual operating conditions instead of relying on laboratory evidence or theoretical assumptions, and it shows whether the technology has unexpected organisational consequences. A technically successful pilot should not automatically lead to wider deployment. The final decision should weigh technical performance, employee acceptance, privacy and security outcomes, operating requirements, financial impact and business value.

5. Theoretical Contribution

The first contribution extends hybrid face detection research from algorithmic capability to technology implementation. Earlier technical research establishes the method's ability to perform a computational task, while the present framework considers how that capability could progress towards organisational application. The second contribution introduces implementation readiness as the outcome that connects technical capability with controlled pilot deployment, which avoids treating adoption as a binary choice between acceptance and rejection. It also responds to the observation that TOE factors are inconsistently categorised and measured (Thomas & Yao, 2023) by defining each dimension and its place in the process explicitly.

The third contribution integrates six implementation dimensions into one framework. Business need alignment, technical readiness, organisational readiness, security and privacy governance, employee acceptance and business value are frequently studied separately. The fourth contribution is the framework's staged character: deployment is conceptualised as a process that runs from business assessment through readiness assessment, integration, pilot and post-pilot evaluation to a final decision.

Practical and Managerial Implications

The framework has several implications for managers considering facial access control. Management should first determine whether an identifiable organisational problem requires stronger identity verification; the availability of facial technology is not itself sufficient justification for investment. Managers should then assess whether infrastructure, technical resources and the operating environment can support the system. Camera placement, lighting, integration, processing capability, door hardware and databases must work together. Cross-functional involvement is likely to be needed: information technology may manage infrastructure, security teams may define access requirements, human resources may coordinate employee communication, legal or compliance functions may address data-protection duties and finance may evaluate costs and benefits.

A pilot is a managerial risk-control mechanism. Rather than committing to organisation-wide deployment, management can test the system in a limited setting and collect evidence before a larger investment. Finally, evaluation should concentrate on organisational value rather than technical success, because a system may reach high detection accuracy and still add little over existing access technologies.

Limitations and Future Research

The framework has limitations. It is conceptual and has not been validated in a real organisation. No new face-detection experiment was conducted, since the hybrid method rests on previous technical research, and the discussion of how hybrid detection affects access control is therefore reasoned from the literature rather than measured. Employee acceptance and business value may differ across organisations and industries. The framework also concentrates on employee physical access and on the detection stage of a complete biometric system.

Future research should validate the framework through expert review, organisational case studies and workplace pilot testing. Technical testing may examine lighting, camera distance, facial orientation, movement and partial obstruction. Employee acceptance can be assessed through surveys or interviews, and business value by comparing security and operational benefits with implementation cost. The proposed relationships may also be tested quantitatively, for example with structural equation modelling. Collaboration with industry partners operating real access-control installations would allow pilots to be run in realistic conditions.

Conclusion

This paper proposed a conceptual framework for applying hybrid Viola-Jones and Multi-Block Local Binary Pattern face detection in business access control. Earlier research showed that the hybrid method can detect faces at different rotation angles. This study extends that work by focusing on the organisational factors that should be considered before the technology is used in a real business environment.

The framework rests on six factors: business need alignment, technical readiness, organisational readiness, security and privacy governance, employee acceptance and business value. These factors determine implementation readiness, that is, how prepared an organisation is to run a pilot. The framework shows that

technical performance alone does not guarantee successful business implementation. A detector may work well technically, but the organisation also needs suitable infrastructure, system integration, sufficient resources, proper protection of biometric data, employee support and clear business benefits.

The implementation process starts with identifying the business need and continues through readiness assessment, system integration, pilot implementation and post-pilot evaluation, after which the organisation can decide whether to deploy, improve, retest or discontinue. The framework thus shifts attention from simply having the technology to asking whether the organisation is ready and whether the technology provides real business value. Future research can validate the framework through expert review, case studies, workplace pilots, employee surveys and business value assessment.

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Cross-Cultural AI Prompting Competencies for Future Global Managers: An Initial Expert-Reviewed Nominal Group Study

*Shamsul Baharin Saihani[1], Janiffa Saidon[2], Mohd Ali Bahari Abdul Kadir[1], Suhana Safari[3], Nadia Adnan[4]
[1]Institute of Business Excellence, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[2]Faculty of Business and Management, Universiti Teknologi MARA Cawangan Selangor, Puncak Alam, Selangor, Malaysia
[3]Department of Postgraduate and Professional Studies, Faculty of Business and Management, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[4]Sunway College Kuala Lumpur, 47500 Subang Jaya, Selangor, Malaysia
Email: *shams887@uitm.edu.my, janiffa@uitm.edu.my, mohda491@uitm.edu.my, ss2909@gmail.com, nadiaad@sunway.edu.my
Corresponding Author: Shamsul Baharin Saihani

Abstract: Generative AI (GenAI) can support managerial analysis but using it effectively in global business involves more than knowing how to write prompts. This study presents an initial Cross-Cultural AI Prompting Competency Framework (CAIPCF) for business education. The framework was developed through a sequential nominal group technique (NGT) involving 53 undergraduate business students in six independent panels. Two panels, comprising 18 students, were held at a multicultural private university; the other four, comprising 35 students, were held at a predominantly monocultural public university. Panel-level rankings and qualitative responses were synthesised by one researcher into a preliminary framework. Eight experts representing strategic management, international business, management education, and GenAI-enabled industry practice reviewed its content in a single 30-minute session. The analysis yielded five domains: strategic judgement, cross-cultural competence, AI prompting, critical evaluation, and human–AI collaboration. The 30-minute expert review and student sample bound the claims: the CAIPCF is an educationally oriented framework for further testing, rather than a definitive or psychometrically validated specification of global-manager requirements. It connects technical prompting with strategic, cultural, evaluative, and ethical capabilities and identifies a basis for subsequent multi-stakeholder validation.

Keywords: *Cross-cultural competence, Generative artificial intelligence, AI prompting, Global managers, Nominal group technique*

1. Introduction and Background

Generative AI is increasingly being applied to business and financial analysis, knowledge management, and organisational decision-making (Chen et al., 2023; Kaczorowska-Spychalska et al., 2024; Leoni et al., 2024). The growing use of GenAI is changing how managers gather information, consider alternatives, and develop recommendations. Yet a fluent AI response does not, on its own, ensure a sound decision. Managers must first define the problem clearly, provide relevant context and consider cultural perspectives and possible bias. They also remain accountable for the final judgement. Even a well-structured prompt may produce advice that is strategically unsound or culturally inappropriate if it leaves important assumptions about hierarchy, communication, risk, time, identity, or stakeholder expectations unstated. GenAI can support managerial decision-making and knowledge management, but its value depends on how managers interpret and apply its outputs (Korzynski, Mazurek, Altmann, et al., 2023).

This has clear implications for business education. Undergraduate students are using GenAI as they develop the judgement needed to interpret information, work across cultural differences and make responsible decisions. The technology can support learning by offering explanations, examples, feedback and alternative viewpoints. However, students may also rely on its responses too readily or accept inaccurate information without checking. Educators therefore need to help students assess AI-generated content, verify claims, recognise the technology's limitations and take responsibility for their academic and professional decisions (Farrokhnia et al., 2024).

Students preparing for global business careers also need intercultural competence. They must be able to communicate and work effectively with people whose cultural assumptions, values and expectations may differ

from their own. Simply encountering different cultures is not enough to develop this competence. Students need opportunities to reflect on cultural differences, consider other perspectives and adapt their behaviour during intercultural interactions. Recent research in higher education shows that intercultural competence supports collaboration across different social and cultural contexts and contributes to students' preparation for internationally connected workplaces (Guillén-Yparrea & Ramírez-Montoya, 2023).

The need to combine intercultural competence with AI capability becomes more apparent when GenAI is used for international markets, multicultural teams, negotiations, stakeholder communication, or cross-border decision-making. In these situations, users must do more than ask clear questions. They need to recognise whose perspectives are represented, identify what cultural and organisational information is missing, verify the accuracy of the response, and determine whether the proposed action is appropriate for the people and institutions involved. They must also revise their prompts when an initial response contains weak assumptions, overlooks relevant stakeholders, or reflects a narrow cultural viewpoint. This reflects the wider understanding of GenAI as part of a human and technological system in which the quality of the result depends on both the capability of the technology and the judgement of the person using it (Feuerriegel et al., 2024).

Essentially, the human role is central to cross-cultural AI prompting competence. It involves writing and revising prompts, checking GenAI's responses, and judging whether they are sound, ethical, and appropriate for the cultural setting. The competence encompasses five connected areas: strategic judgement, cross-cultural competence, AI prompting, critical evaluation and human–AI collaboration. Together, these areas describe capabilities that future managers may need when using GenAI in culturally diverse settings. This view also reflects research that understands intercultural competence as involving awareness, interpretation, reflection, communication and appropriate action, rather than simply knowing about cultural differences (Mitchell, 2023). Recent reviews of AI literacy in higher education describe a field with several useful perspectives, but limited agreement on how to translate them into teaching (Hackl et al., 2026). Research has also tended to develop in separate areas. AI-literacy education has often focused on computer-science settings, with less attention to applying AI to everyday problems (Kong et al., 2024). Prompt engineering has been described as a digital competence in its own right (Korzynski, Mazurek, Krzypkowska, & Kurasinski, 2023), while intercultural competence is commonly understood as a developmental process (Huang, 2023). Management research has examined GenAI's role in organisational knowledge management and change (Kaczorowska-Spychalska et al., 2024). Using the Delphi method, Dai and Feng (2025) re-examined the definition, core components, and evaluation criteria of intercultural competence.

To address this gap, the study develops an initial Cross-Cultural AI Prompting Competency Framework (CAIPCF) for business education and the preparation of future global managers. It has three aims: to identify competencies that undergraduate business students consider important; to organise and prioritise their ideas through student NGT panels, followed by a content review by multidisciplinary experts; and to present a framework that can guide curriculum development and future research. Students provide insight into learning needs, but their views do not replace the experience of practising global managers. The expert review adds academic and professional perspectives. The framework should therefore be considered preliminary until it is assessed with a wider range of participants.

With this in mind, the study poses the following research question:
What competencies do future global managers actually need to craft, contextualise, assess, and refine GenAI prompts in a way that is both effective and responsible, particularly when working across culturally diverse managerial settings?

The study makes a few contributions to the literature. First, it brings AI prompting into conversation with strategic judgement, cross-cultural competence, critical evaluation, and responsible human-AI collaboration. This gives a wider lens than work that mostly concentrates on how prompts are worded or structured. Second, the study uses a structured consensus-building process with six student NGT panels, which is then validated by experts from strategic management, international business, management education, and industry practice. Third, the resulting CAIPCF provides practical guidance for embedding these competencies into courses on strategic management, global business strategy, international business, and cross-cultural management. This kind of integration matters because GenAI is increasingly shaping managerial decision-making, while

intercultural competence continues to be essential for collaborating effectively across diverse business environments (Albashrawi, 2025; Guillén-Yparrea & Ramírez-Montoya, 2023).

2. Literature Review

Intercultural Competence in Global Management

The ability to interact with individuals from diverse cultural backgrounds suitably and successfully is known as intercultural competence. It involves more than just picking up cultural traditions and observing obvious distinctions. People also need to have openness, curiosity, cultural self-awareness, empathy, and the capacity to perceive things from other people's viewpoints. Deardorff's (2006) process model views intercultural competence as a continuous developmental process where attitudes influence the acquisition of cultural information and interpersonal skills, which in turn affect internal comprehension and external behavior. This perspective is supported by more recent research, which contends that meaningful contact, reflection, and engagement, rather than cultural exposure alone are the ways in which intercultural competency in higher education develops (Mitchell, 2023).

This insight is especially crucial to global management. Managers frequently collaborate with employees, customers, suppliers, regulators, and business partners who have varying expectations around authority, trust, time, disagreement, risk, and relationship-building. A culturally informed response requires the manager to listen carefully, evaluate the context, consider alternate interpretations, and adapt communication as needed. Effective managers must therefore detect when cultural differences are influencing a situation and determine how to respond without making naive assumptions. Research in higher education indicates that intercultural competency enhances communication, teamwork, problem-solving, and collaboration across cultural and institutional boundaries (Guillén-Yparrea & Ramírez-Montoya, 2023).

Cultural competence must not be viewed as a list of national traits. National culture frameworks might assist managers in recognizing potential differences, yet they cannot completely account for the actions of an individual, team, or organisation. Cultural identities are formed by various factors, such as nationality, ethnicity, language, religion, occupation, generation, education, and work experience. Managers should utilize cultural understanding as a foundation for investigation instead of as a means for forecasting. Research on intercultural learning facilitated by technology shows that cultural comprehension improves more efficiently when learners engage in active exploration of cultural contexts, consider diverse perspectives, and are given chances to modify their interpretations (Liu et al., 2023).

When managers employ GenAI for international business tasks, these skills become more crucial. For instance, a manager might request that GenAI draft a message for a foreign stakeholder, offer strategies for international negotiation, assess a market-entry possibility, or offer guidance on conflict within a multicultural team. If the query does not give sufficient organisational, situational, and cultural context, the response may be grammatically correct but nevertheless inappropriate. The user can choose what information should be included in the prompt and whether the final response is suitable for the target audience with the aid of intercultural competence. Thus, it provides a crucial basis for AI prompting and decision-making that is sensitive to cultural differences (Guillén-Yparrea & Ramírez-Montoya, 2023; Mitchell, 2023).

Global leadership research provides a more specific basis for identifying the cultural demands of international managerial work. Bird et al. (2010) describe intercultural competence for global leaders as a broad content domain involving the capacities to perceive, interpret, and act effectively across cultural contexts. Cultural intelligence research similarly links metacognitive and cognitive capabilities with cultural judgement and decision-making, and motivational and behavioural capabilities with adaptation (Ang et al., 2007; Saihani et al., 2018). These perspectives support the CAIPCF's distinction between understanding context, adapting behaviour, communicating, and applying judgement; they also caution against reducing intercultural competence to factual knowledge of national cultures. Deardorff's (2006) consensus-based model is especially relevant to the present educational setting because it identifies intercultural competence as a student learning outcome and emphasises attitudes, knowledge, skills, internal shifts and appropriate external behavior.

AI Prompting, Critical Evaluation and Human Accountability

GenAI allows users to produce text, organise information, generate alternatives, and explore possible solutions through natural-language instructions. In a managerial setting, prompting involves explaining the task, providing relevant context, identifying the intended audience, stating constraints, and specifying the expected output. A useful prompt should help the AI system understand not only what the user wants but also why the task matters and how the response will be used. Research on GenAI in organisations shows that the technology can assist with decision-making, knowledge management, customer service, human resource management, and administrative work when it is applied with a clear understanding of the organisational purpose (Korzynski, Mazurek, Altmann, et al., 2023). Prompting is not complete when the first response is produced. Users need to assess the response and judge whether it actually solves the problem. If it doesn't, they might supply additional information, clarify the cultural context, reassign the role given to the AI system, or ask for alternative scenarios. They might also request the system to clarify the reasoning behind its suggestion. These actions are significant since GenAI is applied in social and organisational contexts, and the value of its results relies partially on the details and context supplied by the user (Feuerriegel et al., 2024).

A critical assessment is essential since a seemingly assured answer may still be inadequate, incorrect, biased, or inappropriate for the context. Students and managers ought to verify factual statements with trustworthy sources and assess if the answer is based on untested assumptions. In cross-cultural efforts, this involves questioning if the answer reflects a single cultural viewpoint as universal or perpetuates stereotypes concerning a community or group. Studies in higher education have found that misinformation, bias, lack of transparency, and excessive dependence are among the dangers linked to GenAI usage (Farrokhnia et al., 2024). Thus, human supervision must persist during engagement with GenAI. Managers must continue to be accountable for identifying the issue, selecting which information to communicate, assessing the feedback, and deciding if it should influence their actions. GenAI may enable organizing evidence and proposing alternatives, yet the accountability for a managerial decision lies with the decision-maker. Studies on GenAI-aided decision-making also emphasize that the technology must enhance human judgment rather than replace contextual knowledge, ethical considerations, or accountability (Albashrawi, 2025).

Closely related to this is the notion of AI literacy, which provides a broader foundation for such judgment. Long and Magerko (2020) explain AI literacy as the ability to critically evaluate AI, communicate and collaborate with it, and use it effectively. Ng et al. (2021) organize AI literacy into knowing and understanding, using and applying, evaluating and creating, and ethical issues. UNESCO's AI competency framework for students likewise focuses on a human-centred mindset, ethics, AI techniques and applications, and system design (Miao et al., 2024). These frameworks indicate that prompting is only one part of competent AI use. The CAIPCF extends this educational conversation by locating AI literacy in culturally situated managerial tasks, where users must frame a strategic problem, supply context, test outputs, and remain accountable for decisions.

Integrating Strategic, Cultural and AI Capabilities

Managerial issues are seldom independent. A choice concerning a new market, vendor, worker, or an international partner can impact various stakeholders and lead to effects throughout multiple areas of an organisation (Eisenhardt, 1989; Mintzberg et al., 1976). Systems thinking aids managers in grasping these relationships and identifying how a single choice could affect different activities. Scenario assessment enables them to evaluate potential actions and reflect uncertainty, whereas prioritizing decisions assists them in identifying which matters need urgent focus. What follows from this is that GenAI can help organize data and generate options, yet the manager still decides what needs to be asked and how the resulting information connects to the wider strategic problem (Albashrawi, 2025; Korzynski, Mazurek, Altmann, et al., 2023). Such decisions, though, are shaped well before the prompt is written. Strategic judgement helps the user define the managerial problem, identify relevant stakeholders, and clarify the purpose of the analysis. Cross-cultural competence, meanwhile, helps the user recognize the cultural and institutional context that the AI system needs to consider. Together, these competencies shape how the problem is framed and what the AI system is asked to do. Prompting then translates this understanding into instructions that specify the task, audience, constraints, and expected output.

This connection reflects the view that GenAI should be understood as part of a broader organisational system in which human knowledge and technological capability work together (Feuerriegel et al., 2024). Human-AI

collaboration is thus a cyclical process where technology offers data or potential solutions, and the user supplies context, evaluation, and responsibility. This type of collaboration can support managerial decision-making, though its value depends on whether the human user can recognize both the strengths and limitations of the technology (Albashrawi, 2025). It is important to note, however, that the study does not claim the framework represents a definitive occupational norm, nor that the student sample is representative of managers in practice. Recent studies on business graduates, which examine intercultural abilities from the perspectives of both employers and students, highlight the value of treating these as complementary sources (Prouska et al., 2026).

The literature therefore supports five connected competency domains. Strategic judgement concerns the ability to define problems, examine systems, evaluate scenarios, and establish priorities. Cross-cultural competence supports cultural adaptability, intercultural communication, and sensitivity to context. AI prompting concerns the formulation, contextualisation, and refinement of instructions. Critical evaluation involves fact verification, bias recognition, and reflective judgement. Human-AI collaboration covers collaborative problem-solving, ethical oversight, and responsible AI use. Although these areas have been discussed separately in previous studies, the literature provides limited guidance on how they can be combined into a single competency framework for future global managers. This gap provides the basis for developing and validating the Cross-Cultural AI Prompting Competency Framework through student NGT panels and subsequent expert review (Farrokhnia et al., 2024; Guillén-Yparrea & Ramírez-Montoya, 2023).

Student Perspectives and the Scope of the Framework

Undergraduate business students are appropriate informants for an educationally oriented framework because they are the intended learners whose current and anticipated learning needs are at issue. Higher education research treats intercultural competence as a student outcome that can be developed and assessed (Deardorff, 2006), while emerging AI literacy frameworks explicitly address students' capacity to understand, use, evaluate, and engage ethically with AI (Long & Magerko, 2020; Miao et al., 2024; Ng et al., 2021). Student panels can therefore identify how these capabilities are understood and prioritised in the learning context. They cannot, by themselves, establish the complete competency requirements of experienced global managers. The present study addresses that boundary by including a multidisciplinary expert review and by positioning the CAIPCF as an initial curriculum framework. It does not claim that the student sample represents practising managers or that the framework is a final occupational standard. Recent research on business graduates also examines intercultural competencies through both student and employer perspectives, underscoring the value of treating these as complementary sources (Prouska et al., 2026).

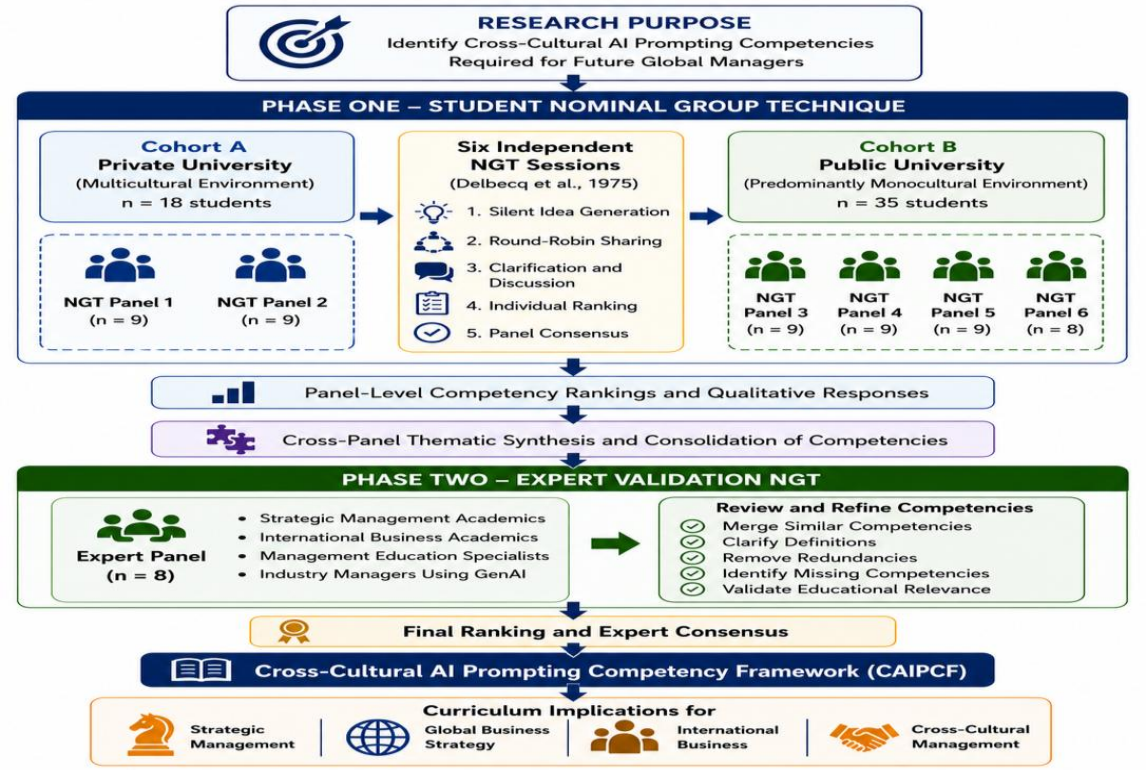
3. Research Methodology

Research Design

This research used a sequential, two-stage nominal group technique (NGT) approach to create and confirm the Cross-Cultural AI Prompting Skills Framework (CAIPSF). NGT was chosen as it offers a systematic method for participants to independently create ideas, articulate their perspectives, debate similarities or differences, and set shared priorities (Delbecq et al., 1975). The approach is especially beneficial when research aims to create a competency framework based on the insights and experiences of multiple groups, making sure that quieter participants can also provide input (Mullen et al., 2021). The study was carried out in two stages. Phase One concentrated on pinpointing the cross-cultural AI prompting skills that undergraduate business students deemed essential for upcoming global managers. The concepts and rankings produced by the student panels were then merged and structured into an initial competency framework. Phase Two included expert confirmation of the initial framework. The specialists examined the suggested domains and competencies, clarified their definitions, evaluated any overlaps or omissions, and determined their significance for management education and professional practice. This pattern aligns with recent uses of NGT where participant knowledge is collected methodically and subsequently enhanced through organized consensus-building (Black et al., 2025).

Figure 1, presented on the following page, provides an overview of the research process. It begins with the research purpose and the student NGT panels, then moves through to expert validation, the final CAIPCF, and finally the implications for curriculum design.

Figure 1: Research Process for Developing the Cross-Cultural AI Prompting Competency Framework



Note. The figure presents the study's two-phase research design, showing the participant groups, the NGT procedures, the cross-panel synthesis, the expert validation stage, and how the final CAIPCF was developed.

Participants and Panel Composition

Phase One included 53 undergraduate business students divided into six separate NGT panels. Cohort A consisted of 18 students from a private university featuring a diverse educational setting. These students were split into two groups, each consisting of nine participants. Cohort B consisted of 35 students from a public university featuring a mostly monocultural educational setting. They were split into three groups of nine individuals and a panel consisting of eight individuals. Splitting the students into smaller groups enabled each participant to engage during the brainstorming and dialogue phases while maintaining the sessions controllable. Smaller groups are typically appropriate for NGT since the approach relies on organized involvement and fair chances for individuals to share their thoughts (Mullen et al., 2021).

The purpose of including the two cohorts was to gather viewpoints from various educational settings. Students from a largely monocultural background may learn more about local institutional and cultural experience, whereas those in a multicultural university setting tend to engage more often with international peers. The study did not assume that one environment produced stronger competencies than the other. Instead, the two settings provided different perspectives that could contribute to developing a framework relevant to a wider range of business students. The institutional descriptions refer only to the learning environments represented in this study and should not be treated as general descriptions of all private or public universities.

Total population sampling was used in Phase One. All students enrolled in the Intercultural Management or Global Management course during the study period were invited to participate, as the entire accessible student population was considered relevant to the study's purpose. Their enrolment in the course provided a shared academic foundation in intercultural concepts and global managerial issues. Participation in the research was voluntary, and students' decisions to participate or decline did not affect their course grades, assessment results, or relationship with the lecturer.

The student sample was selected because the immediate application of the framework is the preparation of

business students for future global management work. Their course enrolment provided relevant academic exposure to intercultural and global-management concepts, and the panels were designed to elicit perceived learning needs and prioritise competencies, not to certify occupational competence. Students' lack of extensive international management experience is therefore a boundary on the inference: their contributions supply an educational and anticipatory perspective. The expert panel was included to assess relevance beyond the classroom. Accordingly, the sample supports an initial educational framework but does not warrant claims that the competencies have been comprehensively established for practising global managers.

Eight specialists from four fields such as strategic management, international business, management education, and industrial practice utilizing GenAI participated in Phase Two. The panel's diverse makeup was meant to guarantee that the framework applied to both managerial practice and management education. Three qualifying requirements were utilized to choose experts: having at least a master's degree, having taught internationally focused courses or worked in an international industry for at least two years, and having hands-on expertise with GenAI products. Given that suggested abilities can be examined from a range of professional viewpoints, the inclusion of participants with different areas of expertise strengthens the development of NGT-based frameworks (Black et al., 2025).

Table 1: Participant Structure and Analytical Role

Phase	Participant group	Panels and sample size	Role in the research
Phase One	Cohort A: Private university with a multicultural learning environment	2 panels; n = 18	Generate, discuss, clarify, and rank competencies before reaching panel-level consensus
Phase One	Cohort B: Public university with a predominantly monocultural learning environment	4 panels; n = 35	Generate, discuss, clarify, and rank competencies before reaching panel-level consensus
Phase Two	Expert panel: academics, education specialists, and GenAI-using managers	1 panel; n = 8	Merge, clarify, remove redundancy, identify gaps, and validate relevance.

Student Nominal Group Procedure

During Phase One, six NGT sessions were carried out separately. "*What competencies do future global managers need to use GenAI effectively, ethically, and properly across culturally varied corporate settings?*" served as the guiding question for each session. While allowing each group to produce and rank its own ideas, uniformity was preserved by using the same guiding question and process for all six panels. Five steps were used in every student session: individual rating, panel consensus, round-robin sharing, clarification and discussion, and silent idea production. The established NGT process is reflected in this sequence, which aids in striking a balance between structured group debate and autonomous thought (Mullen et al., 2021).

Participants independently recorded their ideas during silent idea generation without consulting other participants. This phase decreased the possibility that the initial speaker would direct the conversation and allowed participants to consider the question. Each participant submitted one idea at a time during round-robin sharing until every concept was recorded. Throughout the discussion, participants could examine a shared online document that the facilitator used to record the ideas in real time. At this point, participants were not asked to defend or assess their recommendations. Participants were able to ask questions, clarify the meaning of their ideas, and point out similarities and differences throughout the explanation and discussion stage. Instead of arguing with the person who presented each competency, the facilitator urged participants to concentrate on understanding each competency.

Although similar concepts were clarified during the debate, it was not until the later phases of analysis that competencies were explicitly integrated across panels. Before participants award their individual ranks, this structured conversation is crucial because it establishes a common understanding (Black et al., 2025). Using a five-point importance scale (1 = Not Important, 2 = Somewhat Important, 3 = Important, 4 = Very Important,

and 5 = Critical), participants independently evaluated each competency produced by their panel. The separate ratings were combined to determine a comprehensive importance score for every competency, and the competencies were ordered from the highest to the lowest score. When two competencies achieved the same overall score, the one with more critical ratings was ranked above the other, then followed by the count of very important ratings if needed. The final rankings were shown to the panel for validation and dialogue to guarantee that they accurately reflected the group's overall assessment. The time needed to complete a nominal group varies with group size, the number of questions asked, and the type of participants involved, and adapting stage timings to the time participants have available or to the level of clarification and consensus required is explicitly recognized as a legitimate variation of the method (McMillan et al., 2016). In an extended scoping review of virtual NGT studies, 80% of responding authors considered the virtual format comparable or superior to face-to-face delivery (Lee et al., 2024). Accordingly, every NGT session in this study took around 30 minutes and was held virtually, a duration that reflected the availability of participants and the scope of the questions posed.

Expert Validation Procedure

In Phase Two, the eight-person expert panel reviewed the initial framework created by the student panels. The five suggested domains and the competencies that go along with them were examined by the experts. It was their responsibility to ascertain whether the competencies were distinct, well-defined, pertinent to future global managers, and appropriate for inclusion in business and management education. Five activities were the main emphasis of the expert validation procedure. The experts considered whether closely related competencies should be combined, whether definitions needed to be clarified, whether any items were redundant, whether crucial competencies were absent, and whether the framework was useful from an educational and professional standpoint. Before the experts made their final decision, each suggested modification was examined.

This methodical assessment assisted in ensuring that the final competencies were relevant to both academic and professional users and that the framework was not exclusively reliant on student perspectives. Similarly, recent NGT research shows how professional learning demands can be agreed upon and concepts clarified through expert debate and rating (Black et al., 2025). Expert agreement was achieved when at least 75% of the panel members, equivalent to six of the eight experts, rated competency as either Very Important or Critical. Where this threshold was not met, the panel discussed the competency's wording, meaning, relevance, and placement within the framework. The competency was then revised based on discussion and independently rated again using the same consensus threshold. Competencies that still did not meet the threshold after the second rating were either removed or returned for further revision, depending on the panel's documented decision. The expert validation session lasted approximately 30 minutes and was conducted online.

The 30-minute meeting should be interpreted as a bounded content-review session, not as an extended Delphi exercise or a substitute for a multi-round validation study. The five domains provided the organising structure for review of the 15 associated competency statements. The panel's remit was to consider clarity, distinctiveness, relevance, overlap, omissions, and educational/professional fit, with a consensus threshold of six of eight ratings at "Very Important" or "Critical" as stated above. All 15 competencies were retained in the reported framework. No competency-specific rejection or significant modification example is claimed because the study records supplied for this paper do not offer an auditable item-by-item log of suggested phrasing changes, rejected items, or the order of individual expert comments. The session provides only a preliminary expert content assessment, but more item-level discussion and repeatable change monitoring are still required in subsequent work, which may limit the validity of the validation claim. Session length must be understood in conjunction with the exercise's goal and record because NGT research acknowledges that the amount of time needed changes with the number and complexity of items (Mullen et al., 2021).

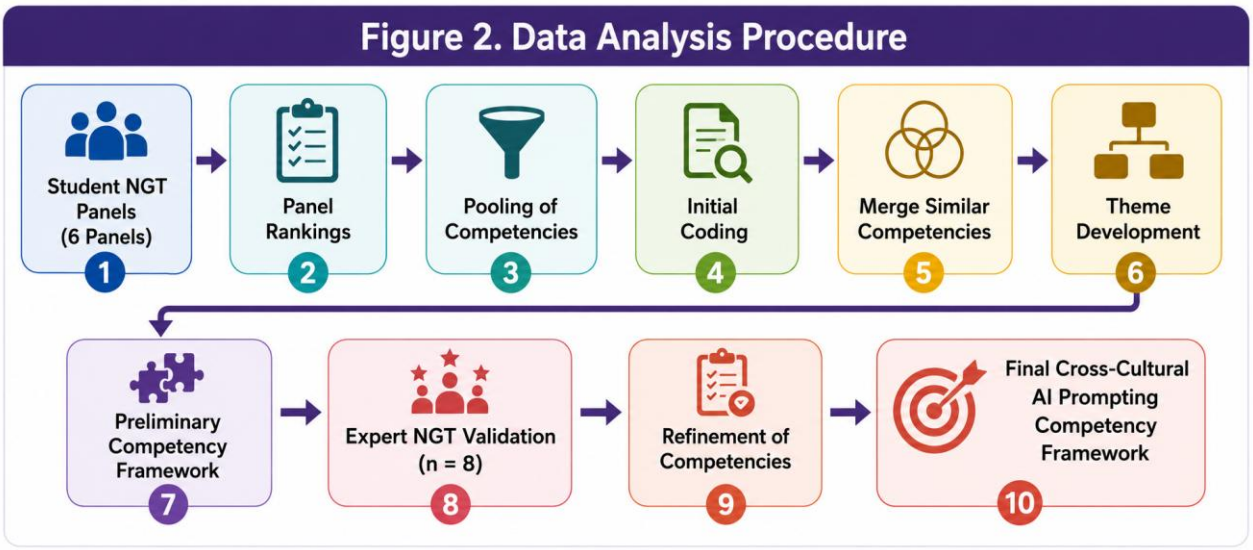
Data Analysis

The ten-step process shown in Figure 2 was used for data analysis. In order to preserve the thoughts and rankings of each panel prior to cross-panel consolidation, the first two phases kept the outputs of the six student panels independently. This was crucial because competencies that were highly relevant to one educational context but less commonly articulated in another could have been hidden by quick aggregation. The skills produced by the six panelists were integrated into a single dataset at Stage 3. In Stage 4, the

researcher went over the qualitative replies and awarded preliminary codes based on each idea's managerial capacity and meaning. Each code was compared with comparable responses from the six NGT panels and verified against the initial student-generated response. Before selecting the best classification for a response that might logically be allocated to multiple codes or domains, the researcher considered the response's significance, managerial goal, and relationship to the other competences.

The initial codes, related competencies that were later consolidated, thematic domains, and changes made during the study were all recorded in an audit trail. Later, during the validation process, the expert panel examined the initial competency framework and coding structure. This documentation made it possible to link the final framework to the ideas that the participants had first come up with (Mullen et al., 2021). During Stage 5, competencies that had related meanings were evaluated and combined when suitable. Efforts were made to avoid merging concepts simply due to the use of comparable terminology. The investigator contemplated whether the competencies reflected the same ability, fulfilled the same managerial function, and could be articulated through a common definition. At Stage 6, the combined skills were grouped into wider themes. This method generated five areas: strategic decision-making, cultural sensitivity, AI interaction, analytical assessment, and human-AI teamwork. At Stage 7, the five domains along with their respective competencies were arranged into an initial CAIPCF. In Stage 8, the initial framework was presented to the panel of eight experts. The modifications suggested during the expert review were analysed in Stage 9, and the competencies were enhanced for better clarity, uniqueness, and educational significance. Stage 10 resulted in the completion of the final CAIPCF. Figure 2 illustrates the connection among student panel outputs, rankings at the panel level, coding, consolidation of competencies, theme creation, validation by experts, and the ultimate framework.

Figure 2: Data Analysis Procedure



Note. The ten stages show how the outputs from the six student NGT panels were transformed into a preliminary framework, reviewed by the expert panel, and refined into the final CAIPCF.

Table 2: Alignment Between the Data Analysis Stages and Research Outputs

Stage	Analytical activity	Resulting output
1–2	Conduct six student NGT panels and retain panel-level rankings	Six sets of student-generated competencies and panel rankings
3–4	Pool the competencies and conduct initial coding	Combined and coded set of student-generated competencies
5–6	Compare related competencies, merge overlapping items, and develop themes	Consolidated competencies organised into five domains
7	Construct the preliminary framework	Preliminary CAIPCF
8–9	Conduct expert NGT validation and refine the competencies	Expert-reviewed domains, definitions, and competencies
10	Finalise the framework	Final five-domain CAIPCF

Trustworthiness and Analytical Rigour

Several steps were used to strengthen the trustworthiness of the study. First, silent idea generation allowed participants to record their views before hearing from others. Second, round-robin sharing ensured that every participant had an opportunity to contribute. Third, individual ranking reduced pressure to follow the most dominant view in the group. Fourth, the six panels operated separately prior to their results being combined. Ultimately, expert validation offered an independent assessment of the framework's clarity, thoroughness, and educational significance. These methods enhanced the study's reliability by integrating independent assessment, organized dialogue, clear prioritisation, participant validation, and expert review from multiple disciplines (Black et al., 2025; Mullen et al., 2021).

A record of the analysis was kept tracking the development from the original student ideas to the first codes, combined competencies, five domains, initial framework, expert suggestions, and the final CAIPCF. The documentation comprised the collective online files utilised in the NGT sessions, competency listings and rankings at the panel level, coding and consolidation logs, along with amendments made after expert validation. Confirmation from participants was secured when the rankings at the panel level were shown to the students for their review and approval following each NGT session. The expert panel from various disciplines later assessed the initial framework, definitions of competencies, domain positioning, and educational significance. These processes assisted in minimizing the chances that the ultimate framework represented the researcher's perspective solely.

One researcher carried out the synthesis. That researcher's interpretive choices were documented in the audit trail and checked against the original statements, panel-level outputs, the rankings confirmed by participants, and the expert-reviewed framework. Statements generated through the NGT were then compiled systematically into competencies and domains. These steps support traceability and leave room for challenge, though they do not amount to independent coding consensus. Cohen's kappa is not required for every qualitative analytic approach; whether it fits depends on the analytic goals and epistemological commitments at stake. Reflexive thematic analysis, in particular, cautions against treating interpretive coding as a stable and objectively replicable act of classification (Braun & Clarke, 2023; Byrne, 2022). The difficulty here is that a single-researcher synthesis cannot be retrospectively validated through a reliability coefficient, and this study does not claim to be a reflexive thematic analysis. Future replications might retain the NGT design while adding a collaborative sense-check or an independent analytical assessment.

Ethical Considerations

Participants were informed about the aims of the study, the voluntary nature of participation, the anticipated activities, and the planned use of the results. They were also told that they could skip any question they preferred not to answer. Informed consent was obtained either in writing or through recorded verbal consent before the NGT sessions began. Participants' identities, email addresses, and other direct identifiers were removed from the analytical files. Panel numbers and cohort identifiers were used instead when organising and presenting the results.

4. Results

Stages 1-2: Independent student NGT panels and panel rankings

A set of panel-level competency rankings and qualitative answers from six separate groups constituted the initial analytical result. The two institutional contexts' contributions were kept separate prior to any aggregation, which made the panel separation methodologically significant. While Cohort B represented a largely monocultural public university setting, Cohort A represented a multicultural private university setting. Therefore, the design allowed for contextual breadth without utilizing institutional type as a deterministic proxy for individual intercultural competency or considering either cohort as a statistical population. Priority was now set within each panel by the NGT procedure rather than among all 53 students. The panel output was therefore the proper unit of synthesis. No supporting panel score or assertion of a statistically significant cohort difference is presented because the uploaded materials do not include the six raw ranking matrices.

Stages 3-4: Pooling and initial coding

Panel results were consolidated after the independent sessions concluded. The first coding centered on the

activity suggested by each competency statement: comprehending a managerial framework, contrasting situations, prioritizing choices, adjusting to cultural variances, interacting across cultures, setting context for AI, verifying information, identifying bias, practicing reflective thinking, partnering with AI, and upholding ethical accountability. Coding at the level of managerial action assisted in making broad values like "awareness" or "responsibility" more concrete for curriculum design. The coding indicated that the developing competencies functioned at various stages within an AI-assisted decision-making process. Certain competencies define the issue before prompting; some affect how the request is conveyed to the AI system; others assess the answer; and still others regulate the human-AI interaction. This temporal logic served as the link between a collection of concepts and a cohesive structure.

Stages 5-6: Merging competencies and developing themes

Items that overlapped conceptually were combined into 15 competencies. These were arranged according to five themes such as critical evaluation, AI prompting, cross-cultural competency, strategic judgment, and human-AI cooperation. Three competencies are included in each theme, creating a well-balanced framework that is nonetheless sufficiently specialized for instruction and evaluation.

Table 3: The Five CAIPCF Domains and 15 Consolidated Competencies

Domain	Competencies	Function in AI-assisted global management
Strategic Judgement	Systems thinking, scenario evaluation, decision prioritization	Defines the managerial problem, alternatives, interdependencies and priorities.
Cross-Cultural Competence	Cultural adaptability, contextual sensitivity, intercultural communication	Ensures that stakeholders and interaction norms are reflected in prompts and outputs.
AI Prompting	Prompt formulation, contextual framing, iterative refinement	Translates managerial intent into clear instructions and improves outputs through iteration.
Critical Evaluation	Fact verification, bias recognition, reflective judgement	Tests accuracy, assumptions, fairness, and managerial fitness before action.
Human-AI Collaboration	Collaborative problem-solving, ethical oversight, responsible AI use	Upholds responsible use boundaries, responsibility and accountability

Stage 7: Preliminary competency framework

The initial framework presented the five themes as part of a single managerial process rather than as disconnected features. Strategic judgement determines which decisions need support. Cultural awareness and sensitivity determine whose context and viewpoint should be reflected. AI prompting conveys the task and its constraints. Critical assessment questions the response that has been produced. Human-AI collaboration oversees iteration, escalation, responsibility, and use. The sequence is recursive: assessment may reveal a missing cultural assumption, which calls for rephrasing and a further prompt, while ethical oversight may require the user to stop using AI for a particular task or to seek additional human input.

Stages 8-9: Expert validation and refinement

The eight-member expert group assessed the initial framework for coherence, distinctiveness, and redundancy, as well as for oversights and its educational and career relevance. All five areas remained in the final structure, and all 15 competencies were retained. The assessment offers a professional evaluation of the framework's overall content and structure, though the study record does not specify which competencies were dismissed or substantially revised. The results are therefore presented at the framework level rather than attributing unrecorded item-specific changes to individual expert discussions. This distinction matters because retention after review supports preliminary content relevance, but it should not be read as evidence of exhaustive consensus or as proof that every competency was debated in depth.

Stage 10: Final Cross-Cultural AI Prompting Competency Framework

Following the expert content review, five domains and fifteen competencies made up the reported Cross-Cultural AI Prompting Competency Framework. Strategic judgment, cross-cultural competency, AI prompting, critical evaluation, and human-AI collaboration were the five domains. The expert panel applied the consensus rule described in Section 3.4 to assess importance. All 15 competencies were retained in the reported framework. Because item-level revision records were not available for reporting, the results do not specify particular rejected or heavily modified items. The framework should consequently be read as a preliminary, expert-reviewed synthesis rather than a final occupational competency standard.

Table 4: Final Cross-Cultural AI Prompting Competency Framework

Domain	Competency	Operational meaning
Strategic Judgement	Systems thinking	Recognising how a managerial issue is connected to wider organisational, stakeholder, cultural, and societal systems.
Strategic Judgement	Scenario evaluation	Comparing alternative actions and considering their possible consequences under different cultural and business conditions.
Strategic Judgement	Decision prioritisation	Determining which issues, stakeholders, risks, and actions require the greatest managerial attention.
Cross-Cultural Competence	Cultural adaptability	Adjusting communication, behaviour, and managerial approaches when working across different cultural settings.
Cross-Cultural Competence	Intercultural communication	Communicating clearly and respectfully with people whose cultural assumptions, languages, or communication practices may differ.
Cross-Cultural Competence	Contextual sensitivity	Recognising how cultural, organisational, institutional, and situational factors may influence the meaning and suitability of a response.
AI Prompting	Prompt formulation	Expressing a managerial task clearly by specifying the purpose, audience, requirements, constraints, and expected output.
AI Prompting	Contextual framing	Providing GenAI with the cultural, organisational, stakeholder, and situational information needed to generate a relevant response.
AI Prompting	Iterative refinement	Reviewing an initial response and revising the prompt to address missing information, weak assumptions, or unsuitable recommendations.
Critical Evaluation	Fact verification	Checking AI-generated claims against credible and relevant sources before using them in managerial analysis or decision-making.
Critical Evaluation	Bias recognition	Identifying stereotypes, cultural assumptions, unequal representations, or other forms of bias in AI-generated content.
Critical Evaluation	Reflective judgement	Considering the quality, relevance, limitations, and possible consequences of an AI-generated response before deciding whether to use it.
Human-AI Collaboration	Collaborative problem-solving	Using GenAI to explore ideas and alternatives while retaining meaningful human involvement in interpreting and resolving the problem.
Human-AI Collaboration	Ethical oversight	Examining whether the use of GenAI and its output is consistent with ethical principles, confidentiality requirements, fairness, and stakeholder interests.
Human-AI Collaboration	Responsible AI use	Maintaining human accountability, disclosing the use of GenAI where required, and applying appropriate limits to its role in managerial decisions.

The five domains are connected rather than independent. Strategic Judgement helps the manager define the

problem and determine what requires attention. Cross-Cultural Competence helps the manager identify the cultural and institutional context that should be considered. AI Prompting translates this understanding into clear and relevant instructions. Critical Evaluation allows the manager to assess the accuracy, bias, relevance, and limitations of the response. Collaboration between humans and AI guarantees that GenAI enhances management thinking without taking the place of human accountability. Additionally, the relationships between the domains are iterative. Critical analysis, for instance, can show that an AI-generated response ignores a significant stakeholder or depends on an unsuitable cultural presumption. After that, the manager might need to reevaluate the issue, provide pertinent context, and improve the prompt. The manager may also need to reject output, look for more proof, speak with someone else, or refrain from utilizing GenAI for a certain activity due to ethical issues.

The final CAIPCF should not be viewed as a hierarchy where one domain holds greater significance than another. Every domain tackles a distinct need for the responsible application of AI in worldwide management. A deficit in any single area might diminish the overall quality of the decision. A well-crafted prompt cannot make up for flawed strategic decisions, absent cultural context, insufficient verification, or the absence of human responsibility. The framework offers an organized foundation for cultivating cross-cultural AI prompting skills in business education. It can be utilised in learning tasks related to international market analysis, management of multicultural teams, negotiation across borders, communication with stakeholders, and strategic decision-making on a global scale. Its educational benefit lies in assisting students in grasping that responsible GenAI utilization necessitates technical skills combined with cultural awareness, critical thinking, ethical reasoning, and managerial responsibility.

Discussion

The study sets out to gather, organize, and obtain a preliminary expert review of the competencies that business students considered relevant to cross-cultural AI prompting for future work in global management. The student NGT panels, cross-panel synthesis, and a limited expert content review produced a framework with five interconnected domains: Strategic Judgement, Cross-Cultural Competence, AI Prompting, Critical Evaluation, and Human-AI Collaboration. While the framework retains an explicitly instructional and preliminary scope, the discussion interprets it in relation to AI literacy, intercultural competence, and strategic decision-making.

From Prompt Technique to Managerial Competence

The AI prompting is presented by the CAIPCF as a component of a larger system of managerial competence. Templates, role assignment, formatting guidelines, and frequent phrase changes are the main components of many useful prompting strategies. Although these methods can make a request more understandable, they do not ensure that the user has recognized the correct managerial issue, considered the pertinent cultural context, verified the facts, or taken ownership of the choice. Effective prompting starts before an instruction is entered and continues after an output is delivered, as demonstrated by the five-domain structure. This perspective aligns with research that characterizes GenAI as a component of a broader organisational system influenced by human knowledge, judgment, and usage patterns (Feuerriegel et al., 2024).

By integrating GenAI interaction into an applied managerial decision-making process, the framework also expands AI literacy. In addition to creating prompts, future managers must comprehend organisational structures, look at different scenarios, spot cultural presumptions, confirm claims, uncover prejudice, and determine whether AI-generated advice is appropriate for use. The manager is still in charge of analyzing the results and reaching a decision, even though GenAI may organize data or recommend potential courses of action. According to a recent management study, users' ability to connect GenAI's capabilities with organisational needs and managerial thinking determines how valuable the technology is (Korzynski, Mazurek, Altmann, et al., 2023).

This procedure begins with the Strategic Judgment domain. The manager can better grasp how a problem relates to other organisational activities and stakeholders by using systems thinking. Comparing potential courses of action under various circumstances is supported by scenario evaluation. The manager can determine which problems, risks, and stakeholders need the most attention by using decision prioritization. These skills affect the manager's requests to GenAI and the appropriate use of the information that is produced. The quality

of human problem formulation and interpretation determines how much GenAI can contribute to managerial decision-making, according to recent data (Albashrawi, 2025).

Cross-Cultural Competence as a Quality-Control Mechanism

The inclusion of Cross-Cultural Competence as a distinct CAIPCF domain shows that cultural considerations should be addressed throughout the prompting process. Cultural Adaptability helps managers adjust their communication and behaviour when stakeholder expectations differ. Contextual Sensitivity helps them identify the cultural, organisational, and institutional information that should be included in a prompt. Intercultural Communication helps them assess whether an AI-generated message is respectful, understandable, and appropriate for its intended audience. Research in higher education similarly shows that intercultural competence supports communication and collaboration across different social, cultural, and institutional settings (Guillén-Yparrea & Ramírez-Montoya, 2023).

Cross-cultural competence therefore acts as a form of quality control rather than an additional interpersonal skill applied after an AI response has been generated. A grammatically correct message may still be inappropriate if it assumes that all stakeholders understand authority, disagreement, trust, time, or relationship-building in the same way. A manager who is culturally competent should be aware of these presumptions, look for additional information as necessary, and adjust the prompt or output appropriately. Cultural competency is developed through introspection, interpretation, and active interaction with diverse viewpoints, according to recent research on intercultural learning (Liu et al., 2023; Mitchell, 2023).

The framework also cautions against treating national cultural traits as fixed rules for prompting. National culture models can help users identify topics worth exploring, but they should not be used to predict the behaviour of every individual or organisation. Managers need to consider the many layers of context at play, including national, ethnic, linguistic, professional, organisational, generational, and personal influences. This approach aligns with current intercultural research, which treats competence as a context-sensitive process rather than a collection of facts about national groups (Mitchell, 2023).

Reflective Judgement and Responsible Human-AI Collaboration

AI-generated data and managerial action are linked by the Critical Evaluation domain. Before utilizing assertions, users must verify them with reliable sources. Users can see preconceptions, unequal representation, or presumptions that support a certain institutional or cultural viewpoint with the aid of bias recognition. When making a decision about whether to approve, amend, or reject an output, the management must take into account its applicability, constraints, and implications. These skills are crucial because, according to Farrokhnia et al. (2024), GenAI may generate information that seems persuasive even if it is erroneous, incomplete, or inappropriate for the circumstance.

To exercise reflective judgment, managers must also think about the potential consequences of implementing AI-generated advice. While ignoring sensitive stakeholders, confidentiality needs, cultural sensitivities, or longer-term organisational effects, a reaction may seem effective. Therefore, before acting, management must check the result with the evidence that is now accessible and professional experience. This supports the idea that GenAI should assist human decision-making rather than take the place of the decision-maker's ethical and contextual judgment (Albashrawi, 2025).

The approach is made more accountable by the Human-AI Collaboration domain. Collaborative Problem-Solving acknowledges that GenAI can assist users in investigating concepts, contrasting options, and questioning preconceived notions. Users must take stakeholder interests, fairness, confidentiality, and transparency into account to comply with ethical oversight. Managers must uphold accountability, identify when a task should remain under direct human management, and disclose AI involvement when appropriate to practice responsible AI use. Research on GenAI in education and management has raised similar concerns about overreliance, transparency, accountability, and the need for clear boundaries around appropriate use (Farrokhnia et al., 2024; Feuerriegel et al., 2024).

AI Prompting, Critical Evaluation, and Human-AI Collaboration have an iterative relationship. The manager may need to amend the prompt and evaluate the revised response if evaluation indicates prejudice, lacking

evidence, or poor contextual understanding. In certain circumstances, it could be better to speak with someone else, get more information, or refrain from utilizing GenAI for the task. Consistent with the emphasis on human judgement in GenAI-supported decision-making (Albashrawi, 2025), the CAIPCF treats human-AI collaboration as a regulated process in which technology offers possible insights and solutions while the human user retains judgement and accountability.

Contextual Contribution of the Multi-Panel Design

The CAIPCF's contribution and boundaries are also determined by the student-based development process. Students are in a good position to recognize the skills they need to acquire and to think about how the use of AI relates to their developing knowledge of global management. They are not stand-ins for managers in action. Although a diverse expert panel and the literature provide conceptual support for the framework's occupational relevance, neither a large employer sample nor observable workplace performance has been used to evaluate it. This distinction aligns with competency-development research, which views global leadership skills as context-dependent and developmental (Bird et al., 2010; Mendenhall et al., 2017). Therefore, rather than acting as a hiring guide or a final benchmark for managerial success, the framework should direct curricular development and additional research.

The multi-panel design lets the framework draw on perspectives from two different educational environments. The private-university cohort came from a multicultural learning setting, while the public-university cohort studied in a predominantly monocultural one. Neither environment was assumed to produce stronger competencies than the other. Running the panels separately meant each group could generate and rank its own ideas before these were brought together during cross-panel synthesis. This supported broader participation and made it less likely that one institutional setting would shape the framework on its own (Black et al., 2025). Including both settings also strengthens the educational relevance of the CAIPCF.

Students who mix regularly with international peers can draw on direct multicultural experience. Those in less internationally diverse settings may lean more on local cultural diversity, classroom cases, digital collaboration, or structured learning activities. Both kinds of experience matter for future global managers. Work on intercultural collaboration makes a similar point: competence can develop through many forms of interaction, reflection, and collaborative learning, not through international exposure alone (Guillén-Yparrea & Ramírez-Montoya, 2023). That said, the multi-panel design should not be read as evidence of causal differences between private- and public-university students, since the study did not test whether institutional type caused any such differences. Its purpose was to bring perspectives from different learning environments into the development of the CAIPCF. Future studies could examine whether students from different institutions, countries, or levels of international exposure interpret and apply the framework differently.

5. Implications for Business Education

The four curricular topics shown in Figure 1, such as Strategic Management, Global Business Strategy, International Business, and Cross-Cultural Management, can all incorporate the CAIPCF. Creating a single class that is solely focused on prompt creation is not the goal. Rather, genuine managerial activities that involve students in defining problems, taking cultural context into account, communicating with GenAI, verifying facts, and defending their conclusions should be used to practice the competencies. Instead of concentrating solely on technological access or efficiency, this method addresses current requests for GenAI education to foster critical and responsible use (Farrokhnia et al., 2024).

Table 6: Curriculum Applications of the CAIPCF

Course area	Illustrative learning task	Competencies emphasised	Assessment evidence
Strategic Management	Use GenAI to compare strategic options under competing stakeholder and resource constraints.	Systems thinking, scenario evaluation, decision prioritisation, fact verification	A decision memorandum containing the prompt sequence, evidence checks, comparison of alternatives, and reasoned final decision
Global	Develop and evaluate	Contextual framing, cultural	A scenario portfolio

Business Strategy	market-entry scenarios for culturally different markets.	adaptability, contextual sensitivity, bias recognition	identifying cultural assumptions, local evidence, risks, and revisions made to the AI-generated analysis
International Business	Prepare stakeholder communications and negotiation options for different institutional and cultural contexts.	Intercultural communication, prompt formulation, contextual sensitivity, reflective judgement	Adapted stakeholder communications accompanied by an explanation of the cultural, strategic, and ethical choices made
Cross-Cultural Management	Diagnose a multicultural team problem and revise AI-generated advice following peer feedback.	Collaborative problem-solving, iterative refinement, ethical oversight, responsible AI use	A team debrief, prompt iterations, evaluation of the AI response, accountability statement, and individual reflection

Assessment should take into account both the students' process and the quality of the final product. A polished AI-generated response should not receive a high grade unless the student shows clear problem framing, suitable cultural reasoning, credible verification, careful revision, and personal accountability. Prompt records can make the development process visible, while reflective notes may explain why a student accepted, changed, or rejected particular AI-generated suggestions. This approach reduces the risk that students are rewarded for producing fluent work without demonstrating understanding or judgement (Farrokhnia et al., 2024). The framework also supports more authentic forms of assessment. Students might be asked to compare AI-generated recommendations, identify missing cultural knowledge, check the evidence, revise prompts, and justify a managerial decision. These tasks allow instructors to assess students' reasoning rather than only the quality of the text GenAI produces. They also connect the use of AI to the ethical, intercultural, and strategic responsibilities students are likely to face at work (Korzynski, Mazurek, Altmann, et al., 2023).

Development of faculty members is equally crucial. In addition to having the intercultural facilitation skills necessary to handle conflict, stereotypes, and various communication styles, educators must possess adequate GenAI literacy to assess prompts and outputs. Additionally, they require precise guidelines about appropriate AI support, disclosure, privacy, academic integrity, and assessment design. According to recent research, responsible GenAI education calls on teachers to assist students in assessing the advantages and disadvantages of the technology, while culturally responsive learning necessitates intentional facilitation and reflection (Farrokhnia et al., 2024; Mitchell, 2023). It is possible to modify the NGT's structured participation principles for use in educational activities. Before a conversation, students can have time to formulate their opinions through silent idea generation. Round-robin sharing can guarantee that every member of the group participates. While group confirmation might motivate students to justify and explain their decisions, independent rating can lessen the immediate temptation to conform. When students assess AI-generated suggestions for intricate or culturally sensitive business issues, these techniques might be helpful (Black et al., 2025).

Limitations and Future Research

Several constraints should be kept in mind when interpreting the results. The student participants came from two organisational settings and were enrolled in either Intercultural Management or Global Management. Total population sampling ensured full coverage of the reachable course groups, but the findings may not extend to students from other fields, institutions, countries, or stages of study. More fundamentally, these participants were not practising global managers and did not bring substantial international managerial experience. Their perspectives are well suited to identifying competencies that matter in education and those that employers expect. They cannot, on their own, determine the full range of competency requirements for the profession. The expert panel adds a practical and scholarly viewpoint, yet it does not remove this limitation. Future studies should involve practising managers, employers, global business experts, and students drawn from a wider range of programmes and settings.

A second constraint concerns the depth of insight that NGT can produce. Rather than generating the in-depth

personal stories typically gathered through individual interviews, NGT was chosen to develop, clarify, and prioritise competencies. Panelists were able to complete the planned NGT phases within each roughly 30-minute online session, but there was little room for extended discussion. The study therefore offers a framework-level account of the required competencies rather than a detailed picture of how students actually experience each one. Future research could explore how students understand and apply the CAIPCF in specific learning contexts, using focus groups, interviews, classroom observations, or reflective diaries.

A third constraint relates to the analytical process. The initial coding, competency consolidation, and thematic development were carried out by a single researcher. Transparency and traceability were strengthened through the audit trail, comparison with the original panel statements, participant confirmation of panel rankings, cross-panel synthesis, and expert content review. These safeguards do not, however, provide independent recoding, and they cannot remove interpretive influence. No intercoder reliability statistic was calculated. The analysis should therefore be read as a transparent single-researcher synthesis rather than as independently replicated coding. Future studies could involve a second analyst to review the coding map and discuss alternative interpretations, with the analytic purpose made explicit. Where it suits the chosen coding approach, agreement statistics may also be considered.

A fourth constraint concerns the scope of expert validation. The expert panel comprised eight members who reviewed the preliminary framework in a single 30-minute online session. The session offered a bounded content review of the five domains and 15 competencies, not prolonged item-by-item deliberation or a multi-round consensus process. All 15 competencies were retained, and the available records do not allow competency-specific examples of rejection or substantial modification to be reported. This limits the strength and auditability of the validation claim. Future validation should retain item-level decision logs and expert comments. It could also use a longer workshop or a multi-round Delphi process with a more internationally diverse panel.

A fifth point concerns how the CAIPCF should be understood. The framework developed in this study is a competency framework, not a measurement tool with psychometric validation. The NGT and expert-validation procedures did not test construct validity, dependability, or predictive validity, though they did demonstrate the relevance, clarity, and conceptual organisation of the competencies. Future work should develop measurable indicators and questionnaire items for each competency. The framework's dimensionality, internal consistency, convergent validity, discriminant validity, and predictive value could then be examined using a larger multi-institutional sample.

A further limitation lies in the comparison between the two settings. The contrast between the multicultural private-university environment and the predominantly monocultural public-university one was contextual rather than causal. The study did not examine whether differences in competency development were caused by institutional type or by the level of exposure to other countries. Future research could compare students from different universities and examine the influence of cultural diversity, academic discipline, language background, international exposure, and prior experience with GenAI.

Finally, there is scope for longer-term and more comparative work. Longitudinal studies could follow students across several semesters to see how their competencies develop with repeated practice. Experimental studies could compare conventional prompt instruction with instruction based on the CAIPCF. Student work could be assessed using indicators of strategic quality, cultural appropriateness, factual reliability, bias recognition, ethical reasoning, and human accountability. To support methodological transparency and allow other researchers to examine how the competencies were formed, future studies should also retain de-identified panel rankings, coding data, and records of framework changes.

Conclusion

This study used six student NGT panels, a cross-panel synthesis, and an eight-person multidisciplinary expert panel to develop the Cross-Cultural AI Prompting Competency Framework. In Phase One, fifty-three undergraduate business students from two institutional settings took part. Their ideas, discussions, and rankings were combined to produce a draft framework. In Phase Two, experts in strategic management, international business, management education, international industry, and GenAI assessed the competencies,

defined them, identified overlap or omissions, and confirmed their educational value. The final CAIPCF consists of five interconnected domains and fifteen competencies. Strategic judgement brings together systems thinking, scenario analysis, and decision prioritization. Cross-cultural competence covers cultural adaptability, intercultural communication, and contextual sensitivity. AI prompting includes contextual framing, iterative refinement, and prompt formulation. Critical evaluation involves fact verification, bias recognition, and reflective judgement. Human-AI collaboration draws on collaborative problem-solving, ethical oversight, and responsible AI use.

The approach shows that effective AI prompting for global management requires more than writing clear instructions for an AI system. Future global managers must describe the managerial problem, understand the wider system, recognise cultural and institutional context, and communicate that context through the prompt. They must also assess whether the response is accurate and acceptable and remain accountable for the final decision. The five domains should therefore be seen as interconnected parts of a continuous process, not as a hierarchy in which one domain matters more than the others.

The CAIPCF offers a formal framework for incorporating GenAI into Strategic Management, Global Business Strategy, International Business, and Cross-Cultural Management. Business programmes should introduce the five domains gradually across relevant courses, rather than limiting GenAI development to a single workshop or technical session. Students need repeated opportunities to apply GenAI to real managerial problems involving global markets, multicultural teams, stakeholder communication, negotiation, and strategic decision-making.

Assessment should examine both the student's process and the final product. Students should document their prompts, describe the cultural and managerial background, verify key claims, identify potential bias, reflect on revisions, and explain how they retained responsibility for the final decision. This allows instructors to assess strategic, cultural, and ethical judgement rather than rewarding polished AI-generated text.

Cross-cultural learning should not reduce culture to national scores or fixed traits. Instead, students should weigh national, organisational, professional, linguistic, generational, and individual factors together. Institutions can support curriculum development by providing faculty expertise and clear procedures for ethical oversight, privacy, disclosure, academic integrity, and responsible AI use.

The CAIPCF offers an initial educational framework for preparing business students to work responsibly with GenAI in culturally varied managerial settings. It is not yet intended as an occupational standard. Further empirical validation is needed with practising managers, companies, and larger, more diverse student populations. Even so, the framework provides a systematic foundation for linking technical prompting skills to strategic judgement, cultural awareness, critical appraisal, ethical reasoning, and human accountability.

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Hibah Awareness in Takaful Products Among the Community in Lembah Pantai, Malaysia

Nur Diyana Yusoff[1], *Azreen Roslan[1], Faziatul Amillia Mohamad Basir[1], Muhammad Majid[1],
Nur Syazwani Binti Zulkatnain[2], Azreen Jihan Che Mohd Hashim[3]
[1]Faculty of Business and Management, Universiti Teknologi MARA, Malaysia
[2]Accenture, Malaysia
[3]Faculty of Economics and Muamalat (FEM), Universiti Sains Islam Malaysia (USIM), Malaysia
Email: diyanayusoff@uitm.edu.my, *azreenroslan@uitm.edu.my, faziatulamillia@uitm.edu.my,
muhdmajid@uitm.edu.my, azreenjihan@usim.edu.my
Corresponding Author: Dr Azreen Roslan

Abstract: Both conventional insurance and Takaful share the common goal of alleviating the financial burden of the unfortunate party. The distinction lies in whether they adhere to Syariah Compliance or not. Recently, there has been a notable increase in the use of Takaful products in Islamic finance. These products offer insurance coverage to consumers while following Islamic principles. Hibah, an Islamic concept about the act of giving or leaving an inheritance, plays a pivotal role in facilitating the equitable allocation of wealth in accordance with Islamic norms. Despite its significance, there is still a noticeable knowledge gap about the advantages of Hibah. This research investigates awareness of the benefits of Hibah in Takaful products among the community in Lembah Pantai, Malaysia. Therefore, this study examines the relationship between age, promotion, education and the community's awareness of the benefits of Hibah in Takaful products. The study has a sample size of 100 respondents and uses a non-probability sampling technique to collect data via structured questionnaires. The study uses reliability, correlation and regression analysis to examine data and determine community awareness of the benefits of Hibah. Results show a strong correlation between age and education as important indicators of the community's awareness of the benefits of Hibah in Takaful products. Furthermore, it seeks to empower individuals to make informed decisions about financial planning and risk management, thereby improving their overall financial resilience and well-being.

Keywords: *Hibah, Takaful, Insurance, Risk Management, Awareness*

1. Introduction

Property is an asset for people around the world. People nowadays are preoccupied with finding money and assets for their families and personal enjoyment. They are pleased when they acquire a large amount of property or assets since they may accomplish a variety of activities with them. According to Mohd Yusof and Ahmad (2013), the amount of assets possessed by a person is often earned through personal labour or inheritance. Malaysian income levels and asset possession have improved year after year as people become more intelligent and hardworking in increasing their property. Malaysians are known for their hard work in expanding property and assets. However, without competent property management, these assets might become problematic after the owner passes away. In addition to that, property management is a crucial issue that requires attention from all individuals. Islamic estate planning is the term used to refer to property management under Islamic principles. Omar (2006) provided a definition of Islamic estate planning as the systematic creation and execution of a comprehensive plan to meet an individual's or property owner's financial objectives, based on Islamic principles.

According to Abd. Wahab et al. (2021), Islamic estate planning is critical to ensuring a seamless distribution of wealth among heirs and loved ones. The primary goal of property management is to ensure that the family experiences a smooth transition and financial stability following the death of the property owner, while also minimising the time and costs associated with the inheritance settlement process (Mujani et al., 2011). In 2020, statistics revealed that between RM70 billion and RM90 billion in assets in the country have been frozen (Ayamany, 2021). In fact, Morhan (2023) also reported that the beneficiaries of deceased individuals have been awaiting the claim of inheritances worth more than RM78 billion since 2022. Said and Saad (2016) stated that the growing issue of frozen and unclaimed Muslim inheritance assets is often attributed to rigid reliance on standard post-death administration. There are numerous methods to manage property with careful attention and thoroughness. Hibah is a method employed in property management. Hibah is the voluntary transfer of legal and beneficial ownership of an asset or property from the owner to the recipient during the owner's

lifetime (Mohd Yusof and Ahmad, 2013). In Malaysia, Hibah refers to a unilateral contract of gifting, often used as an estate management tool among Muslims. It is increasingly popular for its role in facilitating welfare, charity, and efficient wealth transfer, especially to avoid complications with frozen estates after death (Abdul Rahim et al., 2021). However, despite the growth of Takaful and Hibah products, public awareness and engagement remain limited, especially among key community influencers (Mohamad Puad et al., 2026). The objective of the study is to examine awareness of the benefits of Hibah in Takaful products among the community in Lembah Pantai, Malaysia.

2. Literature Review

Awareness of the Benefits of Hibah in Takaful Products

Takaful is an Islamic insurance system based on principles of cooperation (Ta'awun) and donation (Tabarru), where risks are shared collectively. It is positioned as a Shariah-compliant alternative to conventional insurance, providing financial protection and mutual assistance (Dadaboev et al., 2025). In an insurance or takaful agreement, a key individual is the nominee who has the right to obtain the policy benefits upon the participant's demise (Abubakar et al., 2014). According to Abdullah and Abdul Aziz (2010), the purpose of nomination is to guarantee that beneficiaries receive their takaful benefits as soon as possible and Hibah appears to be an alternative for Muslim participants to distribute takaful gains to the intended recipients without violating Islamic inheritance law (fara'id). Additionally, Omar (2006) stressed that property administration is not widely practiced due to a lack of awareness and knowledge. In fact, Malaysian Deputy Finance Minister Takaful and insurance protection remains inadequate, with 60 percent of the population lacking sufficient emergency coverage (Malay Mail, 2023). Yaacob (2006) stated that Amanah Raya Berhad noted that approximately 90% of Malaysians do not have a will (lack estate planning) which indicated that public awareness regarding property administration and legacy planning is critically low. Salleh et al. (2007) concurred that the community's awareness of Hibah is inadequate, as 68% of the 300 respondents to the study acknowledged that they have never employed Hibah as a property management instrument. This might be because the community is not well-informed about other tools used to administer property, as they are only aware of Faraid.

However, in contrast, Elmie Aman Najas, Chairman of the Malaysian Takaful Association (MTA), reported a growing recognition of takaful's importance and benefits, as evidenced by the stable number of in-force certificates following a strong year of new issuances. This trend reflects participants' consistent fulfilment of contribution obligations and a sustained awareness of financial planning and retention (Malaysian Takaful Association, 2024). The Malaysian Takaful Association also reported that the penetration rate for life or family takaful reached 20.1% in 2022, up from 18.6% in the previous year, based on the number of certificates in force relative to the total population. This growth in the industry was fuelled by rising demand for Islamic finance products and the growing preference for takaful as a protection scheme (The Star, 2023). Additionally, Fitch Ratings noted that Malaysia's robust Islamic finance ecosystem, digital transformation, and increasing takaful awareness position the country to become a global leader in Islamic finance and takaful (Kaur, 2024).

Age

The younger generation sometimes lacks knowledge regarding matters pertaining to assets or inheritance. This is because the younger generation perceives the journey of life as being extensive; hence, they prioritise other activities such as education and leisure. Age is regarded as a significant demographic factor that substantially impacts customer purchasing behavior (Slabá, 2019). Research has demonstrated a positive correlation between consumers' age and their likelihood to make purchasing decisions (Peng et al., 2016). Jin et al. (2016) highlighted that age is a critical determinant in the decision to purchase health insurance, as older individuals are more susceptible to specific health risks, making health insurance essential for their protection. Abdul-Fatawu et al. (2019) found that although age is statistically insignificant, it is positively associated with the demand for life insurance, indicating that demand increases with age. Agrawal and Agrawal (2017) noted that factors such as gender, age, and income significantly influence customers' decisions regarding life insurance purchases. However, Latib et al. (2022) found that age, academic qualification, and household income are not positively correlated with knowledge and awareness of Hibah among lecturers and administrative staff at UiTM Sabah and Shah Alam. Puad et al. (2018) added that in Islamic wealth management, demographic factors particularly age significantly influence individuals' perceptions and use of estate planning tools. Also, parents

are known for transferring assets through Hibah in order to avoid the distribution of assets based on the law of inheritance, known as Faraid. The primary motivations for the action stem from the nurturing disposition of parents towards their children (Albertini & Radl, 2012; Barczyk & Kredler, 2014; Wu & Li, 2014). Hence, it is hypothesised that:
H1: There is a relationship between age and awareness of the benefits of Hibah in Takaful products.

Promotion
Shah et al. (2018) emphasized that promotion is a crucial element of business and a fundamental component of an organization's overall marketing strategy. Kim and Lee (2020) observed that implementing integrated price promotions significantly boosts consumers' intention to purchase a company's products. Rusuli et al. (2019) argued that successful marketing programs necessitate the integration of promotional activities with communication strategies such as advertising, sales promotions, public relations, personal selling, and direct marketing, all of which enhance customer awareness of available products and services. Ahmad et al. (2023) noted that there are multiple agencies and bodies for monitoring and supervising Hibah products in Malaysia. The role of mosque committee members as community influencers is highlighted, indicating that targeted promotion through trusted figures can impact Takaful awareness and adoption (Mohamad Puad et al., 2026). Therefore, the inclusion of promotion is crucial in this context.

Further, Yon Bahiyah et al. (2009) emphasized that improving awareness and understanding of Islamic finance within the Malay community requires vigorous promotional efforts from both authorities and the industry. However, Ab. Rahim and Amin (2011) highlighted that generic awareness or surface-level marketing is insufficient; Takaful operators must prioritize customized educational programs that increase the volume of transparent, understandable product information in order to nurture good consumer attitudes and use communal/social networks. Additionally, Ghalid and Saiman (2023) found that promotion is instrumental in increasing awareness of Hibah among residents of Raub, Pahang. Additionally, Cik Khairulnizam et al. (2026) suggest that the public's dependence on wills is frequently caused by a lack of understanding of how Hibah operates. It proposes that trust institutions conduct targeted educational outreach to highlight these disparities, demonstrating how Hibah can help prevent frozen assets and inheritance disputes. Thus, Lee et al. (2020) highlighted the importance of delivering positive messages to potential customers to foster a favourable attitude toward purchasing health products. In addition, Bley and Kuehn (2004) noted that increasing public knowledge about Islamic banking will enhance community awareness of its products. However, Dusuki and Abdullah (2007) disagreed, as their study found that improving service quality is more important than increasing promotion. Thus, it is hypothesised that:
H2: There is a relationship between promotion and awareness of the benefits of Hibah in Takaful products.

Education
Several studies investigate the impact of financial literacy on insurance decisions, finding that individuals with higher financial literacy are more inclined to plan for retirement (Gallego-Losada et al., 2022) and to acquire life insurance products (Armantier et al., 2023). Kamis and Wahab (2022) identified education, religiosity, social influence, and social media as significant factors affecting individuals' understanding of Hibah. Similarly, Basir and Rahman (2022) found that attitude, subjective norms, perceived behavioral control, and knowledge are expected to positively influence the intention to purchase takaful Hibah products. Shah et al. (2018) concur that the utilisation of Hibah in Takaful products has become a concern due to the insufficient understanding of the Hibah concept. Additionally, Rahman et al. (2023) recommended the implementation of standardized Hibah guidelines to avoid disputes and stressed the importance of raising awareness about proper Hibah protocols through information dissemination, as Hibah is seen as an effective method for asset management and preventing unclaimed Muslim properties. Additionally, Mustafa et al. (2022) highlighted the crucial role of knowledge in predicting Hibah, based on their study of the Muslim populations at Politeknik Sultan Salahuddin Abdul Aziz Shah, MSU, UNISEL, and UiTM in Selangor. Thus, it is hypothesised that:
H3: There is a relationship between education and awareness of the benefits of Hibah in Takaful products.

3. Research Methodology

A survey design was used to achieve the research objectives. Sekaran and Bougie (2016) provide a definition of population as a group of individuals, events, or objects that researchers aim to investigate. This group of individuals is crucial to the research as they are required to fill out the provided questionnaire to provide a response. This study employs convenience sampling. According to Saunders et al. (2019) convenience sampling is a non-probability sampling strategy based on the researcher's judgement. By using this selection technique, a sample of respondents with similar characteristics is chosen to assess community awareness of the benefits of Hibah in Takaful products in Lembah Pantai, Malaysia. 100 questionnaires were gathered, surpassing the minimum sample size of 30 participants required for the probability sampling technique. This indicates that the data are suitable for analysis using descriptive statistics (Sekaran & Bougie, 2016). Awareness of the benefits of Hibah in Takaful products was employed as the dependent variable in this study, whereas age, promotion and education were the independent variables.

All instruments were adapted from previous studies. The survey utilised a questionnaire consisting of five parts. The respondents' questionnaire replies were measured using a Likert scale, which ranged from 1 indicating strong disagreement to 5 indicating strong agreement. The data collected from the questionnaire were subjected to statistical analysis using the Statistical Package for the Social Sciences (SPSS). In achieving each objective, the respondents' responses to independent variable questions on age, promotion and education were assessed using correlation, multiple linear regression, and ANOVA analysis.

4. Results

This section describes a study that comprised descriptive, reliability, correlation, and regression analyses. This section presents sets of results related to the profile of respondents' awareness of the benefits of Hibah in Takaful products, the characteristics of the overall sample, and the comparison of respondents' experiences based on demographic and geographic characteristics (gender, age, marital status, level of education, and types of insurance protection). Table 1 illustrates the frequency of socioeconomic factors among respondents that were investigated to ascertain their impact on awareness of the benefits of Hibah in Takaful products. The frequency of male respondents is 40, while female respondents are 60 in the sample size of 100 respondents. The number of female respondents is higher than that of males because, according to the Department of Statistics Malaysia Official Portal, the female population is higher than the male population.

The age distribution of the respondents is as follows: 75 respondents were between the ages of 21 and 30, 14 respondents were between the ages of 31 and 40, 10 respondents were between the ages of 41 and 50, and just 1 respondent was between the ages of 51 and 60. The data were collected from a sample of predominantly young adults, aged below 30, who work in proximity to where the researcher distributed the questionnaire. This is because those between the ages of 21 and 30 are predominantly recent graduates, while those below the age of 49 are often engaged in employment. In contrast, individuals aged 50 and above are more likely to be retired. Other than that, marital status showed that the frequency of respondent that is single is high compared to the married respondent with 68 and 32 respectively. The number of respondents who are single is high because most of the respondents are aged 21 to 30 years old. It is known that most of the individuals above the age of 25 have obtained a degree. Consequently, most individuals under the age of 25 are unmarried due to their intense focus on pursuing higher education.

In addition, the data revealed that the majority of respondents held a degree, with 73 individuals. This was followed by 20 respondents with a diploma, 4 respondents with SPM (the Malaysian Certificate of Education), 3 respondents with a master's degree, and no respondents with a PhD. This educational program will assess the level of comprehension and awareness among the community regarding the benefits of Hibah in Takaful products. Lastly, the analysis of insurance protection preferences revealed that most of the respondents (69) opted for Takaful, while just 31 respondents chose traditional insurance as their preferred form of protection. This is due to the fact that the majority of the population in Lembah Pantai is comprised of Malays, as stated by the Department of Statistics Malaysia Official Portal. Malays, who adhere to the religion of Islam, are more likely to have takaful as their insurance cover due to its adherence to Shariah compliance (Salman & Kawata, 2022). Takaful is an insurance product that adheres to Shariah compliance, as mandated by the Islamic religion, which is the religion of the Malays.

Profile of Respondents: Table 1 displays a summary of the characteristics of a total sample of respondents who participated in the study.

Table 1: Demographic and Geographic Information About Respondents

Variables	FREQUENCY	PERCENTAGE (%)
Gender		
Male	40	40
Female	60	60
Age (years)		
21 - 30	75	75
31 - 40	14	14
41 - 50	10	10
51 - 60	1	1
MARITAL STATUS		
SINGLE	68	68
MARRIED	32	32
LEVEL OF EDUCATION		
SPM	4	4
DIPLOMA	20	20
DEGREE	73	73
MASTER	3	3
PHD	0	0
INSURANCE PROTECTION		
TAKAFUL	69	69
CONVENTIONAL	31	31

Descriptive Statistics: According to Sekaran and Bougie (2016), descriptive analysis employs statistical methods such as mean, frequency, and standard deviation to describe a given dataset in detail. The mean is a statistical measure of the center of a dataset. The term 'mean' refers to a score that represents the value of the data as a whole. Standard deviation is a measure of the dispersion or spread of values in a dataset.

Table 2 reports mean scores and standard deviations for all study variables. These mean scores and standard deviations represent community awareness of Lembah Pantai regarding the Hibah in the Takaful product offering, differentiated by variables of age, promotion, and education. For these mean scores, all scores are between 3 and 4. Therefore, the promotion mean score was the highest of the three individual variables (μ = 4.39, sd = 0.395), with education next (μ = 3.99, sd = 0.704) and age (μ = 3.97, sd = 0.675). For the dependent variable, participants were asked to rate their awareness of the benefits of Hibah in Takaful products, and the mean score was (μ = 3.91, sd = 0.801). For the majority of the participants, it was clear that the awareness of the benefits of Hibah in Takaful products was mostly driven by promotions. For the standard deviation scores for awareness of the benefits of Hibah in Takaful products, the mean score was (0.801) and was the highest of the other standard deviation domains. For this study, all scores for the variables were less than one, indicating that the scores were concentrated.

Table 2: Descriptive Statistics

Variables	Mean	Std. Dev.

Age	3.97	0.675
Promotion	4.39	0.395
Education	3.99	0.704
Awareness of the benefits of Hibah in Takaful products	3.91	0.801

Reliability Analysis

The data were tested for reliability. Referring to Sekaran and Bougie (2016), the findings from this reliability study indicate that the research includes both consistency and stability. The reliability test used is the Cronbach's Alpha test. Cronbach's Alpha can indicate the strength of the association. The higher the value for Cronbach's Alpha, the more internal consistency reliability it indicates. Additionally, Nunnally (1994) supported the point that the Cronbach's Alpha value must be over 0.60 for the variables to be acceptable. As evidenced in Table 3, the awareness of the benefits of Hibah in Takaful products has strong internal consistency and is indicated by a Cronbach's Alpha value of 0.863. The items for age, education, and promotion also indicated fair to strong internal consistency, respectively, of 0.762 and 0.863. The promotion variable, however, scored 0.584, which was on the borderline of acceptability for exploratory research according to Hair et al. (2022). It is due to the low number of items had pushed the Cronbach Alpha to reduce. Cortina (1993) explained that in the case of a construct which only contains 2 to 4 items, the lower value of Cronbach's alpha denotes the brief scale length, thus defeats the assumption of poor item alignment.

Table 3: Reliability Analysis

Variables	Number of Items	Item Deleted	Cronbach's Alpha
Age	6	-	.762
Promotion	6	-	.584
Education	7	-	.824
Awareness of the benefits of Hibah in Takaful products	5	-	.863

Correlation Analysis

The analysis utilises the Pearson correlation coefficient to examine the strength of correlation between variables Saunders et al., 2019). The purpose of this study investigation is to ascertain the correlation between variables, as well as the direction and magnitude of their influence. The result should be closer to 1, as it signifies a robust correlation between the two variables. Table 4 shows that the Pearson correlation coefficient value closest to 1 is education, with 0.783, which falls under acceptable according to Sekaran & Bougie (2016); this value is the highest compared to other variables. This means that education and awareness of the benefits of Hibah in Takaful products have the strongest relationship between the variables as the value is 0.783, which is the highest value among other variables. Moreover, this concludes that the changes in age are strongly correlated with changes in education. The second-highest Pearson correlation coefficient value is between age and education, with 0.743, from which the researcher can also conclude that the changes in education are strongly correlated with changes in awareness of the benefits of Hibah in Takaful products. The lowest value for this analysis is awareness of the benefits of Hibah in Takaful products and promotion, with only 0.251. This shows that the changes in promotion are not strongly correlated with changes in awareness of the benefits of Hibah in Takaful products. Besides that, the positive value in the Pearson correlation coefficient, which is0.783 with no negative sign in front of the value indicates that if the education increases in value, the awareness of the benefits of Hibah in Takaful products will also increase in value. This result is also called a positive correlation.

Assumptions for multiple regression were tested before the regression analysis through SPSS software. The findings stated that all the assumptions including normality of data, skewness, and kurtosis values are acceptable. Regarding linearity, it was found that the observed p-plot was close to the diagonal line, which indicates that linearity among the variables is observed and met. With respect to homoscedasticity, the results showed it was justified for further analysis, as the scatterplots for the model were constant and fit the best line. The last assumption is that multicollinearity issues among all variables were absent since the value of the variance inflation factor (VIF) is less than the threshold of 3.3, as recommended by Hair et al. (2022). Overall,

the assumption procedure was conducted and verified.

Table 4: Correlation Analysis

	Age	Promotion	Education	Awareness of the benefits of Hibah in Takaful products
Age	1			
Promotion	.415**	1		
Education	.743**	.354**	1	
Awareness of the benefits of Hibah in Takaful products	.702**	.251**	.783**	1

Analysis of Variance (ANOVA)

Table 5 shows a p-value of 0.000, which is less than the 0.05 significance level. This shows that the whole model is significant for Hibah in Takaful awareness. The F-test is also significant with a value of 60.142, which shows that the combination of age, promotion, and education can explain the gaps in awareness of the Hibah in Takaful products.

Table 5: Analysis of Variance (ANOVA)

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41.477	3	13.826	60.142	.000[b]
	Residual	22.069	96	0.230		
	Total	63.546	99			

a. Dependent Variable: Awareness of the benefits of Hibah in Takaful products
b. Predictors: (Constant), Age, Promotion, Education

Regression Analysis

Regression analysis is a statistical tool to predict the value of a variable based on the value of another variable to explain the relationship between one dependent variable and two or more independent variables. It is also effective in estimating the mean value of dependent variables. The results of a multiple regression analysis in Table 6 demonstrate the association between age, promotion, and education and awareness of the benefits of Hibah in Takaful products. The R-value is 0.808, which indicates that the degree of association between the dependent and independent variables is very good, as it is below 0.90. It shows that there is a strong positive linear association between the dependent variable, which is awareness of the benefits of Hibah in Takaful products, and the independent variables which are age, promotion and education. Moreover, the R^2 value is 0.653. It can be concluded that 65.3% of the variation in awareness of the benefits of Hibah in Takaful products can be explained by the variables of age, promotion, and education. The other 34.7% variation cannot be explained by the variables. In addition, the Durbin-Watson, d = 2.181 which falls between the critical values of $1.5 < d < 2.5$. Therefore, it can be assumed that in the multiple linear regression data there is no first-order linear autocorrelation.

Table 6: Multiple Regression-Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.808	0.653	0.642	0.479	2.181

The unstandardised coefficient beta indicates that a 1-unit rise in the independent variable will directly correspond to a 1-unit increase in the dependent variable, which is community awareness of the benefits of Hibah in Takaful products (Saunders et al., 2019). Table 7 indicates that the age variable received a beta coefficient of .358 and a t-value of 3.251. This indicates that age did have a substantial impact on the awareness of the benefits of Hibah in Takaful products, as the p-value was .002, which is below the 0.05 significance level (95%). The results align with prior research where Kamarudin and Alma'amun (2013) discovered that older cohorts are consistently more knowledgeable and familiar with Hibah processes than younger age groups.

Retirement preparedness and inheritance distribution become acute considerations as people age. The promotion coefficient is β = -0.166 with a t-value of -1.239. The value was significant at p = .000. Therefore, promotion did not have a substantial impact on the awareness of the benefits of Hibah in Takaful products. According to Kamis and Abd. Wahab (2022), traditional commercial advertising does not transfer into an understanding of Hibah's legal mechanics or practical benefits such as avoiding frozen assets and estate administration delays. Muhammad Nasir et al. (2023) concur and stated that Takaful operators' marketing activities are mostly focused on product sales pitches and commercial promotion, rather than educating customers on underlying principles and product mechanisms. On the other hand, the scores for education were β = 0.670 and t = 6.526. This indicates that education has a substantial impact on the awareness of the benefits of Hibah in Takaful products. Kamis and Abd. Wahab (2022) found that education is a significant factor affecting individuals' understanding of Hibah. Moreover, Basir and Rahman (2022) also found similar findings, which showed that education and knowledge are expected to positively influence the intention to purchase takaful Hibah products.

Table 7: Multiple Regressions – Coefficients

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	VIF
		B	Std. Error	Beta			
1	(Constant)	.548	.545		1.004	.318	
	Age	.358	.110	.301	3.251	.002	2.375
	Promotion	-.166	.134	-.082	-1.239	.218	1.214
	Education	.670	.103	.588	6.526	.000	2.247

a. Dependent Variable: Awareness of the benefits of Hibah in Takaful products

(*p<0.05; **p<0.001)

Discussion

This study examined the relationships between age, promotion, and education level regarding community awareness of the benefits of Hibah in Takaful products among residents in Lembah Pantai, Malaysia. Hypothesis 1 (Age) and Hypothesis 3 (Education) were supported, whereas Hypothesis 2 (Promotion) was rejected due to statistical insignificance. The significant relationship between age and Hibah awareness (p = 0.002) aligns with prior literature indicating that older individuals demonstrate higher awareness of estate planning instruments. As individuals age and accumulate assets or family responsibilities, the necessity to secure financial protection and prevent asset freezing becomes more pronounced. This finding supports the observations of Kamarudin and Alma'amun (2013), who noted that older individuals actively utilize Hibah to manage asset distribution and protect their dependents' financial future.

Education level emerged as the strongest predictor associated with Hibah awareness p=0.000. Individuals with higher educational attainment possess greater financial literacy, enabling them to better comprehend complex estate planning instruments such as Hibah within family Takaful policies. This finding is consistent with research by Basir and Rahman (2022) and Latib et al. (2022), which established that formal education and specialized knowledge significantly enhance public understanding and adoption of Takaful Hibah products.

Conversely, promotion did not have a statistically significant effect on awareness (p = 0.218). This indicates that general promotional campaigns do not automatically translate into improved public understanding of Hibah. While promotional activities may raise general awareness of Takaful as an insurance alternative, they often fail to educate consumers on specific operational mechanisms, such as Hibah nominations versus traditional Faraid distribution. This aligns with Kamis and Abd. Wahab (2022) and Muhammad Nasir et al. (2023) who noted that general marketing presence is insufficient without clear information quality regarding product mechanisms. Therefore, promotional campaigns must move beyond surface-level brand exposure to address specific knowledge gaps in Shariah-compliant estate management (Ahmad et al., 2023; Abdul Rahim et al., 2021).

5. Managerial Implications and Recommendations

The study findings probably provide insight into the community awareness, understanding, and acceptance of Hibah in the context of Takaful products. These insights are extremely helpful for Takaful providers, regulators, and legislators. Because promotion did not significantly influence Hibah awareness, Takaful operators should shift their focus away from general promotional campaigns and instead prioritize targeted educational programs. Marketing efforts that merely increase product visibility without explaining legal and Shariah mechanisms fail to translate into meaningful public understanding. Takaful providers should enhance product development and marketing by developing more targeted Hibah-based products that cater to specific demographic segments or needs. Furthermore, the marketing efforts should emphasize the unique benefits of Hibah, such as estate planning, wealth distribution, and charitable giving. Policymakers should develop favourable regulatory frameworks and support initiatives related to Hibah to increase awareness of the benefits of Hibah in Takaful products. Azmi et al. (2021) agreed and highlighted that the biggest problem society is having right now is that society is still not clear about Hibah. Thus, this study could provide a beneficial perspective on the awareness of the benefits of Hibah in Takaful products.

Conclusion

This study examined the relationships between age, promotion, and education level regarding community awareness of the benefits of Hibah in Takaful products within Lembah Pantai, Malaysia. The findings indicate significant positive associations between both age and education level and awareness. Conversely, promotional efforts showed no statistically significant relationship with awareness of Hibah benefits. Multiple regression analysis demonstrated that higher educational attainment is the strongest predictor associated with increased awareness of Hibah mechanisms.

These findings suggest that enhancing general education and targeted financial literacy regarding estate planning plays a pivotal role in public understanding of Hibah. However, because this study utilized a cross-sectional design with a convenience sample of 100 respondents in a specific urban area, the results indicate statistical associations rather than direct cause-and-effect relationships and cannot be generalized to the broader Malaysian population. Future research should employ longitudinal methods and representative samples across diverse geographical locations to further evaluate these relationships as Malaysia's regulatory frameworks for Hibah and Takaful continue to evolve (Rosele et al., 2024).

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The Effect of COVID-19 on the Unemployment Rate in Malaysia

*Fauziana Bt Fauzi Mat Rawi[1], Nur Shuhada Kamarudin[2], Zuraidah Ismail[1]
[1]Department of Economics and Finance, Faculty of Business and Management, UiTM Puncak Alam, Malaysia
[2]Faculty of Economics and Muamalat, Universiti Sains Islam Malaysia, Malaysia
Email: *fauziana@uitm.edu.my
Corresponding Author: Fauziana Bt Fauzi Mat Rawi

Abstract: This conceptual paper examines the impact of the Coronavirus disease 2019 (COVID-19) pandemic on Malaysia's unemployment rate. The pandemic, which began in early 2020, severely disrupted global and domestic economies, causing widespread job losses, especially in sectors that depend on physical interaction. This paper discusses trends, reviews relevant literature, discusses related theories, and identifies key policy responses. It concludes with recommendations for improving labor market resilience and highlights areas for future empirical research.

Keywords: *COVID-19, Unemployment, Labor Market, Malaysia*

1. Introduction and Background

The COVID-19 pandemic, declared a global health emergency by the World Health Organization in March 2020, has had far-reaching consequences on the global economy. In Malaysia, the outbreak disrupted most economic activities, strained healthcare systems, and caused widespread social and financial hardship. The imposition of the Movement Control Orders (MCOs) and other containment measures significantly reduced business operations, consumer spending, and labour market participation. One of the pandemic's most direct and visible impacts was a sharp spike in unemployment. Malaysia's unemployment rate, which had averaged 3.3 percent in 2019, rose sharply to 5.3 percent in May 2020, translating to approximately 826,100 unemployed persons. This is the highest level recorded in over three decades (Department of Statistics Malaysia, 2020). This surge followed the implementation of the MCO, which effectively shut down most of the non-essential economic activities.

When the economy suddenly stopped, tourism, hospitality, and retail were hit hardest. For instance, Malaysia recorded only 4.3 million tourist arrivals in 2020, a drastic decline of 83.4 percent compared to 26.1 million in 2019 (Tourism Malaysia, 2021). The sharp contraction in tourism caused a domino effect on other sectors. The hotel sector reported average occupancy rates falling to 20–25 percent in 2020, compared to 65–70 percent during the pre-pandemic period, forcing many establishments to close temporarily or reduce operations (Malaysian Association of Hotels, 2020).

The aviation industry was also among the hardest hit. Malaysia Airlines and AirAsia collectively grounded most of their fleets during the peak of restrictions, with Malaysia Airports Holdings Berhad reporting a 77 percent drop in passenger traffic in 2020, down to 43 million passengers from 176 million in 2019 (MAHB Annual Report, 2021). The retail sector also contracted by 16.3 percent year-on-year in Q2 2020, its steepest decline in history, reflecting the combined impact of mobility restrictions and weakened consumer demand (Malaysia Retailers Association, 2020).

These disruptions translated into large-scale layoffs and furloughs. By June 2020, the Ministry of Human Resources reported that more than 90,000 workers had lost their jobs due to company closures and downsizing, with SMEs, which make up 98.5 percent of all businesses and employ about 48 percent of the workforce, bearing the brunt of workforce reductions (SME Corp Malaysia, 2020). Small and medium-sized enterprises (SMEs), which comprise approximately 98 percent of Malaysia's businesses, faced particularly acute challenges. Many were forced to shutter temporarily or cut staff due to severe liquidity constraints.

Table 1: Employment by Sector (2019 vs 2020, Annual Averages)

Sector	2019 Share of Employment	2020 Share of Employment	Change
Services	63.7 %	62.2 %	↓ 1.5 %
Manufacturing	16.7 %	16.9 %	↑ 0.2 %
Agriculture	10.6 %	10.1 %	↓ 0.5 %
Construction	8.0 %	9.5 %	↑ 1.5 %
Mining & Quarrying	1.0 %	1.3 %	↑ 0.3 %
Unemployment rate	3.3 %	4.5 %	↑ 1.2 %

Source: Department of Statistics Malaysia. (2023). Labor Force Statistics.

Table 1 shows the employment by sectors in 2019 and 2020. During COVID-19, the services sector bore the brunt of employment shocks, especially in tourism, retail and hospitality. Manufacturing and agriculture showed resilience, while construction and mining recovered unevenly. Overall unemployment peaked at 5.3 percent in May 2020 before gradually easing to 4.6 percent in 2021.

Table 2: Malaysia's Unemployment During COVID-19

Period	Unemployment Rate	No. of Unemployed Persons	Notes
2019 (pre-pandemic)	3.3%	~510,000	Stable, near full employment.
April 2020	5.0%	~778,800	Start of Movement Control Order (MCO).
May 2020 (peak)	5.3%	~826,100	Highest unemployment in 30+ years
2021 (avg.)	4.6%	~748,800	Recovery slowed by Delta Wave
2022 (avg.)	3.8%	~620,700	Restrictions lifted, labour market rebound.

Sources: Department of Statistics Malaysia. (2023). Labor Force Statistics.

Table 2 shows how the COVID-19 pandemic disrupted Malaysia's labour market. Before the crisis in 2019, the unemployment rate was relatively low at 3.3 percent, reflecting near full employment with about 510,000 unemployed persons. However, the onset of the pandemic and the enforcement of the MCO in April 2020 caused a sudden spike in joblessness, with the unemployment rate rising to 5.0 percent or roughly 778,800 people. This trend worsened in May 2020, when unemployment hit 5.3 percent, which was the highest level in over three decades, leaving more than 826,000 Malaysians jobless. Although conditions gradually improved as restrictions eased, the average unemployment rate in 2021 remained elevated at 4.6 percent due to the economic slowdown and the Delta wave of infections. By 2022, with restrictions lifted and business activity resuming, the unemployment rate fell to 3.8 percent, signalling a significant labour market recovery, though it remained slightly higher than pre-pandemic levels.

In contrast, during the COVID-19 pandemic, Malaysia saw a notable rise in informal sector employment as many workers lost formal jobs due to lockdowns, movement restrictions, and business closures. Beyond outright job losses, underemployment and informal work became increasingly prevalent as individuals sought alternative livelihoods. With limited job security and reduced economic activities, many Malaysians turned to informal work such as online retailing, food delivery, freelancing, and home-based microenterprises to sustain their income. Informal employment increased from 3.05 million persons (20.8%) in 2019 to 3.5 million persons (23.2%) in 2021, representing 23.2 percent of total employment. It reflects a substantial shift of the workforce into informal economic activities (Department of Statistics Malaysia, 2022). The informal sector became a crucial buffer during the crisis, offering short-term livelihood opportunities (World Bank, 2021). Concurrently, skill-related underemployment surged by the end of 2023; about 1.94 million individuals with tertiary education were employed in semi-skilled or low-skilled roles. This is an indicator of persistent structural mismatch in the labour market.

This study aims to conceptually examine the relationship between the COVID-19 pandemic and the unemployment rate in Malaysia. By focusing on the role of key economic variables such as GDP growth, inflation

and the number of COVID-19 cases, this research seeks to quantify the extent to which the pandemic influenced labour market dynamics. The significance of this study lies in its potential to inform policymakers and labour economists about the structural vulnerabilities exposed by the pandemic and the necessary interventions to support labour market resilience in future crises. The Malaysian experience also provides important lessons for other emerging economies navigating the socioeconomic effects of public health emergencies.

2. Literature Review

Past studies show that pandemics and economic crises tend to raise unemployment through demand-side shocks and supply-side constraints. For example, Verick (2021) highlighted global labor losses due to COVID-19, while Foo et al. (2021) noted sector-specific job losses in Malaysia, highlighting that the impact of COVID-19 on employment was not uniform across all sectors. The services sector was hit hardest due to lockdowns and social distancing. Sub-sectors like tourism, hospitality, retail, and F&B saw major declines in employment. Many formal and informal workers were either temporarily laid off or lost their jobs permanently. The manufacturing sector experienced mixed effects. Some industries, like electronics and essential goods, continued operations, while others (textiles, automotive) reduced their workforce due to supply chain disruptions. The construction sector faced project delays and MCOs, leading to temporary unemployment. For the informal sector, many informal workers (street vendors, freelance services) were affected differently. Some could not work because of restrictions, while others shifted to online or home-based activities. Existing literature, such as that by Schotte (2023) and Maji et al. (2022), often emphasizes the role of GDP contraction and public health responses in labor market volatility.

Economic literature has also explored the channels through which pandemics affect labor markets. According to Coibion et al. (2020), the labor market effects of COVID-19 in the U.S. were unprecedented in their speed and magnitude, driven by both lockdowns and voluntary social distancing. Similar findings have been reported in developing countries, where informality and lack of social safety nets exacerbated the impact. In the ASEAN context, Nguyen et al. (2021) found that labor mobility restrictions, combined with reduced foreign investment and declining exports, contributed to labor market rigidity and rising unemployment. For Malaysia, Tan and Zainal (2021) provided evidence that youth unemployment increased disproportionately, highlighting the pandemic's unequal effects.

Moreover, studies such as those by Baldwin and Weder di Mauro (2020) and the World Bank (2021) have emphasized the importance of government intervention in mitigating the economic fallout. Wage subsidy programs, cash transfers and fiscal stimulus have been partially successful in cushioning the shock but may have limited long-term effects without structural labor reforms. This review underscores the necessity of empirical research that isolates the impact of COVID-19 on unemployment by controlling for macroeconomic indicators. While global and regional studies provide a broad picture, country-specific analyses like this one are essential to understanding the nuances of labor market behavior and informing localized policy responses.

Theories Underpinning

The research on the effect of COVID-19 on the unemployment rate in Malaysia is grounded in several economic theories that explain labor market dynamics in response to macroeconomic shocks. According to Keynesian economics, unemployment increases during economic downturns due to a fall in aggregate demand. The COVID-19 pandemic led to a sharp contraction in demand for goods and services, particularly in sectors such as tourism, retail and hospitality. This demand reduction led firms to cut back on production and lay off workers, increasing cyclical unemployment. The efficiency wage theory suggests that firms may pay wages above the equilibrium level to boost worker productivity and morale. However, during economic crises like the COVID-19 pandemic, firms under financial pressure may reduce labor costs by laying off workers rather than reducing wages. This contributes to unemployment even if wages remain sticky downward. This theory highlights the frictions in the labor market, where matching workers with suitable jobs takes time.

The pandemic increased these frictions due to movement restrictions, changes in job structures and a mismatch between the skills of job seekers and the demand in essential or digital-based sectors. As a result, unemployment can persist even as some sectors begin to recover. The Real Business Cycle (RBC) theory attributes fluctuations in employment and output to real (rather than monetary) shocks, such as technological

changes or supply disruptions. COVID-19 acted as a significant real shock, disrupting supply chains and altering labor productivity. These disruptions affected firms' ability to maintain employment, contributing to a rise in the unemployment rate.

The pandemic may also have induced structural unemployment, which occurs when a mismatch exists between workers' skills and the requirements of new jobs in a changing economy. With increased automation, digitization, and changes in consumer behavior, certain jobs may not return post-pandemic, leaving some workers permanently unemployed unless they retrain or reskill. These theories collectively provide a framework to understand the multifaceted impact of the COVID-19 pandemic on Malaysia's labor market and can guide empirical investigations into how such health crises influence unemployment trends.

Model Specification

$$\text{UNEMP}_{i,t} = \alpha_0 + \alpha_1 ln\text{COVID}_{i,t} + \alpha_2 \text{GDPG}_{i,t} + \alpha_3 \text{INF}_{i,t} + \mathcal{E}_t \quad (1)$$

The variable UNEMP represents the quarterly unemployment rate expressed as a percentage of the total labor force. The variable COVID refers to the total number of confirmed COVID-19 cases recorded each quarter. This variable is log-transformed to normalize its distribution and reduce potential skewness. The variable GDPG captures the quarterly GDP growth rate expressed in percentage terms, serving as an indicator of overall economic performance. Lastly, the variable INF measures inflation using the Consumer Price Index (CPI), reflecting changes in the general price level across the economy. Unemployment rate data are obtained from DOSM. Information on confirmed COVID-19 cases is sourced from the Ministry of Health Malaysia (MOH). Meanwhile, quarterly GDP growth and inflation data are retrieved from Bank Negara Malaysia (BNM) and DOSM.

Including additional macroeconomic variables such as GDP growth rate and inflation in a study on unemployment is essential because unemployment is influenced by a wide range of economic factors beyond the COVID-19 pandemic itself. Relying solely on COVID-19 as the explanatory variable may cause omitted variable bias, where the model incorrectly attributes all changes in unemployment to the pandemic, even though economic activity and price conditions also play significant roles. By adding GDP growth and inflation, the analysis becomes more comprehensive and produces more accurate and reliable results, as these variables capture broader economic dynamics that interacted with the pandemic in shaping unemployment trends. GDP growth rate is closely related to unemployment because it reflects overall economic performance.

According to Okun's Law, GDP growth and unemployment have an inverse relationship: when economic output increases, firms expand production and hire more workers, lowering unemployment. Conversely, when GDP contracts, as during lockdowns and movement restrictions, business activity slows, hiring freezes occur, and retrenchments increase, resulting in higher unemployment rates. Therefore, including GDP growth in the model helps explain how much economic expansion or contraction contributed to changes in unemployment during and after the pandemic.

Inflation also plays an important role in influencing unemployment, consistent with the short-run Phillips Curve, which suggests a trade-off between inflation and unemployment. Moderate increases in inflation often signal rising demand for goods and services, which encourages firms to boost production and hire more workers, thereby reducing unemployment. On the other hand, very low inflation or deflation typically reflects weak demand, reduced production, and higher unemployment. In some cases, cost-push inflation caused by rising production costs can increase inflation while simultaneously raising unemployment, demonstrating that the relationship can vary depending on the source of inflation. Including inflation in the model helps capture these price-level dynamics and their impact on labor market conditions.

Diagram 1: Okun's Law – Explaining the relationship between GDP growth and unemployment.

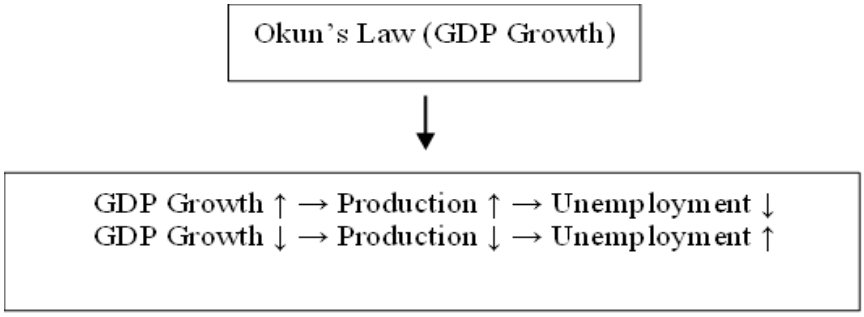


Diagram 2: Philips Curve – Explaining the relationship between inflation and unemployment.

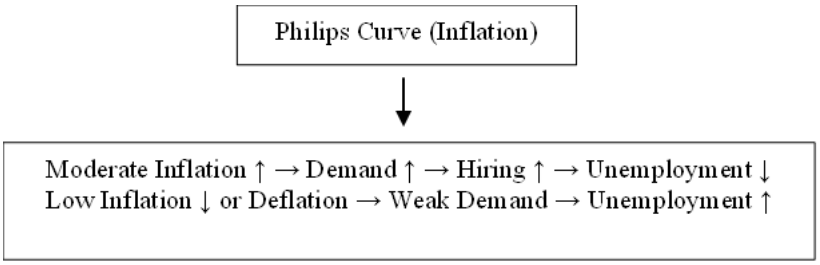
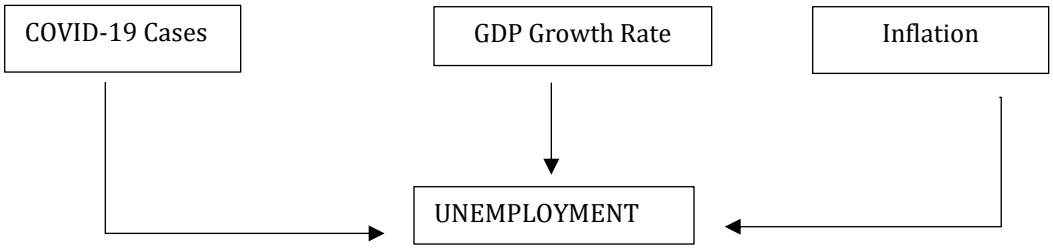


Diagram 3: Conceptual Framework



3. Methodology

The future study is suggested to employ a quantitative empirical research design using quarterly time-series data to investigate the relationship between the COVID-19 pandemic and the unemployment rate in Malaysia. The dataset covers Q1 2015 to Q4 2023. The Autoregressive Distributed Lag (ARDL) model is selected as the primary analytical technique due to its suitability for variables with mixed orders of integration, specifically I (0) and I (1). The bounds test verifies whether a long-run cointegration relationship exists among the variables. For the Error Correction Model (ECM), if cointegration is confirmed, the ECM is estimated to capture short-run adjustments and the speed of convergence toward equilibrium.

For the diagnostic Tests, Residual diagnostics (serial correlation, heteroscedasticity, normality) and stability tests (CUSUM and CUSUMSQ) are conducted to validate the model. This methodological framework enables a robust investigation of how the COVID-19 pandemic influenced unemployment trends in Malaysia, while controlling for macroeconomic conditions. The ARDL approach ensures that both the immediate and persistent effects of the pandemic are adequately captured.

Cointegration Test

The following unrestricted error correction (EC) regressions will be estimated, considering each of the variables in turn as a dependent variable:

$$\Delta UNEMP_{it} = \alpha_0 + \sum_{p=1}^{n} b_{pUNEMP}\Delta UNEMP_{i,t-p} + \sum_{p=1}^{n} c_{pUNMEP}\Delta lnCOVID_{i,t-p} + \sum_{p=1}^{n} d_{pUNEMP}\Delta GDPG_{i,t-p} + \sum_{p=1}^{n} e_{pUNEMP}\Delta INF_{i,t-p+} \lambda_{1UNEMP}UNMP_{i,t-1} + \lambda_{2UNEMP}\, lnCOVID_{i,t-1} + \lambda_{3UNEMP}GDPG_{i,t-1} + \lambda_{4UNEMP}\, INF_{i,t-1} + \varepsilon_{1t}$$
(2a)

$$\Delta lnCOVID_{it} = \alpha_0 + \sum_{p=1}^{n} b_{plnCOVID}\Delta lnCOVID_{i,t-p} + \sum_{p=1}^{n} c_{plnCOVID}\Delta UNEMP_{i,t-p} + \sum_{p=1}^{n} d_{plnCOVID}\Delta GDPG_{i,t-p} + \sum_{p=1}^{n} e_{plnCOVID}\Delta INF_{i,t-p+} \lambda_{1lnCOVID}UNMP_{i,t-1} + \lambda_{2lnCOVID}\, lnCOVID_{i,t-1} + \lambda_{3lnCOVID}GDPG_{i,t-1} + \lambda_{4lnCOVID}\, INF_{i,t-1} + \varepsilon_{1t}$$
(2b)

$$\Delta GDPG_{it} = \alpha_0 + \sum_{p=1}^{n} b_{pGDPG}GDPG_{i,t-p} + \sum_{p=1}^{n} c_{pGDPG}\Delta lnCOVID_{i,t-p} + \sum_{p=1}^{n} d_{pGDPG}\Delta \mathrm{UNEMP}_{i,t-p} + \sum_{p=1}^{n} e_{pGDPG}\Delta INF_{i,t-p+} \lambda_{1GDPG}UNMP_{i,t-1} + \lambda_{2GDPG}\, lnCOVID_{i,t-1} + \lambda_{3GDPG}GDPG_{i,t-1} + \lambda_{4GDPG}\, INF_{i,t-1} + \varepsilon_{1t}$$
(2c)

$$\Delta INF_{it} = \alpha_0 + \sum_{p=1}^{n} b_{pINF}\Delta INF_{i,t-p} + \sum_{p=1}^{n} c_{pINF}\Delta GDPG_{i,t-p} + \sum_{p=1}^{n} d_{pINF}\Delta lnCOVID_{i,t-p} + \sum_{p=1}^{n} e_{pINF}\Delta UNEMP_{i,t-p+} \lambda_{1INF}UNMP_{i,t-1} + \lambda_{2INF}\, lnCOVID_{i,t-1} + \lambda_{3INF}GDPG_{i,t-1} + \lambda_{4INF}\, INF_{i,t-1} + \varepsilon_{1t}$$
(2d)

The F-test tests for the existence of long-run relationships. When long-run relationships exist, the F-test indicates which variable to normalize. The null hypothesis for no cointegration amongst the variables in Equation 2 is:

$(H_o : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0)$

Against the alternative hypothesis

$(H_1 = \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq 0)$

Long - run and Short-run Elasticities

Having found a long-run relationship (cointegration), Equation (1) is estimated using the following ARDL (*m, n, p, q*) model:

$$\mathrm{UNEMP}_{it} = \alpha_0 + \sum_{p=1}^{m} \alpha_1 \mathrm{UNEMP}_{i,t-p} + \sum_{p=1}^{n} \alpha_2\, lnCOVID_{i,t-p} + \sum_{p=1}^{p} \alpha_3 GDPG_{i,t-p} + \sum_{p=1}^{q} \alpha_4 INF_{i,t-p} + \omega_t \quad (3)$$

All variables are as previously defined. The orders of the lags in the ARDL model are selected using either the Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion (SBC), and the selected model is then estimated using ordinary least squares. In the presence of cointegration, short-run elasticities can also be derived by constructing an error correction model of the following form:

$$\Delta \mathrm{UNEMP}_{i,t} = \beta_0 + \sum_{p=1}^{n} \beta_1 \Delta \mathrm{UNEMP}_{i,t-p} + \sum_{p=1}^{n} \beta_2\, \Delta lnCOVID_{i,t-p} + \sum_{p=1}^{n} \beta_3 \Delta GDPG_{i,t-p} + \sum_{p=1}^{n} \beta_4 \Delta INF_{i,t-p} + \psi \mathrm{ECM}_{i,t-1} + \vartheta_t \quad (4)$$

Where ECM_t is the error correction term defined as

$$\mathrm{ECM}_{i,t} = UNEMP_{i,t} - \alpha_0 - \sum_{p=1}^{m} \alpha_1 \mathrm{UNEMP}_{i,t-p} - \sum_{p=1}^{n} \alpha_2\, lnCOVID_{i,t-p} - \sum_{p=1}^{p} \alpha_3 GDPG_{i,t-p} - \sum_{p=1}^{q} \alpha_4 INF_{i,t-p} \quad (5)$$

Here, Δ is the first difference operator; β_s are the coefficients relating to the short-run dynamics of the model's convergence to equilibrium, and ψ measures the speed of adjustment.

4. Expected Results

Based on theoretical frameworks and prior empirical studies, this research anticipates several key outcomes regarding the relationship between the COVID-19 pandemic and Malaysia's unemployment rate.

Positive Relationship Between COVID-19 Cases and Unemployment
The analysis is expected to reveal a positive and statistically significant relationship between the number of COVID-19 cases and the unemployment rate. This aligns with global trends observed during the pandemic, where rising infection rates led to strict containment measures, including lockdowns, travel restrictions, and business closures. These disruptions reduced business operations and labour demand, especially in contact-intensive sectors like tourism, retail, transportation, and food services; sectors that employ a significant portion of Malaysia's workforce. The effect may be particularly acute in urban centers and among low-income, informal, and contract workers.

Negative Impact of GDP Growth on Unemployment
A negative correlation between GDP growth and unemployment is anticipated, consistent with Okun's Law, which postulates that higher economic growth leads to job creation and lower unemployment. During periods of GDP contraction such as the severe economic downturn experienced in Malaysia in 2020, companies reduce output, investment, and labour. Conversely, as GDP begins to recover due to policy stimulus and economic reopening, unemployment is expected to decrease. This suggests that the GDP growth rate will mediate the relationship between the pandemic and employment conditions.

Mixed Effects of Inflation
The impact of inflation on unemployment during the pandemic is expected to be ambiguous. Under normal macroeconomic conditions, the Phillips Curve would suggest an inverse relationship: inflation rises when unemployment falls, and vice versa. However, the COVID-19 crisis introduced stagflationary pressures, with both unemployment and inflation rising due to simultaneous demand and supply shocks. Supply chain disruptions, rising commodity prices, and currency depreciation may have contributed to inflation, while weak demand and labour dislocation increased joblessness. Therefore, the direction and strength of this relationship may vary across the short-run and long-run models.

Short-Run Shocks and Long-Run Adjustment
The ARDL model is expected to differentiate between short-term disruptions and long-term trends in the labour market. In the short run, sudden increases in COVID-19 cases are anticipated to produce immediate spikes in unemployment due to abrupt business closures and worker displacement. In the long run, however, as economic activities normalize and recovery policies take effect, the labour market may gradually adjust, potentially stabilizing the unemployment rate. Moreover, the model is expected to include a statistically significant Error Correction Term (ECT), indicating that deviations from long-run equilibrium are corrected over time. A negative and significant ECT coefficient would confirm that the unemployment rate tends to revert to its long-term path after a shock, such as a pandemic wave.

Sectoral and Demographic Vulnerabilities
Although not captured directly in a macro-level ARDL model, it is anticipated, based on the broader literature that the pandemic's impact on unemployment is not evenly distributed across sectors and demographics. Youth, women, and lower-income groups are likely to have experienced disproportionately higher unemployment. Future research could expand on this by incorporating disaggregated or micro-level data.

5. Implications of Expected Results

The expected outcomes of this study carry several implications for policy and future research. Policymakers need to develop resilient labour market strategies, including job protection programs, upskilling initiatives, and social protection for vulnerable workers. The results may support integrating health indicators into macroeconomic forecasting and employment policy frameworks. Long-term recovery will depend not only on economic growth but also on labour market reforms and digital transformation to absorb displaced workers. By identifying the direct and indirect effects of the COVID-19 crisis on employment in Malaysia, this study will

contribute to a deeper understanding of pandemic-induced economic disruptions and offer evidence-based recommendations for improving labour market resilience in future crises.

Policy Implications

Enhancing labour market resilience requires a multidimensional approach that integrates human capital development, technological adaptation, and institutional reforms. Strengthening active labour market policies (ALMPs) remains central in this regard, particularly through initiatives such as reskilling programs and more efficient job-matching mechanisms. As industries evolve due to globalization and technological progress, workers must continuously upgrade their competencies to remain employable. Structured training programs, combined with evidence-based job placement systems, can help minimize mismatches between labour supply and demand, thereby improving overall labour market efficiency.

Digitalization is another pillar of resilience. The COVID-19 pandemic demonstrated the critical role of digital and remote work infrastructure in sustaining economic activities during large-scale disruptions. Expanding broadband coverage, improving digital platforms, and fostering digital literacy are therefore essential to ensuring inclusive participation in the labour force. Furthermore, integrating remote work arrangements into mainstream labour market structures can increase flexibility, reduce geographic inequalities, and enhance productivity.

Equally vital is the expansion of social protection frameworks to encompass informal sector workers, who frequently lack access to health coverage, unemployment benefits, and retirement security. Given the significant share of informal employment in many economies, excluding this group undermines both equity and resilience. Broadening social protection not only mitigates vulnerability during economic shocks but also promotes more inclusive growth trajectories.

Lastly, sector-specific pandemic contingency plans are essential for industries highly exposed to crises, such as tourism, hospitality, and retail. Tailored interventions, including wage subsidies, liquidity support, and flexible work arrangements, can safeguard employment while supporting firm survival. Incorporating lessons from past disruptions ensures future responses are faster, more targeted, and more effective. Taken together, these measures form the foundation of a resilient labour market capable of withstanding future shocks.

Conclusion

This paper tries to establish a positive link between COVID-19 and the unemployment rate in Malaysia, emphasizing the role of macroeconomic mediators like GDP and inflation. The expected findings support the need for robust and inclusive labour market policies to mitigate the adverse effects of future crises. COVID-19 is expected to influence Malaysia's unemployment rate both directly and via GDP contraction. The pandemic created a dual shock, reducing labour demand and disrupting labour supply. Sectoral effects were uneven, with services and informal jobs most affected.

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A Privacy Trade-off Model for Older Adults' Digital Health Disclosure in Malaysia: The Moderating Role of Persuasion Functions

*Melissa Shahrom[1], Norshima Humaidi[1], Ramita Abdul Rahim[1], Farah Syazreena Azmi[1],
Siti Diyana Binti Ibrahim[2]
[1]Department of Technology and Supply Chain Management Studies, Faculty of Business and Management, Universiti Teknologi MARA, Puncak Alam Campus, Malaysia
[2]Jabatan Kesihatan Negeri Selangor, Jalan Persiaran Kayangan, Wisma Sunway, Shah Alam, Malaysia
Email: *melissa@uitm.edu.my
Corresponding Author: Dr Melissa Shahrom

Abstract: This conceptual paper develops a privacy trade-off model to explain older adults' willingness to disclose personal health information through mobile health applications with electronic health record (EHR)-related functions in Malaysia. It focuses on the trade-off between perceived privacy risk and perceived benefit and on the proposed moderating role of persuasion functions. The paper integrates privacy calculus theory and cognitive dissonance theory with the manuscript's review of gerontechnology, electronic health records, trust, information sensitivity, perceived benefits and four persuasion paradigms: free choice, induced compliance, hypocrisy and effort justification. Fourteen hypotheses are organized into a conceptual framework, followed by a proposed two-phase empirical validation plan. The proposed model positions perceived privacy risk and perceived benefit as the central trade-off mechanisms underlying stated willingness to disclose, rather than observed disclosure behavior. Information sensitivity and trust are linked to privacy risk, while service availability, critical mass, compatibility and complementarity are linked to perceived benefit. The four persuasion paradigms are proposed as moderators of the perceived privacy risk and information disclosure relationships. The model brings privacy calculus and cognitive dissonance perspectives together in a gerontechnology context and applies them to older adults' personal health-information disclosure in Malaysia, connecting digital-health adoption, privacy, persuasion and inclusive digital transformation within one conceptual framework.

Keywords: *Digital healthcare; gerontechnology; electronic health records; privacy calculus; cognitive dissonance; information disclosure; older adults; MySejahtera; Malaysia*

1. Introduction and Background

Gerontechnology is an interdisciplinary field that combines gerontology and technology to address the health, cognitive, and social needs of ageing populations through user-centred design. Gerontological design seeks efficient solutions that enhance older adults' quality of life by applying gerontological insights and design research to understand their preferences and needs (Huang & Oteng, 2023). Its solutions and applications aim to support health, independence, social participation, and quality of life among older adults (Huang & Oteng, 2023; Halicka & Surel, 2021). As populations age, gerontechnology is increasingly relevant to active ageing and efforts to reduce unnecessary dependence on traditional healthcare delivery (Huang & Oteng, 2023).

The benefits of gerontechnology do not automatically translate into adoption. Older adults may also experience barriers associated with digital literacy, technology complexity, usability, and confidence when interacting with digital systems (Yan & Xing, 2025; Huang & Oteng, 2023). These barriers are particularly important in digital healthcare, where users are often asked to provide sensitive information through applications and connected health services. The value of a technically capable system therefore depends partly on whether users consider it understandable, trustworthy and safe enough to use.

Healthcare records management is one area in which digital technologies can support older adults. Electronic health records (EHRs) have increasingly replaced or supplemented paper-based records as healthcare organizations manage larger volumes of patient information (Highfill, 2019). Health information systems can improve access to clinical information, record mobility and decision-making, while well-managed digital records can support continuity and quality of care (Wang et al., 2018; Nguyen et al., 2014; Kruse & Beane, 2018). These benefits are especially relevant for older adults who may require long-term follow-up and coordination across multiple healthcare providers.

EHR use also raises concerns about privacy, security and confidentiality. Poor security practices, insufficient protection measures and vulnerable infrastructure may result in sensitive patient information being exposed and heightening concern about the consequences of data misuse (Kruse et al., 2017; Hall & McGraw, 2014). For older adults, such concerns can combine with technology anxiety, uncertainty, and a sense of vulnerability, thereby decreasing their readiness to take part in digital health services (An et al., 2025). The main issue is therefore not just whether digital health systems can provide services efficiently, but also whether the users are willing to disclose the personal information needed by those services. Additionally, it is essential to involve users in matters of privacy and security in healthcare. If healthcare professionals let users take an active role in protecting their medical records, this will help them to understand their rights and responsibilities in relation to privacy. Offering suitable tools and resources can increase confidence in digital health platforms and lessen the uncertainty about how to protect personal information (Paul et al., 2023).

The model focuses on patient-facing mobile health applications that ask older adults to enter, update or share EHR-related personal health information for their own care. It does not examine automatic sharing between healthcare providers or data collected without an active disclosure decision. Throughout the paper, willingness to disclose refers to a person's stated intention to provide information in such an application, not evidence that the information has actually been shared.

2. Literature Review and Model Development

Gerontechnology and the privacy disclosure dilemma

Older adults' disclosure decisions reflect a tension between expected benefits and perceived barriers. Users may be more willing to share health information when they trust a digital health application and expect benefits such as convenience, better access to care, or continuity of treatment. At the same time, concerns about fraud, misuse, and loss of control can discourage disclosure (An *et al.*, 2025). Therefore, a straightforward rejection of technology and digital systems can be mitigated by persuasive approaches.

Digital literacy shapes how confidently older adults interact with digital platforms. Greater familiarity can make information requests and privacy settings easier to interpret, whereas limited familiarity may increase uncertainty. Security concerns, scams and misinformation can further weaken confidence in digital platforms. Trust and perceived benefits also matter, as users are more likely to participate when they view a health information system as useful, reliable and capable of supporting healthcare outcomes (Kisekka & Giboney, 2018; Verheij et al., 2018; Nilashi et al., 2016). These factors remain important even when a system is technically sophisticated because personal health information is sensitive and its disclosure depends heavily on users' judgement.

A technically efficient health system can therefore remain underused when the disclosure process does not address users' concerns. The highly personal nature of health information means that adoption depends on more than usability or service availability. For instance, users must also decide whether the expected value of participation is sufficient to justify giving a digital platform access to information they regard as private. This tension is especially important for older adults because uncertainty about surveillance, scams, fraud or misuse may reinforce reluctance even when the healthcare purpose is understood. The disclosure decision should consequently be examined as part of technology acceptance itself rather than as a separate administrative step. This study therefore addresses two connected questions. First, what factors discourage older adults from allowing personal health information to be digitized? Second, what factors encourage disclosure despite privacy concerns? The proposed model examines the antecedents of perceived privacy risk and perceived benefit, the effects of those perceptions on willingness to disclose personal health information, and the role of persuasion functions in changing the relationship between perceived privacy risk and information disclosure. The contribution is to bring these risk–benefit judgements together with four distinct cognitive-dissonance-related conditions and to consider whether each condition changes the discouraging effect of privacy risk on disclosure willingness among older adults in Malaysia. This combines an established privacy trade-off explanation with a specific set of proposed boundary conditions in a setting where health information is particularly sensitive.

Digital health and EHR context in Malaysia

Health record management is increasingly shaped by data-driven healthcare systems, integrated care platforms and digital records. This shift increases the importance of accurate and timely information disclosure for personalized care, remote monitoring and continuity of treatment. It can also intensify concerns about privacy and the risks of digital engagement, particularly among older users (Malarvizhi *et al.*, 2024). Understanding disclosure willingness is therefore part of the broader challenge of making digital healthcare inclusive rather than merely technically available.

Malaysia has invested in health information infrastructure for several years. In 2016, the Ministry of Health introduced the Malaysian Health Data Warehouse (MyHDW), a centralized platform that consolidates data from multiple health information systems (Ministry of Health Malaysia, 2016). Digital health systems can improve access to records and support clinical decision-making, but their value depends on the quality, security and responsible use of the information they contain. These issues are particularly significant for older adults whose care may involve repeated consultations and long-term health management.

Among older adults, the advantages of integrated health information are strongly linked to continuity of care. Timely access to records is particularly valuable for repeated consultations, chronic-condition management and coordination between healthcare providers. However, the transfer of information across digital platforms can increase concerns regarding who can view, reuse, or share those records. The resulting challenge is therefore twofold: digital health infrastructure must ensure that relevant information is accessible when required while also providing users with sufficient assurance that access is both controlled and transparent. Consequently, this balance makes privacy perception a direct issue for participation in digital healthcare rather than only a technical security concern.

Malaysia's wider digital-health environment also illustrates the practical tension between access and privacy. Older adults can benefit from mobile health services, yet adoption may still be affected by limited digital literacy, privacy concerns and fear of technology misuse (Malarvizhi *et al.*, 2024). Supportive interfaces, caregiver assistance and focused digital-literacy initiatives may reduce practical barriers, but they do not remove the need for clear consent and credible privacy protection. For this reason, disclosure behavior should be examined as a social and behavioral dimension of digital-health transformation.

Privacy is especially important in gerontechnology because many applications process sensitive personal and health information. Perceived misuse can threaten users' sense of autonomy and control. The willingness of older adults to participate in digital-health services therefore depends not only on functionality but also on whether the system creates an acceptable balance between expected benefits and perceived privacy risk (Sun et al., 2024).

Attitudes towards disclosing personal health information

Attitudes towards health-information disclosure vary across individuals. Some users are comfortable sharing health details, while others may hesitate because of privacy concerns, social stigma or information sensitivity (Robinson, 2018). Health information disclosure should therefore be treated as a personal decision. At the same time, the disclosure of accurate information can reduce unnecessary repetition, improve record availability and support continuity of care. Boise *et al.* (2013) examined older adults' willingness to share health-related data and their privacy concerns after exposure to technology-based in-home monitoring. Their findings indicate that privacy concerns do not necessarily result in complete avoidance of digital health technologies. Instead, disclosure may remain acceptable when users perceive a legitimate and beneficial healthcare purpose. Hence, the policy challenge is to obtain the information needed for effective services without weakening autonomy or confidence.

The privacy trade-off perspective proposes that individuals compare perceived risks with expected benefits before disclosing personal information. In gerontechnology, older adults may be more willing to disclose when the anticipated benefits of health support, safety or connectivity are judged to outweigh privacy-related concerns. This trade-off provides the organizing logic for the proposed model.

Perceived benefits of disclosing health data

Potential benefits of health-data disclosure include more personalized healthcare, greater engagement in health management, improved access to information and a stronger sense of control over care. Digital records can also support continuity and potentially reduce avoidable costs when information is available to appropriate healthcare providers (Highfill, 2019; Kruse & Beane, 2018). The model proposes four antecedents of perceived benefit: number of services, perceived critical mass, perceived compatibility and perceived complementarity.
The number of services available through a digital health platform can influence whether users consider the platform useful. A broader set of relevant services can increase the perceived value obtained from disclosure. Accordingly, the first hypothesis is:
H1: A higher number of available services is positively associated with perceived benefit.

Perceived critical mass refers to a user's perception that technology has achieved sufficiently widespread adoption to become socially established. It captures the point at which adoption becomes self-sustaining and participation increases (Ford *et al.*, 2009; Centola *et al.*, 2018). Reaching critical mass requires technology to offer clear value, appeal to a sufficiently broad group, and remain accessible. For older adults, observing use by peers, family members or healthcare providers may reduce uncertainty and signal that a digital health platform is useful and socially supported. This reasoning leads to:
H2: Perceived critical mass is positively associated with perceived benefit.

Perceived compatibility concerns the extent to which technology fits users' needs, preferences and established ways of performing tasks. Older adults are more likely to perceive value when a digital health service aligns with their expectations and can be incorporated into existing routines (Amadea & Indrawati, 2022). Evidence from other digital-service settings offers a starting point for this proposition; its relevance to older adults' mobile health use still needs to be tested. Compatibility with users' health-information practices and quality-of-life goals may therefore strengthen their willingness to use the technology. Accordingly:
H3: Perceived compatibility is positively associated with perceived benefit.

Perceived complementarity refers to the extent to which the components of an EHR environment, such as software, data and connected services, are viewed as working together to produce better outcomes. It is particularly relevant when care involves multiple providers or systems because the usefulness of one component can depend on how well it works with others (Politi *et al.*, 2022). Hence:
H4: Perceived complementarity is positively associated with perceived benefit.
H5: Perceived benefit is positively associated with willingness to disclose personal health information.

Perceived privacy risk of disclosing health data

Health information is highly sensitive, and users may hesitate to disclose it when they are uncertain about how it will be collected, used, stored, or shared. Concerns can arise from possible misuse, unauthorized access, loss of control and doubts about confidentiality. Security and privacy challenges in EHR environments therefore have behavioral consequences in addition to technical consequences (Alanazi et al., 2015; Keshta & Odeh, 2021; Kruse et al., 2017). Information sensitivity and trust are consequently positioned as important antecedents of perceived privacy risk, while both constructs are also expected to influence disclosure willingness directly.
H6: Higher information sensitivity is positively associated with perceived privacy risk.
H7: As the sensitivity of the requested information increases, willingness to disclose personal health information decreases.
H8: Trust in the platform is negatively associated with perceived privacy risk.
H9: Trust in the platform is positively associated with willingness to disclose personal health information.
H10: Perceived privacy risk is negatively associated with willingness to disclose personal health information.

H10 is the baseline relationship: higher perceived privacy risk is expected to be associated with lower willingness to disclose. H11–H14 examine whether the strength of that negative relationship changes under four different persuasion conditions. A positive interaction in this model would mean that the negative risk–willingness slope becomes less steep; it would not mean that privacy risk has a positive direct effect on willingness.

Theoretical foundations

Privacy, security and confidentiality remain central challenges in EHR implementation (Alanazi et al., 2015; Keshta & Odeh, 2021). Privacy concerns the individual's ability to exercise control over personal information, whereas security concerns the mechanisms used to restrict unauthorized access. The transition from paper-based to electronic records has expanded the number of settings in which health information can be accessed, transmitted and combined, increasing the need for governance and technical safeguards (Rothstein, 2007; Sittig & Singh, 2010).

Privacy calculus theory explains disclosure as a decision in which individuals weigh anticipated benefits against perceived risks (Keith *et al.*, 2013). Cognitive dissonance theory provides a complementary explanation for situations in which behavior conflicts with beliefs or attitudes. A person who believes that disclosure is risky may nevertheless decide to share information to obtain a valued service, creating psychological tension that can influence subsequent attitudes or behavior (Festinger, 1957; Cooper, 2019; McGrath, 2017).

Together, the two theories support the core logic of a privacy trade-off model. Privacy calculus explains why benefits and risks are evaluated, while cognitive dissonance provides a basis for examining how conditions surrounding a disclosure decision may alter the relationship between the evaluations and behavior. The proposed persuasion functions are therefore treated as moderators rather than as substitutes for the underlying privacy risk mechanisms.

Both theories also recognize that the same disclosure situation can be interpreted differently by different individuals. The privacy-calculus evaluation depends on the perceived consequences and advantages attached to a particular request, while dissonance becomes relevant when the action taken does not sit comfortably with an existing belief or attitude. In the present context, an older adult may believe that sharing health information creates privacy risk and still decide to disclose because access to a digital-health service is considered beneficial. The resulting tension provides the conceptual basis for examining whether conditions of choice, compliance, self-consistency or invested effort alter the strength of the risk and disclosure relationships.

Table 1: Theoretical integration in the proposed model

Theory	Core decision mechanism	Model elements	Proposed explanatory role
Privacy calculus theory	Users weigh anticipated benefits against perceived privacy risks before disclosure.	Perceived benefit; perceived privacy risk; willingness to disclose	Explains why risk and benefit evaluations shape disclosure willingness.
Cognitive dissonance theory	Psychological tension can arise when disclosure behavior conflicts with beliefs or attitudes.	Free choice; induced compliance; hypocrisy; effort justification	Explains why conditions surrounding disclosure may alter the risk and disclosure relationships.

Persuasion functions

In this study, persuasion functions refer to cognitive-dissonance-related paradigms that may influence how users respond to perceived privacy risk when deciding whether to disclose their personal health information. Their relevance lies in the possibility that the same level of perceived risk may not lead to the same disclosure decision under different conditions of choice, compliance, self-consistency, or invested effort. Therefore, persuasion functions are proposed to moderate the negative association between perceived privacy risk and willingness to disclose personal health information. The proposed model focuses on the analysis of four persuasion functions which are free choice, induced compliance, hypocrisy and effort justification.

Free choice paradigm

The free choice paradigm emphasizes perceived freedom in making a decision (Brehm, 1956; Risen & Chen, 2010). It is the degree to which individuals see the decision about the disclosure of their health information as a voluntary one and thus do not experience any pressure to take any action. In a digital disclosure setting, users

should be able to determine whether to provide information, understand the consequences of the choice, and modify or withdraw consent where appropriate. When users perceive genuine choice and control, the negative effect of privacy risk on disclosure willingness may be reduced because the decision is experienced as voluntary rather than imposed. Accordingly:

H11: The free choice paradigm positively moderates the relationship between perceived privacy risk and willingness to disclose personal health information, such that the negative effect is weakened when perceived choice is high.

Induced compliance paradigm

The induced compliance paradigm examines situations in which individuals engage in behavior that is inconsistent with an existing attitude and subsequently experience pressure to restore consistency (Risen & Chen, 2010; Cancino-Montecinos et al., 2018). In other words, induced compliance is seen when individuals are encouraged to do something that conflicts with their beliefs. The degree of choice and the explanation given for a request can affect whether an initial act of disclosure leads people to reconsider their earlier reservations. In digital-health environments, these conditions require particular caution because the platform should not make users feel that disclosure is compulsory when meaningful consent is expected.

A related sequential-request strategy is the foot-in-the-door technique (Burger, 1999). It begins with a small request that is relatively easy to accept, followed by a larger related request. The logic is that initial compliance can increase the likelihood of subsequent compliance. In this model, the relevant possibility is that an earlier, freely accepted and low-pressure request may prompt a person to view a later request more favorably despite perceived privacy risk. This is a proposed change in the risk–willingness relationship, not a claim that pressure or large incentives necessarily improve disclosure. Thus:

H12: The induced compliance paradigm positively moderates the relationship between perceived privacy risk and willingness to disclose personal health information, such that the negative relationship is weaker when an earlier, low-pressure disclosure decision encourages consistency with that voluntary choice.

Hypocrisy paradigm

The hypocrisy paradigm draws attention to inconsistency between standards that individuals endorse and their previous behavior. It refers to the discrepancy between beliefs concerning privacy that individuals tend to hold, and their actual actions such as disclosure of personal health information through mobile applications. Making such inconsistency salient can motivate efforts to restore consistency (Gauld *et al.*, 2021). Applied to privacy decisions, users may compare their stated privacy concerns with their previous disclosure behavior or with the benefits they expect from a digital service. The framework therefore proposes that self-inconsistency can alter the effect of perceived privacy risk on willingness to disclose. Accordingly:

H13: The hypocrisy paradigm positively moderates the effect of perceived privacy risk on willingness to disclose personal health information, reducing the negative impact when users experience self-inconsistency.

Effort justification paradigm

Effort justification suggests that people may evaluate an outcome more positively when they have invested substantial time or effort in obtaining it (Harmon-Jones & Mills, 1999; McGrath, 2017). In a digital-health context, users who have invested effort in registration, verification or completing health-related information may place greater value on the resulting service. Where users regard that effort as worthwhile, they may become less reluctant to share information despite perceived privacy risk. The proposed effect therefore concerns a weaker negative risk–willingness relationship, rather than a positive direct effect of privacy risk. This should not be interpreted as support for burdensome registration or pressure to continue after investing effort. Hence:

H14: The effort justification paradigm positively moderates the relationship between perceived privacy risk and willingness to disclose personal health information, such that the negative relationship is weaker when users perceive their earlier effort in using the system as worthwhile.

Moderating role of persuasion functions

Older adults may experience uncertainty in digital environments because of limited familiarity, reduced confidence or concerns about vulnerability. Clear explanations of how information is collected, protected and used can reduce ambiguity and improve risk comprehension. Persuasion, however, should not be treated as a

mechanism for overcoming privacy concerns at any cost. Its role should be to support informed judgement, strengthen perceived control and make the consequences of disclosure easier to understand (Sun et al., 2026).

Perceived privacy risk generally suppresses disclosure willingness, while control and trust can support participation (Keith et al., 2013). The effect of risk may therefore vary according to how a disclosure request is framed and how much autonomy a user perceives. It may also vary when an earlier voluntary disclosure, recognition of inconsistency or worthwhile invested effort changes how a person interprets the request. These variations provide the rationale for modelling the four persuasion paradigms as moderators.

Poorly designed persuasion can have the opposite effect. Complex explanations, exaggerated assurances or coercive design can increase skepticism and reinforce risk-avoidant behavior. The proposed model therefore treats persuasion as conditional: its effect depends on the specific paradigm and on whether the design respects autonomy, transparency and user comprehension. This is particularly important for older adults because persuasive mechanisms should support rather than exploit vulnerability.

The four paradigms offer different explanations for the same proposed moderation of H10: free choice concerns control over a decision; induced compliance concerns consistency following an earlier voluntary action; hypocrisy concerns awareness of a gap between stated beliefs and previous actions; and effort justification concerns the value attached to effort already invested. Each interaction remains a hypothesis to be tested. The direction may differ in practice if users perceive pressure, manipulation, or a loss of control.

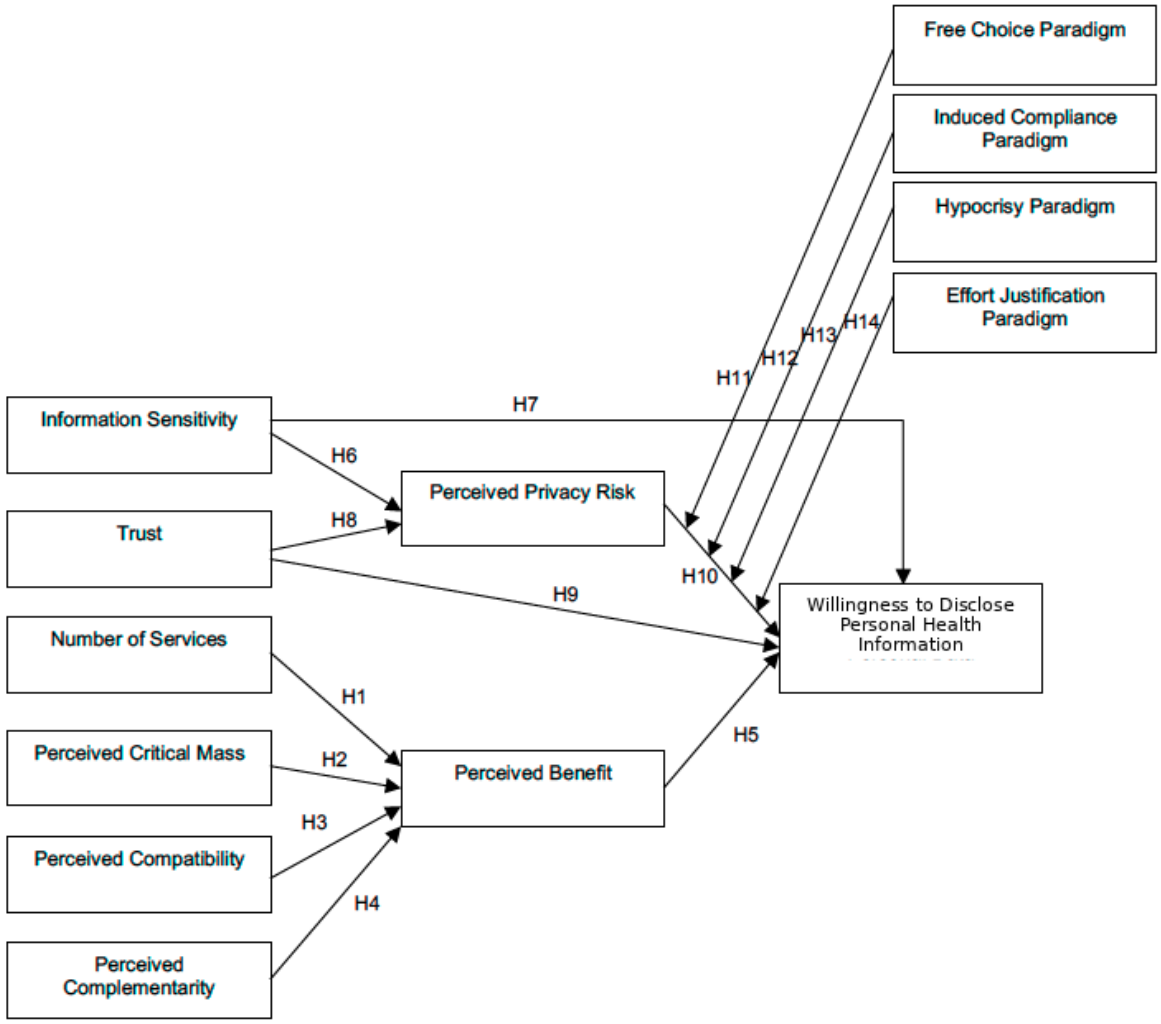
Table 2: Persuasion functions and proposed moderating relationships

Persuasion function	Condition	Moderated relationship	Proposed effect
Free choice	Perceived freedom and control in deciding whether to disclose	Privacy risk → willingness to disclose	Weakens the negative effect when perceived choice is high (H11).
Induced compliance	Earlier voluntary disclosure under a low-pressure request, followed by a desire for consistency	Privacy risk → willingness to disclose	Weakens the negative risk–willingness relationship after an earlier voluntary, low-pressure disclosure (H12).
Hypocrisy	Salient inconsistency between endorsed standards and previous behavior	Privacy risk → willingness to disclose	Reduces the negative effect when self-inconsistency is experienced (H13).
Effort justification	Effort already invested in registration, verification or providing information that is seen as worthwhile	Privacy risk → willingness to disclose	Weakens the negative risk–willingness relationship when earlier effort is seen as worthwhile (H14).

Conceptual framework

Figure 1 summarizes the proposed privacy trade-off model. Perceived privacy risk and perceived benefit form the central trade-off mechanisms. Information sensitivity and trust are linked to perceived privacy risk; number of services, perceived critical mass, perceived compatibility, and perceived complementarity are linked to perceived benefit; and trust and information sensitivity also have direct relationships with disclosure willingness. The four persuasion paradigms are positioned as moderators of the perceived privacy risk and disclosure relationships.

Figure 1: Proposed privacy trade-off model



3. Proposed Empirical Validation

Because the present article is conceptual, the empirical procedures described in this section are proposed for subsequent validation of the framework rather than reported as completed research. The proposed design has two phases. Phase 1 is intended to refine the contextual relevance of the framework and the measurement instrument, while Phase 2 is intended to test the hypothesized relationships quantitatively.

Phase 1: preliminary qualitative study

Phase 1 proposes interviews with approximately three to five key stakeholders from relevant Malaysian health and cybersecurity organizations. The purpose is to explore factors that may contribute to older adults' willingness or reluctance to disclose personal health information and to assess whether the conceptual factors identified from the literature require contextual refinement.

These stakeholder interviews are intended as a preliminary check on the wording and contextual relevance of the proposed constructs, rather than as a source of findings about older adults as a whole. Before the main survey, draft questions will also be tried with a small group of older adults through brief cognitive interviews or think-aloud checks to see whether the consent scenarios, privacy terms and response options are clear.

RQ1: What factors make older adults reluctant to disclose personal health information and allow it to be digitized?

RO1.1: To identify factors that make older adults reluctant to disclose personal health information and allow it to be digitized.

The interview data are proposed to be analyzed thematically and mapped against the literature-derived constructs. The resulting themes would be used to refine the privacy trade-off framework and support questionnaire development. Measurement items would be adapted from prior research where appropriate, with any self-developed items subjected to expert review and instrument pre-testing before the second phase. Participants in these pre-tests will be asked to explain how they understand key terms such as trust, privacy risk and voluntary disclosure. Their comments will be used to revise unclear wording and remove questions that are difficult to answer. No results from these preliminary activities are presented in this conceptual article.

Phase 2: quantitative model testing

Phase 2 proposes a survey of adults aged 60 years or older who use smartphones in selected urban and semi-urban locations in central Malaysia, including Selangor, Kuala Lumpur, Putrajaya and Cyberjaya. Purposive sampling is proposed to identify respondents who fit the study criteria and are able to engage with a specific mobile health application, which is MySejahtera.

RQ2: Which factors contribute to older adults' willingness to disclose personal health information in the context of privacy concerns?

RO2.1: To examine the proposed direct relationships among the model constructs, including factors associated with perceived privacy risk and perceived benefit and their effects on older adults' willingness to disclose personal health information through patient-facing mobile health applications.

RO2.2: To examine whether the free choice, induced compliance, hypocrisy and effort justification paradigms each moderate the relationship between perceived privacy risk and willingness to disclose personal health information.

The survey will use a clearly described voluntary EHR-related disclosure scenario, so respondents are answering about the same kind of request. Trust will be assessed through items on the perceived reliability of the application or provider, confidence in how information is handled and confidence that privacy commitments will be honored. Willingness to disclose will be measured through intention items about providing the requested information in that scenario. Previous disclosure habits will be recorded separately through self-reported frequency of digital-health information sharing, the types of information previously provided and whether respondents have declined earlier requests. These reports describe experience; they are not independently observed disclosure behavior and will not be substituted for the main outcome. Perceived privacy risk, perceived benefit and each persuasion paradigm will be measured with distinct, literature-informed multi-item scales, checked for clarity and validity before model testing.

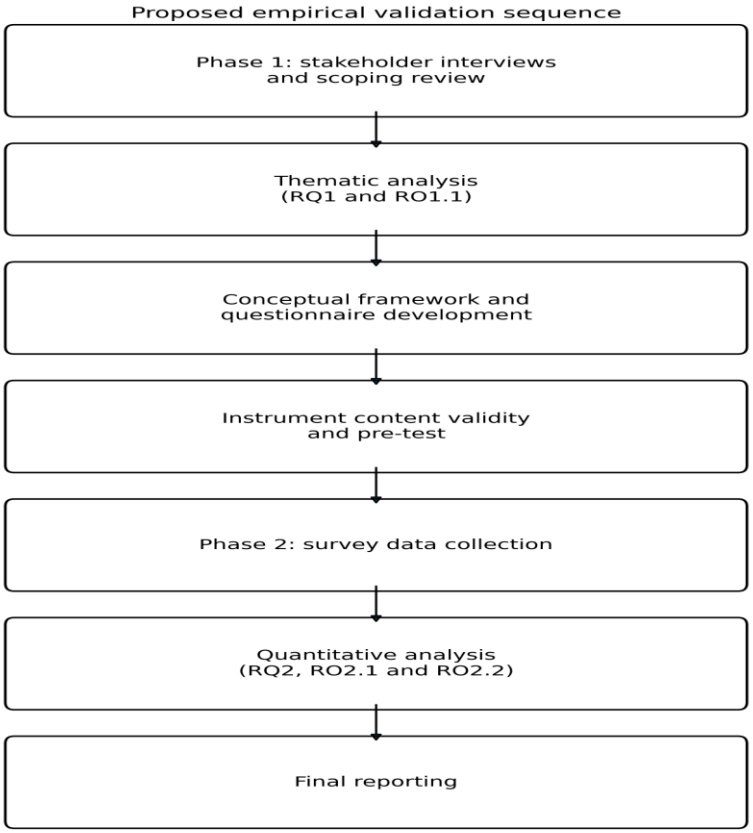
The final sample size would be determined through a priori power analysis after the framework and measurement model are finalized; the current plan anticipates at least 200 participants as an initial recruitment target, subject to the power needed to detect the four moderation effects. Descriptive and preliminary analyses would be conducted in SPSS, followed by PLS-SEM in SmartPLS 4 to assess reliability, convergent and discriminant validity, and the hypothesized structural relationships. The four moderation hypotheses will be tested using separate privacy risk × persuasion-function interaction terms, with bootstrapped confidence intervals and simple-slope plots used to interpret any interactions. Relevant background variables, including age, digital literacy and previous mobile-health experience, will be considered when assessing the model. Figure 2 summarizes the proposed sequence.

The proposed purposive sample covers smartphone users in selected urban and semi-urban parts of central Malaysia. It may therefore underrepresent rural older adults, people who do not use smartphones and those who need substantial assistance with digital services. The eventual findings should not be generalized to all older adults in Malaysia without further sampling and testing.

Table 3: Proposed empirical validation plan

Phase	Participants and data	Purpose	Proposed analysis and output
Phase 1: preliminary qualitative study	Interviews with approximately three to five stakeholders from Malaysian health and cybersecurity organizations; brief questionnaire checks with older adults	Identify factors contributing to willingness or reluctance and assess the need for contextual refinement	Thematic review of stakeholder feedback; older-adult cognitive pre-testing; refine construct wording and questionnaire
Phase 2: quantitative model testing	Adults aged 60 years or older who use smartphones in selected urban and semi-urban locations in central Malaysia; an initial target of at least 200, subject to moderation power analysis	Examine disclosure factors and the four proposed moderating effects	SPSS descriptive analyses; PLS-SEM measurement and structural assessment; bootstrapped tests of four interaction terms and simple slopes

Figure 2: Proposed empirical validation flow



Note: Instrument pre-testing includes feedback from older adults on question wording and the disclosure scenario. Sample-size planning will take account of the four proposed interaction tests before the quantitative phase.

4. Policy and Ethical Implications

The proposed model has policy relevance because digital-health transformation depends on both technological capability and public willingness to participate. A privacy-aware model can help policymakers and system developers identify where disclosure reluctance is associated with perceived risk, insufficient benefit, low trust or the design of the disclosure process. In Malaysia, this perspective is relevant to efforts to expand digital healthcare while maintaining data privacy, patient safety and inclusive access.

Persuasive design requires particular ethical attention when services are intended for older adults. Reminders, prompts, defaults and explanations can support informed decision-making, but they should not undermine autonomy or pressure users to disclose more information than intended. Opaque consent processes, pre-selected options or emotionally manipulative messages can exploit limited digital literacy or excessive trust in authority. Privacy-by-design, transparent consent and accessible privacy information should therefore be treated as safeguards rather than optional interface features.

In practice, an application could explain in plain language why each item of health information is requested, who may access it and how long it will be kept. Optional data-sharing choices could be left unticked, with a clear way to decline or withdraw consent without misleading warnings or unnecessary loss of essential care. Large text, readable consent summaries and optional assistance from a trusted caregiver could help users make the decision themselves. These measures illustrate persuasion that supports understanding and control rather than pushing users towards disclosure.

The framework also emphasizes that inclusion is not achieved simply by increasing the number of digital services. Systems must make benefits understandable, reduce unnecessary disclosure, provide meaningful choices and communicate privacy protections in a way that older adults can evaluate. This approach links individual disclosure decisions with wider questions of digital trust, digital literacy and equitable participation in digital healthcare.

5. Conclusion

This conceptual paper develops a privacy trade-off model for older adults' personal health-information disclosure in Malaysia. The model combines privacy calculus theory with cognitive dissonance theory to explain how perceived privacy risk and perceived benefit shape disclosure willingness and how four persuasion paradigms may alter these relationships. It also positions information sensitivity, trust, service availability, critical mass, compatibility and complementarity as antecedents within the trade-off process.

The model contributes to gerontechnology and digital-health research by treating privacy disclosure as both a technology-adoption issue and a behavioral governance issue. Its practical value lies in directing attention to the conditions under which older adults may consider digital-health disclosure acceptable, including credible privacy protection, meaningful benefits, trustworthy platforms and non-coercive communication. These conditions are relevant to the design of inclusive digital health services and to broader debates on trust, security, privacy and the social consequences of digital transformation.

Once empirically examined, the framework can also help identify which barriers require more focused intervention and where resources should be directed to improve digital-health participation. Evidence on the relative importance of privacy risk, perceived benefit, trust, and persuasion conditions could support more specific strategies for system design and communication. This maintains the original study's practical objective of helping decision makers use evidence to address barriers to EHR and mobile-health adoption among older adults.

The framework remains conceptual and therefore requires empirical validation. The proposed two-phase design provides a route for contextual refinement and subsequent hypothesis testing. Future empirical work should also examine whether the four persuasion paradigms operate as expected among different groups of older adults and whether their effects vary according to digital literacy, experience with health applications

and the sensitivity of the information requested. The central ethical requirement is that persuasion should support informed choice rather than weaken it.

By distinguishing stated willingness from actual disclosure and by specifying the four interaction mechanisms, the framework offers testable explanations for when privacy concerns may have a stronger or weaker influence on older adults' decisions. Whether those explanations hold in practice, particularly outside smartphone-using urban and semi-urban groups, remains an empirical question.

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Building Resilient Healthcare Systems: A Systematic Literature Review on Human Capital and Digital Transformation

Nurkhairun Shuhada Razali[1], *Nazura Mohamed Sayuti[1], Muhammad Hafizi Zamri[1], Siti Norida Wahab[1], Aimi Anuar[2]
[1]Faculty of Business and Management, University Teknologi MARA, Selangor, Malaysia
[2]Faculty of Business Management and Professional Studies, Management and Science University (MSU), Selangor, Malaysia
Email: khrnrzli@gmail.com, *nazura139@uitm.edu.my, muhamm9811@uitm.edu.my, sitinorida23@uitm.edu.my, aimi_anuar@msu.edu.my
Corresponding Author: Dr Nazura Mohamed Sayuti

Abstract: This PRISMA-guided systematic literature review investigated the influence of human infrastructure on the outcome of digital transformation and organizational performance in healthcare by merging the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) with the McKinsey 7S Framework. A total of 43 studies were included and were integrated using qualitative thematic analysis after searches of Scopus, Web of Science, ScienceDirect, and Google Scholar for publications between 2010 and 2025. Performance Expectancy (PE) and Facilitating Conditions (FC) seemed to be the most consistently reported factors that influence the adoption of healthcare technology, while Social Influence (SI) and Hedonic Motivation (HM) also proved to be affected by organizational culture, type of technology, and previous user experience. At the organization level, organizations that are characterized by higher levels of McKinsey 7S soft elements, especially Staff, Skills, Style, and Shared Values, are more likely to see positive intention towards sustained use and improved performance at the individual level. Success in digital transformation could be an intermediate mechanism for human infrastructure to positively influence organizational output in terms of operational efficiency, service quality, and patient satisfaction, and so on. The combined model provides a richer understanding of the digital transformation in healthcare and can assist managers, policymakers, and academics in sustainable adoption.

Keywords: *Human infrastructure, digital transformation, organizational performance, sustainable healthcare, UTAUT2, McKinsey 7S*

1. Introduction and Background

The digital transformation of healthcare is increasingly seen as a people and process challenge rather than a technology challenge. While electronic health records (EHR), telemedicine, AI, cloud-based solutions, and hospital information systems (HIS) are becoming more accessible, successful adoption requires an organization's preparedness and workforce's ability to implement the change. Five interrelated facets of healthcare digitalization were identified by Kraus et al. (2021): operational efficiency, patient-centred care, workforce practices, the organizational and managerial consequences and the socio-economic impact. Their analysis suggests that sustainable change requires an organizational shift as well as access to the technology. This concern resonates in Malaysia, with the national digital-health policy gradually being formulated after the inception of telehealth in 1997 and the Introduction of the Total Hospital Information System (THIS) project /modules in a few Government Hospitals.

The Malaysian government has also supported digital development through initiatives such as the Malaysia Digital Economy Blueprint, the JENDELA programme and the Twelfth Malaysia Plan (2021-2025). Although the COVID-19 pandemic accelerated the use of digital healthcare services, including teleconsultation, the adoption and utilization of healthcare information systems in public health facilities remain uneven. Malaysian studies have identified organizational support, training adequacy, social influence, and digital competency as important factors associated with eHealth adoption and use. International literature likewise emphasizes the importance of organizational and workforce conditions in healthcare transformation.

Recent evidence indicates that successful healthcare digital transformation depends not only on the availability of digital technologies but also on organizational readiness, leadership support, adaptable structures, and the continuous development of employees' digital skills (Zavacká & Jankelová, 2025). Recent healthcare-

technology research shows that healthcare professionals' acceptance is shaped by perceived usefulness, perceived ease of use, social influence, facilitating conditions, training, self-efficacy, and organizational context (Mathew et al., 2023; Thanthrige et al., 2024). A more recent review published after the stated review period similarly emphasizes the importance of organizational and contextual factors in digital-health adoption (Ikawati et al., 2026).

Therefore, the present review is based on two complementary theoretical models: the Unified Theory of the Acceptance and Use of Technology 2 (UTAUT2) model formulated by Venkatesh, Thong, and Xu (2012) and the McKinsey 7S Framework. UTAUT2 is an extended individual-level theory explaining technology acceptance and use in terms of Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price Value, and Habit. The McKinsey 7S Framework can also be applied to the organization level, considering seven interrelated elements through Strategy, Structure, Systems, Staff, Skills, Style, and Shared Values (Loonam, 2021).

Taken together, these models allow a multi-level approach to investigating the ways in which healthcare employees' acceptance of digital technologies and alignment with the organization and human infrastructure coalesce to shape the success of digital-transformation implementation and achievement of organizational performance. The application of UTAUT2 and McKinsey 7S frameworks in this paper is theoretical and should not be understood to mean that these theories combined as frameworks are already quantitatively validated as a solitary causal model. Even with the expanding research body on healthcare digital transformation, three major voids persist (Zavacká & Jankelová, 2025; Mathew et al., 2023). Recent reviews highlight that the discipline now includes healthcare-technology adoption, organisational consequences, leadership, workforce capability, and digital-transformation readiness. Nevertheless, such domains are more commonly analysed with different analytical lenses rather than from a single integrated theoretical perspective.

First, extant research typically investigates individual technology acceptance and organizational readiness as two distinct bodies of literature. Research on the uptake tends to concentrate on the individual beliefs (i.e., Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions) (Mathew et al., 2023; Zavacká & Jankelová, 2025), while organizational studies focus on leadership, organizational design/structures, systems, workforce capabilities, and change readiness. This has led to a paucity of evidence synthesis regarding the relationship between employee-level adoption factors and organization-level conditions in influencing sustained implementation and higher-level digital-transformation outcomes.

Second, although UTAUT2 and related acceptance models have been widely applied to explain healthcare professionals' intentions to adopt digital technologies, and the McKinsey 7S Framework has been used to examine organizational alignment and digital-transformation barriers, few studies appear to combine these perspectives in a single conceptual framework. Recent healthcare-technology research indicates that technology acceptance is influenced not only by perceived usefulness and ease of use but also by training, self-efficacy, facilitating conditions, social factors, and organizational context (Ikawati et al., 2026; Thanthrige et al., 2024). Similarly, the McKinsey 7S Framework identifies Strategy, Structure, Systems, Staff, Skills, Style, and Shared Values as organizational dimensions through which digital-transformation barriers and enablers can be examined (Abouaomar & Alhaderi, 2024). In particular, the role of human infrastructure Staff, Skills, leadership Style, and Shared Values in translating technology acceptance into sustained implementation and improved organizational performance remains insufficiently synthesized.

Third, the available evidence is fragmented across healthcare settings, technologies, professional groups, and national contexts. In Malaysia, recent research has examined technology readiness, perceived usefulness, perceived ease of use, digital competence, and healthcare professionals' intention to use telemedicine. However, adoption remains uneven, and limited evidence has synthesized how individual acceptance factors interact with organizational alignment factors in Malaysian public healthcare organizations (Cheah et al., 2025). Accordingly, this systematic literature review seeks to synthesize evidence on how individual technology-acceptance factors and organizational-alignment factors interact to influence healthcare digital transformation and organizational performance, with particular attention to the Malaysian healthcare context.

2 Literature Review

Building on the Introduction, this section reviews the theoretical and empirical literature linking healthcare digital transformation with technology acceptance, human infrastructure, organizational readiness, and performance. The discussion focuses on how UTAUT2 explains employee-level adoption and how the McKinsey 7S Framework explains the organizational conditions that support or constrain implementation. UTAUT2, developed by Venkatesh et al. (2012), describes technology adoption through Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, and Hedonic Motivation. The McKinsey 7S Framework focuses on organizational alignment through Strategy, Structure, Systems, Staff, Skills, Style, and Shared Values (Loonam, 2021). Together, these frameworks provide a two-level perspective for examining how healthcare employees' acceptance of digital technologies interacts with organizational readiness and alignment to influence digital transformation and organizational performance.

UTAUT2 and McKinsey 7S: An Integrated Perspective on Digital Transformation

The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) and the McKinsey 7S Model operate at distinct but complementary layers of the healthcare digital transformation. The UTAUT2 is at the individual level of awareness as to why HCWs adopt, or intend to adopt, and continue using digital HC tools. It is defined as Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price Value, and Habit (Venkatesh et al., 2012). Reviews of more recent healthcare technology indicate that UTAUT or similar models are still being used in investigations of telemedicine, electronic health records, mobile health applications, and health information systems. Adoption can be predicted by Performance Expectancy (PE) to a high degree, and the extended model addresses additional factors such as trust, compatibility, training, self-efficacy, organizational support, and task-technology fit (Mathew et al., 2023; Ikawati et al., 2026; Thanthrige et al., 2024).

The McKinsey 7S Model, on the other hand, focuses on the organizational elements that facilitate or hinder digital transformation. These are Strategy, Structure, Systems, Staff, Skills, Style, and Shared Values (Loonam, 2021). These aspects highlight that transformative success is contingent not only on employees' openness toward technology diffusion but also on the coherence between organizational priorities, leadership models, operating processes, workforce capabilities, and organizational culture. And in healthcare settings, that may be particularly crucial, as digital solutions not only need to be adapted to clinical workflows and business processes but also to professional roles and patient-service delivery.

The conceptual cross-layer integration of UTAUT2 and the McKinsey 7S Model better explains digital transformation. UTAUT2 identifies the individual factors affecting acceptance of technology, 43 whereas the 7S framework describes the organizational context in which acceptance takes place. For instance, an organizational Strategy may reinforce Performance Expectancy by making explicit the expected benefits of digital transformation. Training and professional development might influence Effort Expectancy through improving confidence and competence of employees. Leadership Style and Shared Values might impact Social Influence through promoting digital acceptance among managers and professional teams. Systems, Structure, and the human and nonhuman elements of an organization may enhance Facilitating Conditions through technical assistance, clearly defined roles, and protocols for carrying out tasks.

Conceptually, the UTAUT2 and the McKinsey 7S framework are combined in this paper but not in a statistical sense. The framework is intended to help organize evidence about how individual acceptance and organizational alignment might influence one another. It should not be construed to mean that UTAUT2 and McKinsey 7S have been empirically tested as a single causal model.

This orientation is supported by recent literature. Studies of digital transformation in healthcare (Zavacká & Jankelová, 2025) identify (transformational) leadership, organizational readiness, flexible structures, and employee digital skills as key prerequisites for effective transformation. Reviews of healthcare-technology adoption reinforce that Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, training, self-efficacy, and the context of the organization are significant factors in technology adoption (Mathew et al., 2023; Ikawati et al., 2026; Thanthrige et al., 2024).

3. Systematic Literature Review Methodology

This study used a systematic literature review (SLR) approach guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). The SLR approach was chosen as it allows for transparent, rigorous, and replicable identification, selection, and synthesis of appropriate literature on human infrastructure dimensions and their impact on the success of digital transformation and organizational performance in the field of healthcare. The systematic search was conducted across four major academic databases (Scopus, Web of Science, ScienceDirect, and Google Scholar). These databases were chosen for their comprehensive coverage of management, information systems, healthcare administration, and organizational behavior literature.

Screening

All retrieved records were compiled and screened in stages in accordance with the PRISMA process. Titles and abstracts were first reviewed against the predefined inclusion criteria. Potentially relevant records then proceeded to full-text assessment, during which the study population, healthcare setting, digital-transformation focus, human or organizational factors, and reported outcomes were examined. Records that did not address the review question, duplicated another record, or lacked sufficient methodological and substantive relevance were removed. The screening process resulted in the inclusion of 43 studies in the qualitative synthesis.

Quality Appraisal

The methodological quality of the included studies was appraised using the Mixed Methods Appraisal Tool (MMAT), which is suitable for evaluating qualitative, quantitative, and mixed-methods research designs. The appraisal considered the appropriateness of each study's research design, sampling strategy, data-collection procedures, analytical methods, and the coherence between the research question, evidence, and conclusions. Each article was assessed against the MMAT criteria relevant to its design and classified as having high, moderate, or low methodological quality. Quality appraisal was used to interpret the strength and reliability of the evidence during thematic synthesis rather than as an automatic reason for exclusion, allowing relevant studies with methodological limitations to remain visible while ensuring that their findings were weighted cautiously. The MMAT criteria used to appraise the methodological quality of the included studies are presented in Table 1.

Table 1: MMAT Quality Appraisal Criteria

Study design	Appraisal domains
Qualitative research	Appropriateness of the qualitative approach; adequacy of data collection; appropriate analysis; interpretation supported by data; coherence between data sources, analysis, and interpretation.
Randomized controlled trial	Appropriate randomization; concealment of allocation; completeness of outcome data; blinding where relevant; appropriate outcome measurements.
Non-randomized quantitative study	Representativeness of participants; appropriateness of measurements; completeness of outcome data; control of confounding; suitability of statistical analysis.
Quantitative descriptive study	Clear sampling strategy; representative sample; appropriate measurements; low risk of non-response bias; suitable statistical analysis.
Mixed-methods study	Clear rationale for using mixed methods; effective integration of qualitative and quantitative components; appropriate interpretation of integration; adherence to the relevant design criteria; limitations of integration addressed.

Eligibility

Studies were eligible when they examined digital transformation or digital-health technology in a healthcare setting and addressed at least one human-infrastructure or technology-acceptance factor, such as workforce skills, staff readiness, leadership, organizational support, facilitating conditions, performance expectancy, effort expectancy, social influence, or cultural alignment. Studies also had to report implications for

implementation, adoption, organizational performance, service quality, operational efficiency or related healthcare outcomes. Studies were excluded when they focused only on technical system development without human or organizational analysis, were unrelated to healthcare, were editorials or opinion pieces without an empirical or review basis or did not provide sufficient information for assessment. The inclusion and exclusion criteria applied during the screening and eligibility stages are presented in Table 2.

Table 2: Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Literature type	Journal articles (research and review), theses, and conference proceedings	Book chapters, editorial letters, opinion pieces without empirical basis
Publication timeline	2010–2025 (with exceptions for seminal foundational works pre-2010)	Before 2010 (except foundational UTAUT/McKinsey 7S works)
Language	English	Non-English
Nature of study	Focuses on human infrastructure, digital transformation adoption, or organizational performance in healthcare AND/OR applies UTAUT/UTAUT2 or McKinsey 7S to digital transformation contexts	Does not address digital transformation adoption, human factors, or organizational performance
Geographic scope	Global with emphasis on Malaysian and Asian healthcare contexts	Studies with no relevance to healthcare or organizational digital transformation

Search Strategy

A structured literature search was conducted in Scopus, Web of Science, ScienceDirect, and Google Scholar to identify studies examining human infrastructure, digital technology acceptance, healthcare digital transformation, and organizational performance. Search terms were developed from the study concepts and combined with Boolean operators, synonyms, and truncation where appropriate. The search covered studies published from 2010 to 2025 and was limited to research relevant to healthcare organizations and healthcare professionals. Reference lists of eligible studies were also examined to identify additional relevant publications. The database search strings and key terms used to identify relevant studies are presented in Table 3.

Table 3: Search Strings

Database	Keywords Used
Scopus & Web of Science (Search String 1-Human Infrastructure)	TITLE-ABS-KEY (("human infrastructure" OR "digital skills" OR "workforce readiness" OR "human capital" OR "organizational culture") AND ("digital transformation" OR "healthcare digitalization" OR "hospital information system") AND ("organizational performance" OR "service quality" OR "performance outcomes"))
Scopus & Web of Science (Search String 2-UTAUT2)	TITLE-ABS-KEY (("UTAUT2" OR "UTAUT" OR "performance expectancy" OR "effort expectancy" OR "social influence" OR "facilitating conditions" OR "hedonic motivation") AND ("healthcare" OR "hospital" OR "medical" OR "health service"))
Scopus & Web of Science (Search String 3-McKinsey 7S)	TITLE-ABS-KEY (("McKinsey 7S" OR "McKinsey 7-S" OR "7S framework") AND ("digital transformation" OR "organizational change" OR "change management"))
Google Scholar (Search String 1)	All in title: ("digital transformation" OR "healthcare digitalization") AND ("human infrastructure" OR "workforce readiness" OR "UTAUT" OR "McKinsey 7S")
Google Scholar (Search String 2)	All in title: ("performance expectancy" OR "effort expectancy" OR "social influence" OR "facilitating conditions") AND ("healthcare" OR "hospital" OR "Malaysia")

Data Extraction and Analysis

The PRISMA process proceeded through four stages: identification, screening, eligibility, and inclusion, resulting in 43 articles being included in the review. Data were systematically extracted from each selected study, including the study design, geographic context, theoretical framework, focal variables, and key findings. The extraction process was guided by the objectives of the review, with particular attention given to human infrastructure, digital transformation, technology adoption, and organisational performance in healthcare contexts.

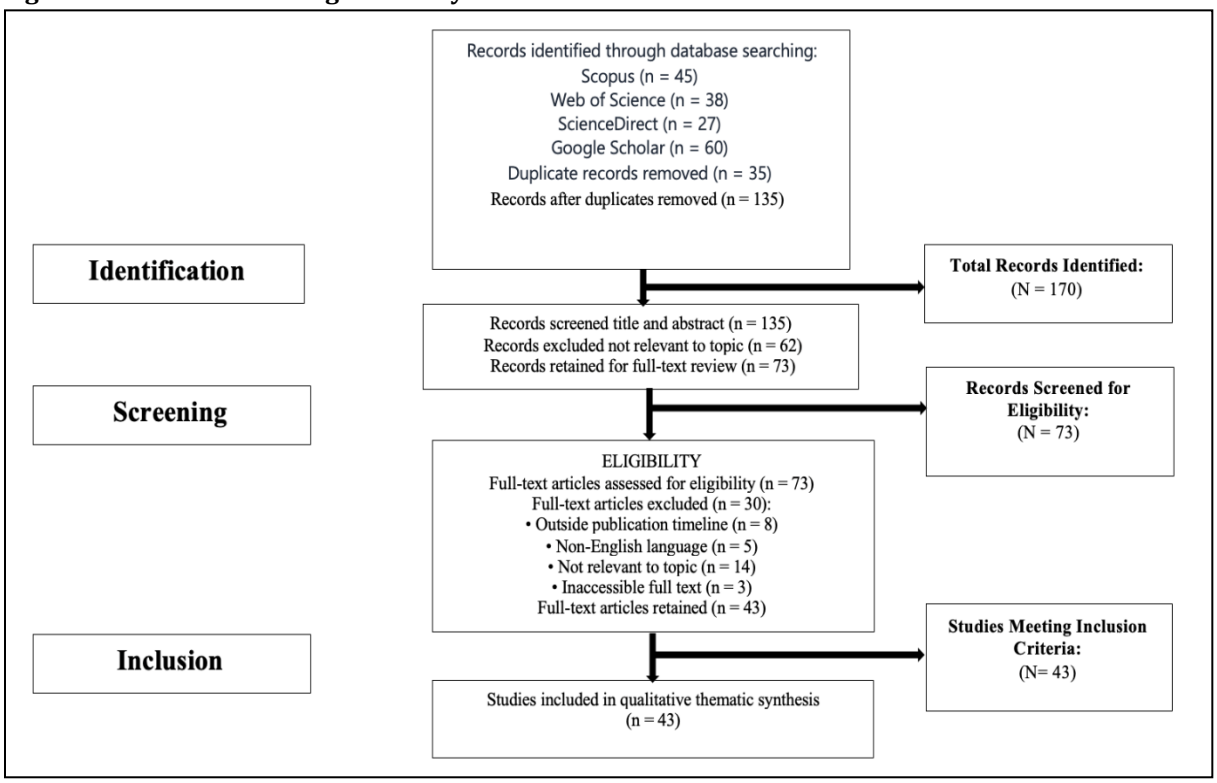
The extracted findings were then analysed using qualitative thematic synthesis. The analysis involved comparing the findings across the selected studies, identifying recurring concepts and relationships, and grouping studies with similar areas of focus into broader thematic categories. The themes were developed inductively from patterns identified across the reviewed literature while remaining aligned with the two theoretical frameworks underpinning the study, namely UTAUT2 and the McKinsey 7S Framework.

Seven thematic categories were subsequently identified: (1) Digital Transformation in Healthcare, (2) Organisational Performance, (3) Human Infrastructure and the McKinsey 7S Framework, (4) Performance Expectancy, (5) Effort Expectancy, (6) Social Influence and Hedonic Motivation, and (7) Facilitating Conditions and Workforce Readiness. These themes were used to structure the synthesis of evidence and to explain how individual-level human infrastructure factors and organisational-level factors jointly contribute to digital transformation and organisational performance in healthcare. Given the heterogeneity of the included studies in terms of research design, geographical context, and methodological approach, qualitative thematic synthesis was considered appropriate for integrating the findings.

Data Analysis and Theme Development

A hybrid coding approach was used to develop the themes. Deductive coding was guided by the review question and the two theoretical frameworks: UTAUT2 provided initial codes for performance expectancy, effort expectancy, social influence, facilitating conditions, and hedonic motivation, while the McKinsey 7S Framework provided codes for strategy, structure, systems, staff, skills, style, and shared values. Inductive coding was then used to capture concepts and recurring findings that emerged from the included studies but were not fully represented by the initial framework, including organizational readiness, leadership, digital competency, training, system integration, user satisfaction, and workforce resilience. The extracted findings were compared across studies, grouped into conceptually related categories, and iteratively refined into seven final themes. Theme boundaries were reviewed against the original study findings to ensure that each theme was internally coherent and distinct from the others. Because the included studies were heterogeneous in design, context, and outcome measurement, the analysis remained qualitative and no statistical pooling was undertaken. The study-identification, screening, eligibility and inclusion process is illustrated in Figure 1.

Figure 1: PRISMA Flow Diagram for Systematic Review Process



4. Results

The systematic review included 43 articles for qualitative thematic analysis. Seven themes were identified: (1) Digital Transformation in Healthcare, (2) Organizational Performance, (3) Human Infrastructure and the McKinsey 7S Framework, (4) Performance Expectancy, (5) Effort Expectancy, (6) Social Influence and Hedonic Motivation, and (7) Facilitating Conditions and Workforce Readiness. The findings are synthesized below according to the overall pattern, supporting evidence, conflicting findings, and contextual differences. Table 4 presents a summary of the characteristics and thematic coverage of the included studies.

Table 4: Summary of Included Studies

Study Characteristic	Summary of Included Evidence
Number of included studies	43 studies were included in the qualitative thematic synthesis.
Publication period	2010–2025.
Main setting	Healthcare organizations, including hospitals and health-service environments; Malaysian evidence was considered alongside international studies.
Study focus	Healthcare digital transformation, electronic health records, telemedicine, health-information systems, digital skills, organizational readiness, leadership, and workforce adoption.
Individual-level constructs	Performance expectancy, effort expectancy, social influence, hedonic motivation, facilitating conditions, behavioral intention, user acceptance, and digital competency.
Organizational-level constructs	Strategy, structure, systems, staff, skills, style, shared values, organizational support, culture, leadership, training, and implementation readiness.
Reported outcome domains	Operational efficiency, service quality, patient satisfaction, staff performance, technology adoption, implementation success, and organizational performance.
Synthesis approach	Qualitative thematic analysis across seven themes because the included studies differed in design, geography, theoretical framing, variables, and methods.

Theme 1: Digital Transformation in Healthcare

The literature reviewed defines digital transformation in healthcare as a systemic change process, including technology adoption, workflow redesign, and organizational restructuring and cultural adaptation. The literature also consistently emphasizes the distinction between the availability of technology and the use of it, noting that the gap between the two is mainly driven by human and organisational factors. Stoumpos et al. (2023) identified digital transformation in healthcare as one of the emerging yet rapidly maturing research domains; e-health acceptance and organizational implications are among the most active research sub-fields. Kraus et al. (2021) put that into a broader perspective of five overlapping clusters, and showed, for example, that operational efficiency and organizational factors are inherently dependent: organizations that are unable to leverage human dimensions will lose the efficiencies of technology investments. The Malaysian scenario mirrors this global development. While government intervention has supported public hospital HIS since the 1990s, adoption was only about 24% in 2019. Limna (2023) suggests there are obstacles to uptake, including provider resistance and lack of organizational support. In a hospital case study, Nurhani and Sari (2025) reported relatively high staff enthusiasm for digital innovation, but also noted differences in technology mastery, the need for continuous training, dependence on technology vendors, and challenges related to external-system integration.

Theme 2: Organizational Performance

Organizational performance in the reviewed literature was operationalized across four domains: operational efficiency, including reduced waiting times, streamlined workflows, and lower administrative burdens; service quality, including patient satisfaction, care continuity, and error reduction; financial performance, including cost optimization and resource utilization; and staff performance, including productivity, engagement, and

competency levels. The reviewed literature generally associated digital transformation with improvements in organizational outcomes; however, the strength of these relationships appeared to vary according to adoption levels, user satisfaction, and human-infrastructure conditions. Matrook et al. (2024) reviewed the effects of digital transformation on hospital efficiency and reported that electronic health records, telemedicine, and automated systems may reduce administrative burdens and support data-driven resource optimization. Agustian et al. (2025) indicated that system quality and service quality were associated with organizational performance, with user satisfaction forming part of this relationship. These findings suggest that digital transformation success may represent an intermediary pathway linking human infrastructure with organizational outcomes (Abouaomar & Alhaderi, 2024b).

Theme 3: Human Infrastructure and the McKinsey 7S Framework

The McKinsey 7S Framework in the examined literature serves as a diagnostic measure for evaluating organizational readiness for digital transformation and as a prescriptive tool for identifying areas requiring human-resource investment. Abouaomar and Alhaderi (2024) identified skills gaps, cultural misalignment, and staff-development deficits as important barriers across the seven dimensions of the framework. Aceron (2025) applied the 7S Framework to higher education institutions and reported that Shared Values and Staff were important enablers of digital transformation, whereas Skills and Systems were identified as areas requiring improvement. This finding may offer a useful comparison for healthcare institutions, although its transferability should be examined empirically. Across the reviewed studies, the four "soft" elements, which are Staff, Skills, Style, and Shared Values, were repeatedly emphasized as important dimensions of digital transformation, although the extent of their influence varied across organizational contexts. Sharma (2025) discussed resistance as an important challenge in complex transformation efforts and linked this challenge to weaknesses in human and organizational infrastructure.

Theme 4: Performance Expectancy

Performance Expectancy emerged as one of the most consistently reported factors associated with digital-technology adoption intention across the healthcare contexts represented in the review. Healthcare employees who perceived digital tools as beneficial for job performance, patient outcomes, or service quality generally reported stronger adoption intentions and, in some studies, greater actual use. Teng et al. (2024) reported a positive association between Performance Expectancy and intention to adopt telemedicine in Malaysia. Hassan et al. (2022) similarly identified Performance Expectancy as an important determinant of behavioural intention to adopt a health-information application in Malaysia. Chong (2019) reported an association between Performance Expectancy and electronic health-record adoption, while perceived goal attainment appeared to reinforce the perceived usefulness of the system.

Theme 5: Effort Expectancy

The relationship between Effort Expectancy and technology adoption appeared to vary according to system design, user experience, and the availability of training. Perceived effort may be lower, and adoption barriers may be reduced, when systems are well designed, adequately supported, and accompanied by training. Tanis et al. (2024) reported positive perceptions of ease of use across professional specialties in Greek hospitals, while age appeared to influence these perceptions. The Selangor hospital-management-system study indicated that user-friendly interfaces were important for staff acceptance, highlighting the practical role of system design in shaping Effort Expectancy. Noviany (2024) identified system complexity and user resistance as barriers to digital adoption, suggesting that difficulties with system use may reinforce implementation challenges and reduce organizational support for adoption.

Theme 6: Social Influence and Hedonic Motivation

The literature highlights context-dependent effects of Social Influence and Hedonic Motivation. In collectivist and hierarchical organizational cultures, Social Influence may be more influential when peer behaviour or supervisory support carries normative significance. Hedonic Motivation may be more relevant to voluntary technologies or platforms with gamification and engagement features, although its influence may be weaker for mandatory enterprise systems. Hassan et al. (2022) reported that Hedonic Motivation was an important predictor of Malaysian health-application adoption, while Sharuddin et al. (2023) reported mixed effects across UTAUT2 constructs in the adoption of professional training among Malaysian enforcement officers.

Theme 7: Facilitating Conditions and Workforce Readiness

In the reviewed literature, Facilitating Conditions appeared to be one of the most actionable human-infrastructure constructs from a policy and management perspective. Although Performance Expectancy and Social Influence may be more difficult to influence directly, Facilitating Conditions may be strengthened through investment in training, infrastructure, technical support, and organizational policy. Yahya et al. (2021) reported that facility access and training were important factors associated with digital-skills readiness in the Malaysian service sector. Bilgiç and Camgöz Akdağ (2021) found Management Support and Resource Reservation as critical digital transformation readiness factors in hospitals (Sharuddin et al., 2023). Nyamboga (2026) identified structured training programmes, digital dashboards, and cloud-based management systems as interventions that may support healthcare performance by developing workforce competencies relevant to digital adoption. The seven themes were then compared to identify common patterns, areas of disagreement, and differences associated with healthcare, organizational, and technology contexts.

Results Synthesis

Overall Finding

In general, this literature review shows that the individual level of technology acceptance and the organizational level of organizational readiness are intertwined in the digital transformation of healthcare. Performance Expectancy and Facilitating Conditions seemed to be the most robust predictors. Healthcare providers reported greater willingness to endorse or utilize digital systems when they saw obvious advantages in terms of their own clinical work, patient care, quality of service, and efficiency of the institution, and when the necessary physical infrastructure, training, technical support, and organizational backing were in place. At the organizational level, Staff, Skills, Style, and Shared Values were consistently mentioned in relation to workforce readiness and the sustainability of the digital transformation.

Supporting Evidence

The results of the effectiveness expectation suggest that usefulness is a key element of the acceptance of healthcare technology. The included studies reported that stronger adoption intentions were exhibited among healthcare professionals when they considered digital technologies to be supportive of work performance, patient outcomes, quality of service, or delivery of service. This trend was found in health applications, telemedicine, and electronic health-records adoption studies in Malaysia (Hassan et al., 2022; Teng et al., 2024; Chong, 2019).

Facilitating Conditions were a second significant predictor of support. The studies reviewed highlighted the importance of training, infrastructure, technical support, management support , and availability of resources to cultivate and strengthen digital skills and to allow for system utilization. Data from studies of healthcare-readiness suggested that support from management and availability of resources were key organizational facilitators for digital transformation (Bilgiç & Camgöz Akdağ, 2021). Similarly, research on workforce readiness at the national level revealed that facility access and training were significantly related to skill development among the workforce in Malaysia (Yahya et al., 2021).

Consistent with this, the McKinsey 7S-related evidence also underscored the need for organizational alignment. Staff, Skills, Style, and Shared Values were frequently mentioned as potential areas that would impact whether staff can, are supported to, and want to get involved in digital transformation. Literature reviewed linked challenges in responding to digital change with skill gaps, poorly developed staff, cultural misalignment and the lack of leadership support (Abouaomar & Alhaderi, 2024; Aceron, 2025; Sharma, 2025).

Conflicting Findings

The results indicated that Performance Expectancy and Facilitating Conditions were consistently relevant belief constructs, but the results for Social Influence and Hedonic Motivation were more mixed. Social Influence seemed to matter in some contexts, largely linked to supervisory expectations, peer use, and professional norms around use of the technology. But its impact differed between cultural and organizational contexts. Similar to that, Hedonic Motivation was mentioned as a critical factor in a number of voluntary health-applications scenarios, while it was not as (if not less) influential in mandatory systems for the workplace.

The reviewed literature, on the other hand, has also indicated variation in the significance of Effort Expectancy. Some studies suggested that perceived ease of use and user-friendly interface promoted technology acceptance, but others argued that this relationship would be moderated by training, technical support, system complexity, user experience, and profession. This indicates that high system usability may not be enough to mitigate such barriers to adoption without organizational support for employees and when digital systems are not well aligned with traditional workflows.

Contextual Differences

The Effects of UTAUT2 and McKinsey 7S elements on individuals varied for V-block according to the type of technology, organizational culture, the digital maturity level of the organization, and the type of technology application was voluntary/mandatory. Social Influence may be more powerful in the hierarchical structure of the healthcare system, where the expected behavior is shaped by managers and professional peers. Hedonic Motivation is more relevant on voluntary, interactive, or engagement-oriented platforms rather than the enterprise solutions that employees are obligated to use. Effort Expectancy might also be important when digital systems, such as smartphones, are sufficiently complex for their potential users to base their expectations on related prior digital experiences.

The elements of the McKinsey 7S model were also affected by organisational context. Transformational leaders and shared values are critical in transforming large systems because they embody trust, communication, and willingness for employees to change. Staff and Skills may be more significant in locations where digital literacy and lifelong education are more the exception. Systems, Structure, and Strategy may also be emphasized as organizations try to connect across organizational borders, which may include a variety of units such as departments, professional groups, and hospitals.

The broader differences are reflected in the Malaysian context. The findings from the studies suggest that training, organizational support, management commitment, digital competence, and system integration continue to be significant factors for the enablement of healthcare digitalisation. Yet the findings do not point to a scenario in which any one factor holds exclusive sway across Malaysian healthcare facilities. Types of hospitals, ownership, size, professional groups, technology features, and organizational preparedness may affect the degree to which individuals and organizations are aligned with acceptance.

Taken together, these findings indicate that employees appreciating the value of digital systems, together with the presence of adequate organizational supports to enable the use of these systems, are important contributors to healthcare digital transformation being maintained. Therefore, success in digital transformation may constitute an intermediate path between human infrastructure and organizational performance, but this interpretation is conceptual, as the studied literature did not test mediation statistically.

Discussion

The results suggest that healthcare digital transformation is not fully driven by the availability of technology. The integration of UTAUT2 and the McKinsey 7S Framework proposes that transformation is a result of the interplay between individual-level technology acceptance and organization-level alignment. UTAUT2 elucidates the determinants how healthcare employees would be motivated to adopt and use the digital system, whereas McKinsey 7S illustrates whether the entity possesses the necessary leadership, capabilities, systems and culture to give support and maintain such usage (Venkatesh et al., 2012; Loonam, 2021).

The UTAUT2 factors, Performance Expectancy and Facilitating Conditions, were among the strongest and most consistent predictors of behavioural intention. Performance Expectancy is related to increased intention to use as healthcare professionals anticipate digital technologies to enhance their work performance, including improvement of patient care, quality of service, and operational efficiency. However, positive anticipation does not necessarily lead to real use. Facilitating Conditions facilitate employees' access to infrastructure, training, technical support, and organizational resources to help employees realize their intentions. This indicates that healthcare organizations may make significant investments in digital systems yet find adoption to be patchy if workforce training and implementation assistance are lacking.

The McKinsey 7S Framework adds an organizational context to this gap between adoption and diffusion. The

Soft elements Staff, Skills, Style and Shared Values are more important in this respect, as they may determine if employees are ready, enabled and motivated to take part in the digital transformation. Staff is the number and type of human resources needed to carry out a function, and Skills is the degree of digital confidence and competence of these personnel. Style is the leadership style and how much managers talk about, actively support, and model digital adoption. Shared Values can determine if the digital transformation is viewed as a meaningful organizational priority as opposed to a technical change imposed externally.

The combination of the two models proposes that the elements of the McKinsey 7S shape the UTAUT2 constructs. As an illustration, an organizational leader Style could promote Social Influence by motivating managers and peers to endorse digital adoption. Staff training and Skills improvement may have a positive impact on Effort Expectancy by empowering staff to feel the ability to operate with digital tools. 'Strategy and Shared Values' can also influence Performance Expectancy by demonstrating the role of digital transformation in improving healthcare delivery. Systems and Structure could also help facilitate Facilitating Conditions, by way of well-established routines, technical assistance, obligations, and means for execution.

This relationship could be conceptualized as a path-dependent and reciprocal process. One may be able to argue that organizational alignment creates an environment that yields positive perceptions at the individual level, and these positive perceptions at the individual level may link to positive intentions of technology adoption and longer use of the system. In exchange, successful employment of digital systems could yield benefits in operational efficiency, quality of service, patient satisfaction, and staff performance, among others. Therefore, the relationship does not imply a direct impact of technology investment upon the performance of an organization. Rather, the results imply that organizational success may be a function of how human infrastructure supports employees in adopting and successfully incorporating digital systems into their work. The integrated model also contextualises the Malaysian healthcare setting. The observed gaps in adoption and use also imply that challenges to digital transformation may be more than just technological availability. They may also be indicative of deficiencies in training, organizational support, technical assistance, leadership alignment, system integration, and readiness of the workforce. In light of this, technology investment must be supplemented by investment in employee capabilities, enabling leadership, clear pathways for execution, and corporate values that support learning and adaptation.

Social Influence and Hedonic Motivation are more contingent factors compared to Performance Expectancy and Facilitating Conditions. Social Influence in particular might also play a stronger role in hierarchical and collectivist healthcare systems, as the conduct is shaped by professional norms and supervisor expectations. Hedonic Motivation might be more pertinent when digital platforms are optional, interactive, or intended to foster engagement, but its impact might be diminished in situations where users are mandated to use enterprise systems in the conduct of their formal duties. These results suggest that not all UTAUT2 variables necessarily hold equally across different healthcare contexts. Their impact may be influenced by organizational culture, type of technology, user experience, and whether adoption is voluntary or compulsory.

Therefore, the combination of UTAUT2 and McKinsey 7S offers a higher explanatory power in the conceptual understanding of healthcare digital transformation than either model alone. UTAUT2 explains the psychological and behavioural processes through which employees come to adopt, while McKinsey's 7S exposes the organizational configurations that enable or disable those processes. A key theoretical contribution from this integrated approach is its linking of individual acceptance to organizational readiness and transformational outcomes. Its implication is a warning to healthcare leaders that they should not approach digital transformation as a purchasing exercise. Design strategies for acquisition should "integrate technology investment with workforce development, leadership support, organizational restructuring, system integration and cultural alignment."

However, the suggested convergence is meant to be a theoretical one rather than a reflection of a model that was statistically supported. The included articles differ in design, healthcare setting, constructs and outcome variables, and the qualitative synthesis did not quantitatively explore the associations between the two models. Hence, it is suggested that empirical studies in Malaysian healthcare organizations investigate if the elements of the McKinsey 7S model moderate the relationships among UTAUT2 constructs, actual system use, success of digital transformation and organizational performance; and if success of digital transformation acts as a

mediator within these relationships. It could also examine if hospital type, size, ownership, professional group and digital maturity level moderate these relationships.

5. Limitations and Future Research

There are several limitations to this review. The included studies varied in terms of study design, geographic location, healthcare system, theoretical framework, and outcome assessment. These differences hindered direct comparisons between studies, and pooling by means of statistical methods was not appropriate. Thus, these results should be interpreted as qualitative thematic patterns rather than as pooled estimates or validated causal associations.

Second, the review synthesized findings across two levels of analyses: individual-level technology-acceptance research and organization-level digital-transformation research. However, even though this framework broadens the conceptual lens, there was no consistent investigation of the links between UTAUT2 constructs, McKinsey 7S elements, and actual system use and organizational performance (model 1) and (within a single analytic model) of relationships among these constructs by including organizational performance (model 2). The hypothesized mediating mechanism is, therefore, for empirical testing.

Third, the international literature was reviewed in conjunction with the Malaysian evidence. Variations in the regulation of healthcare, culture, structure, professional identity and role, and level of digital maturity may all contribute to restricting how findings can be applied across borders. Thirdly, any evidence pertaining to the enforcement or from non-Malaysian healthcare settings is to be taken with a grain of salt when applied to Malaysian healthcare institutions.

Primary data should be gathered from Malaysian healthcare organizations to validate the integrated framework put forward. Based on quantitative research, it would be interesting to investigate whether and to what extent elements of the McKinsey 7S Model moderate the relationships between UTAUT2 constructs and technology use and, based on longitudinal or mixed-methods research, to analyze the development of adoption intentions towards implementation at FOSS in future research. Future research should also make comparisons between hospitals based on ownership and size, professional group, type of technology, as well as the extent of digital maturity."

Conclusion

This systematic literature review applied the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) and the McKinsey 7S Framework to examine how human infrastructure factors influence healthcare digital transformation and organizational performance. The findings suggest that Performance Expectancy and Facilitating Conditions play important roles in encouraging technology adoption, while organizational factors such as leadership style, staff capability, organizational culture, and shared values influence the implementation and sustainability of digital transformation.

Review-based findings further indicate that the success of digital transformation acts as a potential mediating path in which human infrastructure leads to organizational performance results. This understanding suggests that the returns from investment in technology are not expected to be fully realized in the absence of organizational readiness, workforce preparation, strong leadership, and suitable implementation support. Yet since a review allowed to synthesize qualitative findings and did not provide for statistical testing for mediation, the suggested association is to be considered a conceptual path rather than a validated causal mediation effect.

In terms of theory, the study adds contribution to the extant literature by integrating UTAUT2 and the McKinsey 7S framework at the macro (organizational) and micro level (individual) in a dual-level model. UTAUT2 focuses on the individual level and explains technology acceptance by individuals within the organization, and the McKinsey 7S framework explains the organizational context enabling or limiting the realization of adoption intentions in sustained usage. From this integrated lens, health care managers and policy makers may better understand where to focus efforts to close implementation gaps and align workforce capability, leadership, organizational culture, systems, and strategy.

In future, the proposed framework needs to be tested empirically using primary data from Malaysian healthcare organizations. Such studies may determine if hospital type, size, ownership, professional group, and degree of digital maturity moderate the relationships between the success factors of UTAUT2 and the organizational factors of McKinsey's 7S model with that of digital transformation success and, in turn, organizational performance.

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Immersive Systems in Financial Pedagogy: Exploring Augmented Reality, Perceived Financial Learning and Reported Budgeting

Abdul Hamid Abdul Halim[1], *Hairulnizam Hashim[1], Masrur Mohd Khir[1], Ryan Kang Jee Hong[2], Natalie Loi Yoke Kei[2], Ummi Raida Awang Zaki[3]
[1]Faculty of Business and Management, Universiti Teknologi MARA, Malaysia
[2]Unbound Malaysia Sdn. Bhd. Malaysia
[3]Faculty of Business and Accountancy, Universiti Selangor, Malaysia
Email: abdulh2949@uitm.edu.my, *hairul1927@uitm.edu.my, masrur@uitm.edu.my, ryank@unboundmalaysia.com, nataliel@unboundmalaysia.com, ummiraida@unisel.edu.my
Corresponding Author: Dr Hairulnizam Hashim

Abstract: Financial education in higher education presents the challenge of encouraging students to think critically about spending, saving, and debt. This study summarizes baseline and follow-up financial surveys for an augmented reality (AR) financial education program. The program's documentation records data collected on June 4-27, 2024, at login and after the game, across ten financial items, with 750 responses per item per round. The follow-up survey agreement was greatest in increased awareness of investing (81.73%); increased understanding of basic concepts (49.87%) and planning skills (47.73%) were also common responses. At baseline, 14.40% had a personal budget, and 41.47% at follow-up (net aggregate difference of 27.07 percentage points). Several items asked about changes in perception rather than repeated measures (baseline). Items assessing comfort changed the response category labels. The program's documentation does not provide records that linked a participant's responses across the two rounds. Thus, the present results describe an individual's perception of learning and practices. The analysis identifies the advantages of controlled assessments (same outcome measures), objective tasks, and long-term follow-up (rather than estimating individual improvement, ongoing practices, and causal relationships). Cognitive and experiential perspectives offer conceptual interpretation: The analysis highlights the benefits of controlled comparisons using equivalent outcome measures, objective tasks, and extended follow-up.

Keywords: *Augmented reality; Financial literacy; Personal budgeting; Immersive technology; Perceived learning*

1. Introduction

University students make financial decisions about living expenses, borrowing and saving while learning to manage their own resources. Financial literacy matters because students need to apply concepts such as interest, risk and budgeting to decisions with real consequences (Lusardi & Mitchell, 2014). A student may know how interest is calculated but still need practice comparing repayment options or revising a budget when expenses rise. Research on financial management among Malaysian students outside finance programmes also points to the relevance of financial literacy and self-efficacy (Shanmugam et al., 2024). These considerations make practical financial education relevant across disciplines.

Malaysia's national survey data illustrate why knowledge and behaviour should be examined separately. Bank Negara Malaysia (2025) reported that the Malaysia Financial Literacy and Capability Index was 59.1 in 2024, compared with 59.0 in 2021. Over the same period, the financial knowledge score increased from 60.2 to 62.9, while the financial behaviour score fell from 61.9 to 59.9. These figures describe Malaysians surveyed nationally and do not estimate financial literacy among university students. They provide a local rationale for examining what students report doing alongside what they perceive they have learned.

Augmented reality (AR) places digital information within a view of the physical environment. In financial education, an illustrative AR activity could let students adjust spending allocations and see how each decision affects the balance available for saving. The value of such an activity depends on the quality of the task and feedback. Malaysia offers a relevant setting for evaluating digital delivery: in 2024, 99.5% of individuals used a mobile phone, while household internet access stood at 98.8% in urban areas and 90.3% in rural areas

(Department of Statistics Malaysia, 2025). These figures suggest broad reach for mobile learning, but they do not establish access to AR-compatible devices or reliable connectivity for every student.

This study examines baseline and follow-up survey summaries from an AR financial education programme for university students, with 750 responses per financial item at each wave. It focuses on perceived understanding, financial planning and reported personal budgeting. Several follow-up items measure perceived improvement rather than repeat the baseline questions, and the available responses cannot be linked to participants. The study therefore describes response patterns without attributing individual learning or behavioural change to AR.

For Malaysian universities, these findings can help identify which financial topics warrant further evaluation and where a pilot programme needs stronger assessment. Educators could pair locally relevant exercises, such as budgeting a monthly allowance in ringgit, with an objective task and a later check on budget use. Curriculum teams can also plan for uneven access by offering equivalent non-AR exercises. The study's local contribution is to help guide those design and evaluation choices before institutions consider wider adoption.

2. Literature Review and Hypotheses Development

The Limitations of Traditional Financial Pedagogies

Financial instruction often includes an explanation of concepts alongside numerical exercises. Such activities enable to build a foundational knowledge, but the ability to recall a definition is different from the application in a financial decision. Kaiser et al. (2022) report positive effects of financial education on knowledge as well as downstream behaviour across randomized evaluations. Their findings offer a rationale for education but do not identify the delivery format that would be the most effective. Comparisons using equivalent content and appropriate outcome measures are needed to evaluate the additional contribution of AR.

Personal budgeting offers an illustration of the difference between conceptual knowledge and its application. A learner may understand the definition of a budget but need practice in adjusting the expenditure, accommodating an unexpected cost or reconciling competing goals. Simulated scenarios offer opportunities to examine such decisions. Resource constraints should also be considered: financial understanding does not necessarily provide disposable income for saving. Simon's (1957) account of bounded rationality informs the design of manageable decision tasks, but the present survey does not directly measure information-processing constraints.

Cognitive Load Dynamics and Spatial Encoding in Immersive Learning Environments

Financial decisions often require individuals to take into consideration various factors at once. According to Cognitive Load Theory developed by Sweller in 1988, the process of instruction has inherent cognitive load, which can be increased by the way the information is presented. Personal finance involves several interacting variables, including the amount of the initial deposit, the rate of return, the compounding frequency, inflation, volatility, and other factors. When presented with a graph that does not match the accompanying text or is missing, one has to invest a lot of cognitive effort to analyze the relationship between these variables.

The dual-coding hypothesis developed by Paivio in 1986 can help explain how verbal information can be integrated with visual information. For instance, in an example with an augmented reality application, the graph of growth in the example could be changed to demonstrate how different assumptions would impact the outcome. Note that this is a hypothetical example, as the actual application and its features were not discussed. According to Zhu et al. (2026), the results of different experiments on augmented reality varied, suggesting that the design of instruction was crucial. Since cognitive load and retention were not directly measured, these two theories might help explain why certain results were obtained rather than providing direct evidence.

Conceptualizing Augmented Reality as an Experiential Learning Tool

Financial simulations can be used to create a "safe" environment in which people can explore the trade-offs between immediate and delayed gratification. Laibson's (1997) economic model of hyperbolic discounting provides theoretical groundwork for addressing such a challenge. The use of visual projections can aid

temporal inspection of consequences, but it does not necessarily inform students' own financial prospects. The actual impact of such a simulation on intertemporal preferences requires empirical justification.

The described design is conceptually similar to the concept of Choice Architecture (Thaler & Sunstein, 2008), as well as Kolb's (1984) Experiential Learning Model. By embedding decision-making in a potentially engaging context, the two principles suggest that AR-based financial simulations can promote experiential exploration of alternative allocations of resources. The reflective phase of the process supports learners in building mental models of the association between means and ends. In particular, users can try different options, watch their consequences unfold, and adjust their choices in subsequent iterations. With that said, the actual effectiveness of such simulations in promoting sustainable behavioral change would require further investigation beyond the described intervention.

Technology Acceptance and Self-Efficacy in Financial Habit Formation

Technology acceptance and self-efficacy refer to different phenomena. Technology Acceptance Model proposed by Davis (1989) and self-efficacy theory by Bandura (1997) explain how perceived usefulness and control over a certain behavior can increase application rates of the technology or the probability of occurrence of the behavior. These concepts do not necessarily indicate the presence of a mediating mechanism that makes technology usage inevitable for every person who has adopted it.

A user-friendly interface does not automatically ensure financial literacy. A student might have confidence in their capacity to make mistakes when using the application or have a clear understanding of the task but not know how to apply the learned rules to practice. Budget-creation confidence is measured by a single item in this survey, while a self-efficacy measure would have required multiple items to assess the level of skill proficiency. The totals in this category cannot confirm if the respondents who expressed confidence actually possessed a budget. Thus, as two distinct concepts, acceptance and self-efficacy do not prove to be mediating variables in this study.

Hypotheses Development

The theoretical discussion motivates three hypotheses for a subsequent controlled evaluation. They preserve the study's focus on understanding, planning and budgeting, but require comparable outcome measures and participant-linked observations. H1–H3 are not tested by the present descriptive analysis:

H1: Exposure to the AR Education System improves objectively assessed understanding of core financial concepts, investment options and credit risks relative to a suitable comparison condition.

H2: Exposure to the AR Education System improves financial planning confidence and saving behavior relative to a suitable comparison condition.

H3: Exposure to the AR Education System increases personal budget adoption and sustained use relative to a suitable comparison condition.

3. Research Methodology

Study Design and Implementation Timeline

This study uses a descriptive, one-group baseline and follow-up design. Programme documentation records data collection from 4 June to 27 June 2024, with baseline assessment at sign-in and follow-up at game completion. No control group or randomized allocation is documented. Response patterns therefore cannot isolate AR from instructional content, facilitation, repeated measurement or other influences.

The implementation is described in three phases:

Phase 1: Baseline assessment at sign-in, covering financial perceptions and reported practices. Each financial item contains 750 responses.

Phase 2: Participation in the programme, which the workbook describes as including interactive simulations, gamified quizzes, virtual group work and AR-based lectures.

Phase 3: Follow-up assessment at game completion, covering perceived learning and reported practices. The documentation does not establish a delayed retention assessment.

Target Population and Sampling Strategies

The programme description mentions undergraduates and postgraduates who pursue various fields of study. Each line item contains 750 respondents for every wave. The provided summaries do not mention the institutions, recruitment procedures, eligibility criteria, or response rates, which should be examined in detail in the study records.

The demographic summary contains 428 female (approx. 57%) and 322 male (approx. 43%) respondents. The age distribution contains 389 students who studied in their first or second year of higher education, or 52% of the sample: 202 were 19 years old, and 187 were 20 years old. Other age groups amounted to 83 respondents (below 18), 135 respondents (18), 90 respondents (21), and 53 respondents (22 or older).

The workbook indicates that the same students were invited to participate in the next wave of surveys. However, it can be noticed that the worksheets contain category counts on the margins instead of respondent identifiers, which does not allow examining the cases in detail. No information is provided on whether the same participants completed all waves of the study or if there were some changes due to drop-off or other reasons.

The Augmented Reality Education System Architecture

Programme documentation lists simulations, gamified quizzes, virtual group work and AR-based lectures. The programme account identifies four financial content areas, outlined below. These descriptions require confirmation against the materials actually delivered; they do not independently verify software features or mobile hardware.

Interactive budgeting: Allocating income between expenditure and savings and considering the implications of alternative choices.
Investment options: Examining asset classes, diversification, risk and return.
Credit management: Exploring borrowing costs, repayment choices and common credit pitfalls.
Strategic planning: Connecting short- and long-term goals with financial allocations.

Reproducibility requires the application version, device requirements, AR tracking method, duration, facilitation, feedback and completion criteria to be documented.

Operationalization of Research Variables

The survey covers ten financial items, reproduced in Table 1. Q1–Q6 change from baseline status statements to perceived-improvement statements at follow-up. Q7–Q8 retain related anchors but introduce comparative framing; Q9 changes both its focus and response anchors. Q10 asks about current personal budget possession. These differences restrict longitudinal interpretation: identical numerical codes do not ensure that the same construct is measured at each wave.

Table 1: Financial Item Operationalization and Comparability

Item/domain	Baseline focus	Follow-up focus/interpretation
Q1 Basic concepts	I understand basic financial concepts such as budgeting, saving, and investing.	The Augmented Reality Education System has improved my understanding of financial concepts such as budgeting, saving, and investing.
Q2 Budget confidence	I am confident in my ability to create a personal budget.	I feel more confident in my ability to create a personal budget after using the system.
Q3 Investment awareness	I am aware of the various types of investment options available.	I am more aware of the various types of investment options available.
Q4 Risk and reward	I can identify the risks and rewards associated with different investments.	I can now identify the risks and rewards associated with different investments more clearly.

Item/domain	Baseline focus	Follow-up focus/interpretation
Q5 Credit management	I understand how to manage credit and avoid common credit pitfalls.	I have improved my knowledge of how to manage credit and avoid common credit pitfalls.
Q6 Financial planning	I am knowledgeable about financial planning for short-term and long-term goals.	The system has enhanced my financial planning skills for short-term and long-term goals.
Q7 Saving frequency	How often do you save a portion of your income?	How often do you save a portion of your income now compared to before using the system?
Q8 Credit-score awareness	How aware are you of your credit score and how it impacts your financial options?	How aware are you of your credit score and how it impacts your financial options now compared to before?
Q9 Financial comfort	How comfortable are you with managing your own finances?	How comfortable are you with managing your own finances now compared to before using the system?
Q10 Budget possession	Do you currently have a personal budget?	Do you currently have a personal budget after using the system?

Statistical Processing and Verification

The category frequencies were cross-tabulated against 750 responses for each financial item at each wave. Q1-Q8 were scored on an ordinal scale from 1 to 5, and weighted means and sample standard deviations were computed for each wave separately. The descriptive summaries of the ordinal responses at the item level are provided below. Independent Welch's tests are not informative for the intended same-student design. A paired analysis would require the observations to be linked at the participant level and have sufficient comparability between the two measures. The marginal frequencies do not contain the covariance information needed to estimate paired change intervals or standardized paired differences. Indeed, for Q10, a paired McNemar analysis would require No-to-No, No-to-Yes, Yes-to-No, and Yes-to-Yes transitions, but No-to-Yes and Yes-to-No cannot be reconstructed from the two Yes totals. Paired Participant Linkage Alone Would Not Suffice
A participant linkage alone would not suffice to address the different meanings of the items Q1-Q6 and Q9. Similarly, the item marginals cannot be used to estimate internal-consistency coefficients or investigate associations at the individual level with factor analysis or other multivariate techniques. The analysis therefore focuses on the descriptive summaries of the distributions at the item level and does not attempt to make inferences or estimate causal effects.

Data Governance and Ethical Reporting

Programme documentation asserts that their study involves storing research data in an encrypted format, with restricted access. The information is retained for a period of 45 days after the game ends, and there are plans to anonymize any archived data. The study involves institutional ethics approval or exemption, informed consent, and safeguards for participants below 18 and needs to verify these aspects before publication. No claims of ethics approval or consent procedure can be made unless there are supporting records.

4. Results and Analysis

Comprehensive Frequency Distributions

Table 2 below contains category frequencies and percentages for each wave. Baseline Q1 responses contain 31.20% Strongly Disagree and 37.73% Disagree for a total of 68.93%. At follow-up, 49.87% agreed that there has been improvement in their basic financial understanding. As this is a question about improvement, rather than status, these two figures are not comparable.

Investment awareness (Q3) has 659 out of 750 responses at baseline in the two Disagree categories (87.87%), while follow-up agreement is 81.73%. Risk and reward identification (Q4) has 87.20% disagreement at

baseline and 41.20% agreement at follow-up for identifying them more clearly. These figures highlight areas in which respondents feel they have benefited, but do not indicate the same level of improvement in knowledge. Credit management (Q5) had 25.47% agreement that they have become more knowledgeable and 38.27% neutrality. Financial planning (Q6) had 47.73% agreement at follow-up. Saving responses (Q7) were split between Rarely, which fell sharply from 80.00% to 40.27%, Sometimes, which rose from 6.93% to 38.80%, and Never, which also rose from 8.80% to 17.07%. Always stayed at 0%. For the last question, Moderately Aware or Very Aware at follow-up make up 45.87%. Comparative analyses require these distributions to be interpreted in context.

Table 2: Financial Response Frequencies and Percentages (n = 750 per Item and Wave)

Item	Response (baseline/ follow-up if different)	Baseline n (%)	Follow-up n (%)
Q1	1 - Strongly Disagree	234 (31.20%)	72 (9.60%)
	2 - Disagree	283 (37.73%)	111 (14.80%)
	3 - Neutral	103 (13.73%)	193 (25.73%)
	4 - Agree	121 (16.13%)	236 (31.47%)
	5 - Strongly Agree	9 (1.20%)	138 (18.40%)
Q2	1 - Strongly Disagree	104 (13.87%)	41 (5.47%)
	2 - Disagree	242 (32.27%)	124 (16.53%)
	3 - Neutral	250 (33.33%)	380 (50.67%)
	4 - Agree	132 (17.60%)	182 (24.27%)
	5 - Strongly Agree	22 (2.93%)	23 (3.07%)
Q3	1 - Strongly Disagree	91 (12.13%)	9 (1.20%)
	2 - Disagree	568 (75.73%)	21 (2.80%)
	3 - Neutral	86 (11.47%)	107 (14.27%)
	4 - Agree	2 (0.27%)	511 (68.13%)
	5 - Strongly Agree	3 (0.40%)	102 (13.60%)
Q4	1 - Strongly Disagree	229 (30.53%)	30 (4.00%)
	2 - Disagree	425 (56.67%)	129 (17.20%)
	3 - Neutral	65 (8.67%)	282 (37.60%)
	4 - Agree	30 (4.00%)	198 (26.40%)
	5 - Strongly Agree	1 (0.13%)	111 (14.80%)
Q5	1 - Strongly Disagree	212 (28.27%)	112 (14.93%)
	2 - Disagree	330 (44.00%)	160 (21.33%)
	3 - Neutral	103 (13.73%)	287 (38.27%)
	4 - Agree	75 (10.00%)	180 (24.00%)
	5 - Strongly Agree	30 (4.00%)	11 (1.47%)
Q6	1 - Strongly Disagree	108 (14.40%)	87 (11.60%)
	2 - Disagree	300 (40.00%)	182 (24.27%)
	3 - Neutral	319 (42.53%)	123 (16.40%)
	4 - Agree	23 (3.07%)	250 (33.33%)
	5 - Strongly Agree	0 (0.00%)	108 (14.40%)
Q7	Never	66 (8.80%)	128 (17.07%)
	Rarely	600 (80.00%)	302 (40.27%)
	Sometimes	52 (6.93%)	291 (38.80%)
	Often	32 (4.27%)	29 (3.87%)
	Always	0 (0.00%)	0 (0.00%)
Q8	Not aware at all	565 (75.33%)	24 (3.20%)
	Slightly aware	111 (14.80%)	84 (11.20%)
	Somewhat aware	74 (9.87%)	298 (39.73%)
	Moderately aware	0 (0.00%)	201 (26.80%)
	Very aware	0 (0.00%)	143 (19.07%)
Q9	Not comfortable at all / Much less comfortable	0 (0.00%)	15 (2.00%)

Item	Response (baseline/ follow-up if different)	Baseline n (%)	Follow-up n (%)
	Slightly comfortable / Less comfortable	53 (7.07%)	72 (9.60%)
	Somewhat comfortable / No change	200 (26.67%)	465 (62.00%)
	Moderately comfortable / More comfortable	266 (35.47%)	178 (23.73%)
	Very comfortable / Much more comfortable	231 (30.80%)	20 (2.67%)
Q10	Yes	108 (14.40%)	311 (41.47%)
	No	642 (85.60%)	439 (58.53%)

Separate-Wave Descriptive Summaries

Table 3 provides ordinal codes by wave separately. Thus, baseline indicators range from 1.345 (SD = 0.651) for credit-score awareness to 2.635 (SD = 1.019) for budget-creation confidence. In turn, follow-up indicators reach 3.901 (SD = 0.700) for investment awareness and 3.473 (SD = 1.024) for credit-score awareness. A column with differences is excluded because the instrument fails to establish invariant baseline and follow-up measurements.

Table 3: Separate-Wave Coded Response Summaries

Item	Baseline mean	Baseline SD	Follow-up mean	Follow-up SD
Q1	2.184	1.082	3.343	1.211
Q2	2.635	1.019	3.029	0.866
Q3	2.011	0.532	3.901	0.700
Q4	1.865	0.739	3.308	1.046
Q5	2.175	1.073	2.757	1.026
Q6	2.343	0.759	3.147	1.264
Q7	2.067	0.569	2.295	0.792
Q8	1.345	0.651	3.473	1.024

Note. Ascending response codes run from 1 to 5. Each summary describes its own item and wave; the means are not tested learning gains.

Findings Related to the Hypothesis Domains

Conceptual Understanding and Perceived Learning (H1 Domain)

Follow-up responses indicate the perceived benefits of understanding fundamentals, investment knowledge, and risk identification. Credit-management expertise appears to be a less widespread area of self-perceived proficiency, which shows the variance across the content areas. In addition, the responses do not demonstrate competence levels, as H1 is not supported.

Planning, Confidence and Saving (H2 Domain)

The budget-creation confidence (Q2) obtained 27.33% of follow-up agreement with neutral reactions from 50.67%. The financial planning (Q6) was positively endorsed with 47.73%. The responses about saving shifted to Sometimes, but with a low level of Often (3.87%) in the follow-up and zero Always; thus, it is not possible to consider that saving is generally positively perceived since the increase in Never is also relevant. The hypothesis H2 has not been verified.

Comfort and Reported Budget Possession (H3 Domain)

The analysis of financial comfort, as reflected by question 9, should be undertaken separately for each wave of the survey. Thus, 66.27% selected an option between Moderately Comfortable and Very Comfortable at baseline. Then, 62% indicated No Change, 26.4% experienced an increase, and 11.6% registered a decrease at the follow-up. It is inappropriate to compare means due to the essential difference between absolute levels and changes.

Possession of a personal budget, as identified in question 10, was reported by 108 respondents (14.40%) at baseline and 311 (41.47%) at the follow-up. This reflects an overall increase by 203 (27.07%) in terms of the proportion of affirmative responses and a 2.88 times greater representation. However, this statistic does not indicate who exactly adopted the positive attitude and whether they applied it consistently. Thus, H3 cannot be supported based on the presented evidence.

Discussion

Theoretical Integration and Perceived Learning

The strong follow-up endorsement suggests that participants felt there was value in this area of the content. Kolb's (1984) experiential learning framework and Sweller's (1988) Cognitive Load Theory offer possible explanations as to why such an interaction would be beneficial to the learning of financial concepts. However, the cognitive processes were not assessed, nor were the benefits of the spatial presentation of the learning materials. Comparisons with similar content or objective/scenario-based assessments would be helpful in understanding the learning outcomes. Kaiser et al. (2022) provide the context for financial education, but not confirmation of the efficacy of this programme.

Financial Comfort and the Limits of Calibration Claims

High baseline comfort is associated with low-budget ownership and infrequent saving at the aggregate level, but these facts alone cannot indicate who is associated with whom, nor do they demonstrate overconfidence. Hypotheses about parental support or financial independence would also require direct evidence. During the follow-up, respondents indicated little change in comfort, and because the baseline and follow-up questions are different, mean responses to the coded questions cannot calibrate one against the other or demonstrate valence change.

From Perceived Learning to Reported Practice

The higher percentage of continued-reported budget users among those reporting learning is an intriguing factor that could warrant further consideration. Aggregate data cannot indicate if those who reported feeling they learned were the ones who had started budgeting. Bandura's (1997) self-efficacy theory could provide an analytical basis for investigation, while OECD's (2024) instrument serves as a measuring baseline; the present survey is not claimed to be adapted after it. Concurrent assessments of self-performance, confidence, and budget utilization would be needed in such evaluation.

5. Implications and Recommendations of Study

Theoretical Implications: Reconceptualizing Financial Literacy as Procedural Competence

The results suggest that there is a need to make a distinction between declarative knowledge, perceived capability and procedural competence. A question about definitions, a confidence item, and a report of budget possession give different types of evidence. Future assessments need to maintain these distinctions and evaluate the practical decision-making directly. The current summaries cannot demonstrate that the change in understanding caused the changes in financial practices.

Pedagogical Implications: Integrating Simulations into Higher Education Curricula

Rather than replacing traditional practices, AR simulations should be used as supplementary laboratories in the university teaching process. The following three main ideas will be implemented:

Supplementing Lectures with Simulation Labs: Students will learn to allocate budgets, evaluate investments, and make credit decisions with the help of instructors and receive feedback and reflections.

Supplementary Experiences for Non-Business Students: The pilot program will be launched in both business and non-business schools, thus considering different levels of preparation, technology access, and didactic needs.

Assessment of Competencies Acquired: Both written tests and scenario-based assessments of competencies acquired should be used to measure different aspects of performance before introducing simulation-based evaluation.

Technological Implications: Designing Context-Aware Gamified Learning Interfaces

Software design should start with the financial relationship or decision that a learner needs to understand. Feedback can explain what will happen when one makes a choice and allows it to be reconsidered. Progression rules and rewards might help one to accomplish this if they are based on reasoning rather than task repetition. These are design suggestions, not effects exhibited by the survey. Usability, cognitive load and performance would require a separate assessment.

Practical and Policy Recommendations

Institutional Level: Evaluated Pilots Across Universities

Higher education institutions could start with the piloting of the assessed options that have been developed by educators, instructional designers, and the technology staff. The goals of learning, access to the devices, and the evaluation criteria should be decided before scaling. The collaboration with financial institutions and relevant regulatory bodies could ensure that the scenarios and the underlying assumptions are realistic, while the educational effectiveness should be independently evaluated by these entities.

Software Design Level: Developing Dynamic Feedback and Persistent Nudge Architectures

Feedback prompts may help if conflicting simulation choices and a learner's declared financial goals. Their appropriateness, timing, wording and acceptability should be considered. Longer-term mobile prompts are another proposal, the impact on budgeting or saving of which is not established here. The tracking should be optional, limited, and based on informed consent.

Societal and Macro-Policy Level: Integrating Public-Private Partnerships for Financial Inclusion

The public-private collaboration has the potential to broaden the reach of the financial literacy pilots. The funding decisions should consider the content accuracy, device availability, implementation costs and independent evaluation besides perceived benefits. The work in underserved communities should take into account the local constraints instead of postulating that the outcomes will be identical. The current summaries cannot demonstrate the impact on the population-level of financial inclusion and economic mobility.

Conclusion, Limitations and Future Directions

Summary of Core Findings

The survey results reported for 750 university students in an AR program indicate financial literacy improvements reflected in enhanced knowledge and attitudes. Follow-up responses demonstrated the strongest endorsement for increased investment awareness (81.73%); 49.87% reported improved understanding of the underlying principles. Thus, the observed increases in budget possession (from 14.40% at baseline to 41.47% at follow-up) can be related to participants' perception of their learning and an aggregate practice contrast. However, these findings cannot confirm statistically significant gains, causal relationships, or long-term improvements reflected in sustained habits due to mixed saving responses and the high percentage of respondents who expressed no changes in their comfort.

Methodological and Structural Limitations

The interpretation of results has the following limitations:

One-group design: Without a comparison condition, the contribution of AR cannot be isolated from content, facilitation or other influences.

Instrument non-equivalence: The changes in item stems and response anchors preclude multiple items from representing the same status measure across waves.

Unlinked records: Marginal counts do not identify individual transitions, paired change or associations between learning and practice.

Evaluation and reporting: Follow-up at completion cannot establish retention or sustained practice. Self-report may be affected by social desirability or response shift; recruitment and implementation details also require verification.

Roadmap for Future Inquiries

Future evaluation of perceived benefit should distinguish between perceived benefit and changes in competence and practice. Priorities include:

Controlled comparisons: Comparing AR with another delivery mode using equivalent financial content and contact time, with random allocation if feasible.

Linked longitudinal measurement: Using anonymous participant identifiers, invariant outcome questions and objective tasks, and appropriate follow-up intervals for the practice under evaluation.

Practice validation: Where ethically and methodologically appropriate, comparing self-reports with evidence of budget use or task performance. Documenting attrition and financial constraints when describing persistence.

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Beyond Zakat: Unpacking the Drivers of Entrepreneurial Success among Asnaf

Shaidatul Zulaikha Binti Meor Zakaria[1], Nur Enani Binti Kamarudin[1], *Heizal Hezry Omar[2], Ismah Osman[2], Masturah Ma'in[2], Norshima Humaidi[2], Sharifah Faigah Syed Alwi[2]
[1]Arshad Ayub Graduate Business School, Kompleks Al-Farabi, Universiti Teknologi MARA, Malaysia
[2]Faculty of Business and Management, Puncak Alam Campus, Universiti Teknologi MARA Cawangan Selangor, Malaysia
Email: shycheya93@gmail.com, nurenanikamarudin@gmail.com, *heizal@uitm.edu.my, ismah817@uitm.edu.my, maszan@uitm.edu.my, norshima958@uitm.edu.my, shfaigah@uitm.edu.my
Corresponding Author: Heizal Hezry Omar

Abstract: Productive zakat programs are intended to support the economic empowerment of asnaf (zakat recipients), including their transition towards sustainable self-employment. However, the individual-level factors associated with entrepreneurial success among asnaf remain insufficiently understood. This study examines the relationships of five psychological entrepreneurial traits—self-efficacy, locus of control, innovativeness, risk-taking propensity, and need for achievement—and religiosity with entrepreneurial success among participants in the Skim Bantuan Jayadiri administered by Lembaga Zakat Negeri Kedah (LZNK). A quantitative cross-sectional survey was conducted with 152 asnaf entrepreneurs across the twelve districts of Kedah, and the data were analyzed using SPSS. Multiple regression results indicate that self-efficacy, locus of control, innovativeness, and religiosity are positive, statistically significant predictors of entrepreneurial success, whereas risk-taking propensity and need for achievement are not statistically significant after the other predictors are considered simultaneously. Religiosity has the largest standardized coefficient in the model. The findings suggest that zakat institutions may complement financial assistance with capability development, practical innovation support, and ethically grounded entrepreneurship training. Because the study is cross-sectional and confined to one state program, the findings should be interpreted as associations within this setting rather than causal effects or evidence of nationwide program effectiveness.

Keywords: *Entrepreneurial Asnaf; Islamic Entrepreneurship; Entrepreneurial Success; Religiosity; Self-Efficacy; Sustainable Poverty Alleviation*

1. Introduction

Poverty and limited economic participation remain persistent socio-economic challenges worldwide. Over recent decades, entrepreneurship has been increasingly recognized as an effective mechanism for promoting inclusive economic growth, generating employment opportunities, and facilitating upward social mobility, particularly among disadvantaged communities. Consequently, governments and development agencies have implemented entrepreneurship-based poverty alleviation initiatives to empower marginalized groups towards sustainable economic self-sufficiency. Within the Islamic economic framework, entrepreneurship extends beyond economic activity and is regarded as a means of fulfilling social obligations and achieving balanced socio-economic development in accordance with the objectives of Maqasid al-Shariah (Mohieldin et al., 2012).

In Malaysia, zakat institutions have progressively shifted from conventional welfare-based assistance towards productive zakat initiatives aimed at empowering zakat recipients (asnaf) economically. Rather than providing temporary financial relief, productive zakat seeks to develop the capacity of asnaf to achieve long-term financial independence and transition from zakat recipients to zakat contributors. Entrepreneurial development has emerged as one of the primary approaches adopted by State Islamic Religious Councils to realize this objective. Through financial assistance, entrepreneurial training, mentoring, and continuous business support, asnaf with entrepreneurial potential are provided opportunities to establish and sustain micro-enterprises (Abdul Halim et al., 2012; Din et al., 2019). Such initiatives closely reflect the broader objectives of Islamic social finance in promoting wealth circulation, poverty alleviation, and the socio-economic upliftment of the Muslim community.

Among these initiatives, entrepreneurial empowerment programs have demonstrated considerable potential in fostering both economic and social advancement among underprivileged groups. However, entrepreneurial success within the context of productive zakat extends beyond financial profitability and encompasses business

sustainability, self-sufficiency, upward social mobility, and positive societal contributions (Afif Muhamat et al., 2013; Fisher et al., 2014). Despite substantial institutional support, achieving sustainable entrepreneurial outcomes among asnaf remains a significant challenge. Previous studies have reported that many participants struggle to sustain their businesses despite receiving financial and structural assistance. Such challenges are frequently attributed to inadequate entrepreneurial competencies, limited psychological preparedness, and difficulties in adapting to the behavioral demands associated with managing a business venture.

Research on asnaf entrepreneurship has often emphasized program-level and external supports, including financial assistance, training, marketing support, and business networks (Afif Muhamat et al., 2013; Hashim et al., 2021). These supports are important, but they do not fully explain why entrepreneurs who receive assistance may experience different business outcomes. Entrepreneurship research indicates that individual-level capabilities and dispositions can also shape how entrepreneurs recognize opportunities, respond to setbacks, and use available resources (Rauch & Frese, 2007; Chatterjee et al., 2019). In the context of Muslim entrepreneurship, religiosity may also provide an important ethical and motivational dimension to entrepreneurial activities (Ali & Al-Owaihan, 2008).

A specific gap therefore remains in understanding how psychological entrepreneurial traits operate alongside religiosity among participants in a productive-zakat program. This study addresses that gap by testing six individual-level predictors against entrepreneurial success among participants in LZNK's Skim Bantuan Jayadiri in Kedah. It does not evaluate the program's causal impact, because the design does not include a comparison group or longitudinal outcome data. Addressing this gap can provide a more nuanced understanding of why entrepreneurial outcomes may differ among beneficiaries who have received program support.

In Malaysia, productive zakat programs have increasingly been used to support the economic empowerment of asnaf through business capital assistance, entrepreneurial training, mentoring, and other forms of institutional support. These initiatives aim to facilitate the transition of zakat recipients towards greater economic independence and, ultimately, the capacity to contribute zakat themselves. However, the provision of financial and institutional assistance alone does not necessarily explain differences in entrepreneurial outcomes among program participants. Understanding the individual-level factors associated with entrepreneurial success is therefore important for strengthening the design of productive zakat initiatives.

Within Muslim communities, entrepreneurial behavior is influenced not only by psychological and economic considerations but also by religious values. From an Islamic perspective, entrepreneurship conducted ethically and in accordance with Shariah principles constitutes an act of worship (ibadah) that embodies accountability, perseverance, honesty, and social responsibility. Religiosity therefore serves as an important moral and motivational mechanism that shapes entrepreneurial attitudes and behaviors. Previous studies have demonstrated that religious commitment positively contributes to entrepreneurial development by strengthening intrinsic motivation and promoting ethical business practices. Nevertheless, empirical studies integrating religiosity with psychological entrepreneurial traits within the context of productive zakat and asnaf empowerment programs remain limited.

The study makes a context-specific contribution by examining the combined associations of five psychological traits and religiosity with entrepreneurial success among entrepreneurial asnaf in Kedah. This focus is relevant because the objective of productive zakat is not limited to immediate relief; it also seeks to support beneficiaries' longer-term economic participation. The study does not assume that all productive-zakat programs fail or that the Kedah program is ineffective. Rather, it examines variation in reported entrepreneurial success among program participants, providing evidence that may inform further assessment and program design. The findings should be generalized cautiously beyond the respondents and institutional setting studied.

Accordingly, this study examines the relationships of self-efficacy, locus of control, innovativeness, risk-taking propensity, need for achievement, and religiosity with entrepreneurial success among asnaf entrepreneurs participating in the Skim Bantuan Jayadiri program in Kedah, Malaysia. By examining these six predictors within a unified empirical framework, the study contributes context-specific evidence to the literature on

Islamic entrepreneurship and productive zakat. The findings may also inform zakat institutions in considering how psychological capability development and religiously grounded ethical guidance can complement existing financial and entrepreneurial support.

2. Literature Review

Theoretical Foundations and Integration

This study draws on three complementary perspectives to explain entrepreneurial success among asnaf entrepreneurs: Psychological Entrepreneurship Traits Theory, Social Cognitive Theory and the Islamic entrepreneurship perspective. Rather than treating these perspectives as separate explanations, the study integrates them to examine entrepreneurial success from individual, capability-related and religious-value dimensions.

Psychological Entrepreneurship Traits Theory serves as the primary theoretical foundation for examining the individual characteristics associated with entrepreneurial success. From this perspective, entrepreneurial outcomes may be related to characteristics such as locus of control, innovativeness, risk-taking propensity and need for achievement. These characteristics provide a basis for investigating why individuals may differ in their approaches to identifying opportunities, making decisions and managing business challenges. In the present study, this perspective provides the overarching rationale for examining psychological characteristics as potential predictors of entrepreneurial success among asnaf entrepreneurs. Entrepreneurs who demonstrate stronger psychological characteristics are generally more resilient, proactive and adaptable in navigating entrepreneurial challenges (Chatterjee et al., 2019).

Social Cognitive Theory complements the trait perspective by providing a more specific explanation of self-efficacy. While the trait perspective focuses on relatively enduring individual characteristics, Social Cognitive Theory emphasizes the role of perceived capabilities in shaping behavior and performance. Self-efficacy concerns individuals' beliefs about their ability to organize and execute actions required to achieve particular goals. In an entrepreneurial setting, these beliefs may be relevant to decision-making, persistence and responses to business difficulties. Accordingly, Social Cognitive Theory provides a complementary theoretical explanation for self-efficacy in the research framework.

The Islamic entrepreneurship perspective provides the religious and ethical lens through which entrepreneurship is examined in the context of asnaf. In this study, it is used as a theoretical lens rather than being presented as a separate, fully developed formal theory. Religiosity is included as an individual-level predictor to examine whether religious values are associated with entrepreneurial success. This perspective is relevant because entrepreneurship among asnaf beneficiaries takes place within a productive zakat context, in which economic empowerment can be considered alongside ethical conduct, responsibility and the broader objective of improving beneficiaries' economic well-being. Nevertheless, the relationship between religiosity and entrepreneurial success remains an empirical question rather than an assumption.

The study of entrepreneurial success has evolved from predominantly economic perspectives towards a greater appreciation of the psychological determinants underlying entrepreneurial behavior and performance. Early entrepreneurship research largely focused on objective measures of success, such as profitability, business growth, and market performance. More recently, scholars have recognized that entrepreneurial outcomes are substantially influenced by individual psychological characteristics that shape how entrepreneurs perceive opportunities, respond to challenges, and sustain business performance over time (Rauch & Frese, 2007).

Within Muslim communities, entrepreneurial activities are influenced not only by psychological and economic considerations but also by religious values. From an Islamic perspective, entrepreneurship conducted ethically and in accordance with Shariah principles constitutes an act of worship (*ibadah*) that promotes both individual prosperity and societal wellbeing. Religiosity therefore functions as an important moral and motivational mechanism that shapes entrepreneurial attitudes, ethical conduct, perseverance, and social responsibility (Mohieldin et al., 2012). Religious values may further strengthen entrepreneurs' commitment towards sustainable business practices, particularly among beneficiaries of Islamic social finance initiatives.

The theoretical framework combines three complementary elements. First, the psychological-traits perspective provides the organizing framework for examining self-efficacy, locus of control, innovativeness, risk-taking propensity, and need for achievement as individual differences associated with entrepreneurial outcomes. Second, Social Cognitive Theory as stated by Bandura (1986, 2001) offers a more specific explanation for self-efficacy: entrepreneurs' beliefs about their capabilities may influence persistence and the way they respond to challenges. Third, the Islamic entrepreneurship perspective is used as a contextual and normative lens—not as a separately tested formal theory—to explain why religiosity may be relevant to entrepreneurial conduct among Muslim asnaf. In this framework, the traits perspective organizes the predictors, Social Cognitive Theory explains the self-efficacy mechanism, and the Islamic perspective contextualizes religiosity and ethical responsibility. These perspectives are complementary, but the present regression model tests the associations of the measured predictors with entrepreneurial success; it does not empirically test interactions among the theories.

Self-Efficacy and Entrepreneurial Success

Self-efficacy is generally considered an important psychological resource for entrepreneurship because it influences individuals' confidence in managing business challenges and pursuing opportunities. However, the strength of its relationship with entrepreneurial outcomes may depend on the context in which entrepreneurs operate. For asnaf entrepreneurs, confidence in one's capabilities may support business decision-making and persistence, but its contribution may also depend on access to capital, business knowledge and market opportunities. Therefore, self-efficacy should be examined as a potential contributor to entrepreneurial success rather than assumed to guarantee it (Bandura, 1986).

Empirical studies have consistently reported a positive relationship between self-efficacy and entrepreneurial outcomes. Rauch and Frese (2007) found that self-efficacy enhances entrepreneurs' abilities to identify opportunities, establish goals, and sustain business performance. Similarly, Chatterjee et al. (2019) demonstrated that entrepreneurs with higher levels of self-efficacy are more likely to achieve superior entrepreneurial performance than their counterparts with lower levels of entrepreneurial confidence. More recently, Caliendo et al. (2023) reported that self-efficacy positively influences business survival and entrepreneurial income, particularly among entrepreneurs pursuing innovation-oriented and growth-focused ventures.

Within the context of entrepreneurial asnaf, self-efficacy assumes even greater importance given the socio-economic challenges frequently encountered by program participants. Limited entrepreneurial experience, financial constraints, and business uncertainties may undermine individuals' confidence in their ability to successfully manage entrepreneurial activities. Consequently, entrepreneurial empowerment programs implemented by zakat institutions are intended not only to provide financial support but also to strengthen beneficiaries' entrepreneurial capabilities and confidence. Asnaf entrepreneurs who possess stronger self-efficacy are expected to utilize available resources more effectively, demonstrate greater perseverance, and exhibit stronger commitment towards sustaining their business ventures over time. Consequently,
H1: *Self-efficacy is positively associated with entrepreneurial success among entrepreneurial asnaf.*

Locus of control and entrepreneurial success

Locus of control is an important psychological characteristic that influences entrepreneurial behavior and business performance. Originally introduced by Rotter (1966), locus of control refers to individuals' beliefs regarding the extent to which they can influence outcomes through their own actions and decisions. Entrepreneurs possessing a strong internal locus of control tend to perceive business outcomes as largely determined by their personal effort, capabilities, and perseverance rather than by external circumstances. Consequently, they are generally more proactive in identifying opportunities, overcoming challenges, and exercising greater control over their entrepreneurial activities.

Consistent with Psychological Entrepreneurship Traits Theory, entrepreneurs with a stronger internal locus of control are more likely to achieve superior entrepreneurial outcomes because they view business-related challenges as manageable and responsive to their actions and decisions (Rauch & Frese, 2007). Such individuals exhibit higher levels of entrepreneurial commitment, opportunity recognition, and persistence when confronted with uncertainty. Mueller and Thomas (2001) similarly reported that entrepreneurs with stronger

internal locus of control demonstrate greater entrepreneurial commitment and are more willing to learn, adapt, and persist in pursuing entrepreneurial goals compared with individuals who attribute outcomes primarily to external factors.

Empirical evidence further supports the positive role of locus of control in entrepreneurial development. Hamzah and Othman (2023) found that internal locus of control positively influences entrepreneurial outcomes through the development of entrepreneurial competencies among small business owners. Their findings suggest that entrepreneurs who believe they can influence business outcomes are more likely to actively develop their competencies and strategically utilize available resources to achieve sustainable business performance. These characteristics are particularly important within entrepreneurial environments that require continuous learning, adaptability, and resilience.

Within the context of entrepreneurial asnaf programs, locus of control assumes even greater importance given the socio-economic challenges frequently encountered by program participants. Productive zakat initiatives are designed not merely to provide financial assistance but to facilitate the long-term economic empowerment of asnaf entrepreneurs. Achieving this objective requires beneficiaries to demonstrate initiative, perseverance, and confidence in their ability to influence their entrepreneurial outcomes. Asnaf entrepreneurs with stronger internal locus of control are therefore more likely to utilize institutional support effectively, proactively develop their entrepreneurial competencies, and sustain their business ventures over time. By perceiving entrepreneurial success as the outcome of their own efforts and commitment, they are better positioned to achieve both economic self-sufficiency and sustainable entrepreneurial performance. Hence,
H2: *Locus of control is positively associated with entrepreneurial success among entrepreneurial asnaf.*

Innovativeness and entrepreneurial success

Innovativeness is an important psychological entrepreneurial trait that reflects an individual's propensity to generate creative ideas, develop novel solutions, and implement improvements that enhance business performance and competitiveness. Mueller and Thomas (2001) define innovativeness as the tendency to introduce and apply new ideas, systems, and processes that enable entrepreneurs to respond effectively to changing market conditions. Within entrepreneurial settings, innovativeness facilitates opportunity recognition, problem-solving capabilities, and strategic adaptability, all of which are essential for sustaining business growth and competitiveness.

Consistent with Psychological Entrepreneurship Traits Theory, innovativeness contributes significantly to entrepreneurial success by enabling entrepreneurs to adapt to dynamic business environments and overcome entrepreneurial challenges (Rauch & Frese, 2007). Entrepreneurs who possess higher levels of innovativeness are generally more capable of identifying emerging opportunities, refining business practices, and introducing value-creating solutions that strengthen their competitive advantage. In increasingly competitive markets characterized by evolving consumer preferences and technological advancements, innovativeness allows entrepreneurs to respond proactively to environmental changes and sustain business performance over time (Chatterjee et al., 2019).

Empirical studies have consistently demonstrated the positive relationship between innovativeness and entrepreneurial performance. Falahat et al. (2018) found that entrepreneurial innovativeness positively influences perceived business growth, competitive performance, and non-financial business outcomes. Their findings suggest that innovative entrepreneurs are better positioned to enhance business sustainability through continuous learning, strategic adaptation, and the effective utilization of entrepreneurial opportunities. In addition, a study by Falahat et al. (2018) revealed that there was a significant positive impact of entrepreneurial innovativeness on three types of business performance, namely perceived non-financial performance, perceived business growth, and perceived performance relative to competitors.

Within the context of entrepreneurial asnaf programs, innovativeness assumes particular importance given that many beneficiaries operate small and micro-enterprises in highly competitive and resource-constrained environments. Productive zakat initiatives are intended not only to facilitate business creation but also to cultivate sustainable entrepreneurial capabilities that promote long-term economic independence. Asnaf entrepreneurs who exhibit stronger innovative capabilities are more likely to adapt their business strategies,

effectively utilize institutional support, and continuously improve their products, services, and operational practices. Their willingness to seek new knowledge, embrace change, and explore entrepreneurial opportunities may further strengthen their capacity to sustain business performance and achieve economic self-sufficiency. Consequently, innovativeness constitutes an important internal entrepreneurial resource that contributes to sustainable entrepreneurial outcomes among entrepreneurial asnaf. Therefore,
H3: *Innovativeness is positively associated with entrepreneurial success among entrepreneurial asnaf.*

Risk-taking propensity and entrepreneurial success
Risk-taking propensity is an important psychological entrepreneurial trait that reflects an individual's willingness to undertake calculated and strategic risks when pursuing entrepreneurial opportunities. Entrepreneurship is inherently characterized by uncertainty arising from fluctuating market conditions, resource constraints, and evolving business environments. Consequently, entrepreneurs are frequently required to make strategic decisions despite possessing incomplete information regarding future outcomes. Individuals with higher levels of risk-taking propensity are generally more willing to evaluate opportunities, commit resources, and implement innovative strategies that may contribute to business growth and sustainability.

Consistent with Psychological Entrepreneurship Traits Theory, risk-taking propensity contributes to entrepreneurial success by enabling entrepreneurs to respond proactively to uncertainty and strategically pursue value-creating opportunities (Rauch & Frese, 2007). Rather than reflecting reckless behavior, entrepreneurial risk-taking involves the ability to make informed and responsible decisions by carefully weighing potential benefits against possible consequences. Entrepreneurs possessing moderate and calculated risk-taking tendencies are more likely to allocate resources strategically, adapt their business approaches, and pursue opportunities that enhance entrepreneurial performance and long-term business sustainability.

Within the context of entrepreneurial asnaf programs, risk-taking propensity assumes particular importance given the financial and operational challenges frequently encountered by program participants. Many asnaf entrepreneurs operate small and nascent businesses that require them to make strategic decisions concerning investment, business expansion, and resource utilization despite operating under resource constraints. Productive zakat initiatives provide institutional support that facilitates entrepreneurial development; however, the effective utilization of such support ultimately depends upon the entrepreneur's willingness to recognize and pursue viable business opportunities. Asnaf entrepreneurs who possess stronger risk-taking tendencies are therefore more likely to make informed entrepreneurial decisions, strategically utilize available resources, and adapt proactively to business challenges. Their willingness to undertake calculated risks may further strengthen their capacity to sustain business performance and achieve long-term economic self-sufficiency. Therefore,
H4: *Risk-taking propensity is positively associated with entrepreneurial success among entrepreneurial asnaf.*

Achievement and entrepreneurial success
The need for achievement is one of the most established psychological determinants of entrepreneurial behavior and motivation. Originally proposed by McClelland (1961), Need Achievement Theory posits that individuals possessing higher levels of achievement motivation are intrinsically driven to pursue excellence, establish challenging goals, and continuously improve their performance. Such individuals derive satisfaction from accomplishing difficult tasks and demonstrate greater perseverance when confronted with obstacles and setbacks. Within entrepreneurial settings, the need for achievement motivates individuals to pursue business goals proactively and sustain their commitment towards long-term entrepreneurial success.

Consistent with Psychological Entrepreneurship Traits Theory, the need for achievement contributes significantly to entrepreneurial outcomes by fostering persistence, self-improvement, and goal-directed behavior (Rauch & Frese, 2007). Achievement-oriented entrepreneurs are generally more willing to develop entrepreneurial competencies, embrace continuous learning, and pursue innovative approaches that strengthen business performance and sustainability. Rather than perceiving failure as an endpoint, they are more likely to interpret entrepreneurial challenges as opportunities for growth and improvement. Consequently, individuals possessing higher levels of achievement motivation are better positioned to sustain entrepreneurial efforts and adapt effectively to dynamic business environments.

Empirical studies have consistently demonstrated the positive relationship between the need for achievement and entrepreneurial performance. Collins et al. (2004) identified achievement motivation as an important determinant of entrepreneurial behavior and success, while Makuya (2024) reported that the need for achievement exerts a direct and significant positive influence on financial performance. Similarly, Akhtar et al. (2020) found that achievement motivation positively influences entrepreneurial intentions both directly and indirectly through entrepreneurial self-efficacy. Staniewski and Awruk (2019) also found significant correlations between entrepreneurial success and achievement motivation (e.g., Flexibility, Courage, Faith in success, Dominance, Preference for difficult tasks, Independence, and Objective orientation), thereby confirming the theoretical accuracy of the Questionnaire of Entrepreneurial Success. Nookazi and Mpiti (2023) also evaluated the relationship between the need for achievement and entrepreneurial performance thereby looking at some personality traits (risk-taking propensity, independence, and motivation) of entrepreneurs in the Chris Hani District Municipality. The findings of this study indicated that the need for achievement has the potential to enhance entrepreneurial performance. Collectively, these findings suggest that entrepreneurs possessing stronger achievement motivation are more likely to demonstrate sustained entrepreneurial commitment and superior business outcomes.

Within the context of entrepreneurial asnaf programs, the need for achievement assumes particular importance given that productive zakat initiatives are intended to facilitate sustainable socio-economic transformation rather than provide temporary financial assistance. The successful transition of asnaf from zakat recipients to financially independent entrepreneurs requires sustained entrepreneurial commitment that extends beyond financial support and technical competencies. Asnaf entrepreneurs possessing stronger achievement motivation are more likely to actively develop entrepreneurial capabilities, pursue continuous business improvement, and utilize institutional support effectively to achieve long-term entrepreneurial goals. Their intrinsic motivation to excel may further strengthen their commitment towards business sustainability, economic self-sufficiency, and meaningful contributions to their communities. Accordingly, entrepreneurial success among asnaf should be understood not only in terms of financial profitability but also in terms of sustainable economic empowerment and self-reliance. Thus,
H5: *Need for achievement is positively associated with entrepreneurial success among entrepreneurial asnaf.*

Religiosity and entrepreneurial success
Unlike conventional entrepreneurship literature, which predominantly emphasizes the psychological and economic determinants of entrepreneurial success, Islamic entrepreneurship recognizes entrepreneurship as a multidimensional endeavor encompassing economic, ethical, and spiritual dimensions. Within the Islamic worldview, entrepreneurial activities conducted in accordance with Shariah principles are not merely economic pursuits but constitute acts of worship (*ibadah*) that contribute to both individual prosperity and societal wellbeing. Consequently, entrepreneurial success extends beyond financial achievement to include ethical conduct, social responsibility, and the fulfilment of broader Maqasid al-Shariah objectives. Within this context, religiosity assumes an important role in shaping entrepreneurs' motivations, values, and business behaviors.

Religiosity refers to the extent to which individuals internalize and practice their religious beliefs and values in their daily lives (Worthington et al., 2003). It influences individuals' attitudes, motivations, and behavioral orientations across various domains, including entrepreneurship. Entrepreneurs possessing stronger religious commitment are generally more likely to demonstrate honesty, accountability, perseverance, and social responsibility in conducting their business activities. Religious values may further strengthen intrinsic motivation by encouraging disciplined entrepreneurial behavior, continuous self-improvement, and commitment towards ethical business practices. Previous studies have consistently reported positive relationships between religiosity and entrepreneurial commitment, business sustainability, and ethical entrepreneurial behavior among Muslim communities (Ali & Al-Owaihan, 2008).

Empirical evidence further highlights the significance of religiosity in shaping entrepreneurial outcomes across diverse contexts. Lim et al. (2025) found that religious values positively influence entrepreneurial orientation dimensions, including autonomy, innovativeness, proactivity, and risk-taking behaviors among restaurant entrepreneurs. Similarly, Sulaiman et al. (2019) reported significant relationships between religiosity, emotional regulation, motivation, and entrepreneurial behavior, while Lehmann and Wiebe (2025) identified

positive associations between religiosity and entrepreneurial performance, although the magnitude of such relationships may vary across cultural and religious contexts. McIntyre. et al. (2023) investigated the impact of religiosity on entrepreneurial intentions. They discovered a significant relationship between religiosity and the intent to participate in social entrepreneurship, but no relationship between religiosity and traditional entrepreneurship intentions. Maviya. et al. (2024) studied the effects of religious practices on entrepreneurship. Their findings indicated that religious cultural practices promote success in entrepreneurship activities. All of these practices are based on faith, which renders it impossible to scientifically prove the claims therein. These religious practices promote some ethics as motivation within the individuals which results in the success of their entrepreneurship activities. Collectively, these findings suggest that religiosity contributes not only to entrepreneurial motivation but also to the development of ethical and sustainable entrepreneurial practices.

Within the context of entrepreneurial asnaf programs, religiosity assumes particular importance given that productive zakat initiatives are inherently grounded in the broader objectives of Maqasid al-Shariah, including poverty alleviation, wealth redistribution, and sustainable socio-economic development. Entrepreneurial empowerment programs are intended not merely to facilitate income generation but to cultivate financially independent and socially responsible entrepreneurs who contribute positively to their communities. Consequently, religiosity may function as an important spiritual resource that strengthens perseverance, self-discipline, and commitment towards sustainable entrepreneurial practices. Religious asnaf are therefore more likely to perceive entrepreneurial activities not solely as mechanisms for financial gain but also as opportunities to fulfil social responsibilities and contribute meaningfully to societal wellbeing.

Religiosity may shape entrepreneurial behavior by influencing individuals' values, ethical judgements, business practices and perceptions of responsibility. In the context of asnaf entrepreneurship, religious beliefs may provide a source of motivation and guidance in conducting business activities. However, the extent to which religiosity translates into entrepreneurial success remains an empirical question, as business outcomes may also depend on entrepreneurial capabilities, financial resources and market conditions. Therefore, examining the association between religiosity and entrepreneurial success is important for understanding the potential role of religious values in the development of asnaf entrepreneurs. Asnaf entrepreneurs possessing stronger religious commitment are therefore expected to demonstrate greater perseverance, ethical consciousness, and dedication towards achieving both economic self-sufficiency and broader social objectives.
H6: *Religiosity is positively associated with entrepreneurial success among entrepreneurial asnaf.*

3. Research Methodology

Research Design

This study adopts a quantitative, cross-sectional research design to examine the determinants of entrepreneurial success among entrepreneurial asnaf participating in the Skim Bantuan Jayadiri program administered by Lembaga Zakat Negeri Kedah (LZNK), Malaysia. Quantitative research is particularly appropriate for examining relationships among multiple constructs and testing hypotheses derived from established theoretical frameworks (Hair et al., 2022). Given that the present study investigates the influence of psychological entrepreneurial traits and religiosity on entrepreneurial success, a quantitative correlational approach provides an appropriate means of assessing the relationships among the study variables.

Consistent with the theoretical framework underpinning this study, Psychological Entrepreneurship Traits Theory explains the role of psychological entrepreneurial characteristics, while the Islamic entrepreneurship perspective highlights the importance of religiosity as a spiritual determinant of entrepreneurial behavior and outcomes. Accordingly, the present study examines the influence of self-efficacy, locus of control, innovativeness, risk-taking propensity, need for achievement, and religiosity on entrepreneurial success among entrepreneurial asnaf.

The unit of analysis comprises entrepreneurial asnaf who participated in the Skim Bantuan Jayadiri program administered by Lembaga Zakat Negeri Kedah (LZNK). This population is particularly relevant because productive zakat initiatives are designed to facilitate the long-term socio-economic transformation of beneficiaries from zakat recipients into financially independent entrepreneurs and, ultimately, zakat

contributors. Examining entrepreneurial asnaf therefore provides valuable insights into the effectiveness and sustainability of entrepreneurial empowerment programs implemented by zakat institutions in Malaysia.

Data were collected between October and December 2024 using a cross-sectional survey. The target population comprised asnaf entrepreneurs who participated in the Skim Bantuan Jayadiri administered by Lembaga Zakat Negeri Kedah (LZNK) between 2020 and 2024. Although program participation covered several years, data were collected from respondents during a single survey period.

Population and Sampling Procedures

The target population of this study comprises entrepreneurial asnaf who participated in the Skim Bantuan Jayadiri program implemented by Lembaga Zakat Negeri Kedah (LZNK) between 2020 and 2024. The program represents one of LZNK's productive zakat initiatives that provides eligible asnaf beneficiaries with business capital assistance, entrepreneurial training, and continuous business development support. Beyond poverty alleviation, the program seeks to promote sustainable economic empowerment by facilitating beneficiaries' transition from zakat recipients to economically self-sufficient entrepreneurs.

A total of 152 entrepreneurial asnaf respondents from all twelve districts of Kedah participated in the study. Respondents were identified using official records provided by Lembaga Zakat Negeri Kedah. Given the specialized nature of the study population, only entrepreneurial asnaf who had participated in the Skim Bantuan Jayadiri program were considered eligible to participate. This selection criterion was necessary to ensure that respondents possessed the entrepreneurial experience required to meaningfully evaluate the constructs examined in the present study.

Simple random sampling was employed to ensure that all eligible entrepreneurial asnaf registered under the program had an equal probability of selection. This sampling technique was chosen because it enhances sample representativeness while reducing the likelihood of selection bias (Sekaran & Bougie, 2019). Furthermore, restricting participation to entrepreneurial asnaf enhances the internal validity of the study by ensuring that the findings are directly relevant to the context of productive zakat entrepreneurial empowerment programs.

From a statistical perspective, the sample size of 152 respondents satisfies the recommended minimum requirements for multiple regression analyses involving six predictor variables (Hair et al., 2022). The sample therefore provides adequate statistical power for testing the proposed hypotheses and evaluating the relative contributions of psychological entrepreneurial traits and religiosity towards entrepreneurial success among entrepreneurial asnaf.

Data Collection Procedures

Primary data were collected using a self-administered online questionnaire distributed through Google Forms between October and December 2024. The questionnaire was administered once to eligible participants across the twelve districts of Kedah. This single-wave collection period is consistent with the cross-sectional design described above.

Participation in the study was entirely voluntary. Prior to completing the questionnaire, respondents were provided with a brief explanation outlining the objectives and purpose of the study together with assurances regarding the confidentiality and anonymity of their responses. Participants were informed that the information collected would be used exclusively for academic research purposes and that no personally identifiable information would be obtained throughout the data collection process. These procedures were implemented to ensure compliance with established ethical principles relating to informed consent, voluntary participation, anonymity, and confidentiality in human subject research.

Given that all variables were measured using self-reported responses collected from a single source at a single point in time, procedural remedies recommended by Podsakoff et al. (2003) were implemented to minimize the potential influence of Common Method Bias (CMB). Respondent anonymity was strictly maintained to reduce social desirability bias, while questionnaire items were carefully constructed using clear, concise, and neutral language to minimize response distortions. Furthermore, the measurement items were organized into distinct sections comprising demographic information, independent variables, and entrepreneurial success to

reduce consistency motif effects and respondents' tendencies to infer relationships among the study constructs. These procedural safeguards are consistent with best practices frequently adopted in behavioral and entrepreneurship research to enhance the validity and reliability of self-reported survey data.

Data Screening Procedures

Prior to hypothesis testing, several statistical assumptions were examined to ensure the robustness and validity of empirical findings. Missing values were treated using listwise deletion procedures, while potential outliers were systematically examined through both univariate and multivariate approaches. Univariate outliers were assessed using standardized Z-scores adopting the threshold value of ±3.29, whereas multivariate outliers were evaluated using Mahalanobis Distance statistics at the significance level of $p < 0.001$ (Hair et al., 2022).

The normality of the data distribution was subsequently examined using skewness and kurtosis statistics together with graphical inspections involving histograms and normal Q-Q plots. Following established recommendations within social science research, skewness and kurtosis values falling within acceptable thresholds indicate that the data are sufficiently normally distributed to support subsequent parametric analyses.

Furthermore, Harman's single-factor test was conducted as a post-hoc statistical assessment of Common Method Bias. The results indicated that no single factor accounted for the majority of the total variance, thereby suggesting that Common Method Bias does not pose a significant threat to the validity of the study findings. Collectively, these screening procedures provide additional confidence regarding the robustness of the dataset prior to hypothesis testing.

4. Results

This section presents empirical findings concerning the determinants of entrepreneurial success among entrepreneurial asnaf participating in the Skim Bantuan Jayadiri Program administered by Lembaga Zakat Negeri Kedah (LZNK). Consistent with the theoretical propositions advanced in this study, the analyses seek to determine whether entrepreneurial success among asnaf entrepreneurs is significantly influenced by psychological entrepreneurial traits and religiosity. The statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) Version 25 and comprised descriptive statistics, reliability analysis, Pearson's correlation analysis, and Multiple Linear Regression (MLR) analysis.

Table 1: Demographic Analysis

No	Profile	Description	Frequency	Percent
1	Gender	Male	67	44.1
		Female	85	55.9
2	Age	Under 30 years old	16	10.5
		31 – 40 years old	44	28.9
		41 – 50 years old	70	46.1
		51 years old and above	22	14.5
3	Business Type	Food	69	45.4
		Services	33	21.7
		Fishery	8	5.3
		Livestock	12	7.9
		Farming	18	11.8
		Others	12	7.9
4	Monthly Income	< RM1000	35	23.0
		RM1001 – RM3000	89	58.6
		RM3001 and above	28	18.4
5	Marital Status	Single	22	14.5
		Single Parent	23	15.1
		Married	87	57.2

		Divorced	20	13.2
6	Household size	1 – 3	70	46.1
		> 3	69	45.4
		None	13	8.6
7	Current Status	*Asnaf*	79	52.0
		Zakat Payer	73	48.0

Source: Authors' own data from survey

A total of 152 (Table 1) valid responses were retained for the subsequent analyses from entrepreneurial asnaf who participated in the Jayadiri Program between 2020 and 2024 across twelve districts in Kedah. The respondents comprised Muslim entrepreneurs who received productive zakat assistance either in the form of capital or business equipment provided by LZNK. The demographic profile indicates that the majority of respondents were female (55.9%), aged between 41 and 50 years (46.1%), operated businesses within the food industry (45.4%), earned monthly incomes ranging between RM1,001 and RM3,000 (58.6%), and were married (57.2%). Notably, approximately 48 per cent of the respondents had successfully transformed their status from zakat recipients to zakat payers, thereby reflecting the effectiveness of productive zakat initiatives in promoting economic empowerment among entrepreneurial asnaf.

Reliability analysis (Table 2) was conducted to assess the internal consistency of the scales. Cronbach's alpha ranged from 0.582 to 0.901. Entrepreneurial Success (α = 0.901), Self-efficacy (α = 0.889), Innovativeness (α = 0.853), Religiosity (α = 0.725), and Risk-taking Propensity (α = 0.702) showed higher internal consistency than Locus of Control (α = 0.582) and Need for Achievement (α = 0.587). The latter two coefficients fall below the commonly used 0.70 guideline and should therefore be treated as a measurement limitation rather than described as unequivocally acceptable. These values warrant caution in interpreting the findings associated with the two constructs. Accordingly, the coefficients are not treated as unequivocal evidence of adequate reliability. Further assessment of item-total correlations, item wording and scale dimensionality is necessary to determine whether the measurement properties of these constructs can be improved. The relatively low internal consistency also represents a limitation of the study and should be considered when interpreting the corresponding regression results.

Table 2: Reliability Analysis

Variables	Cronbach's Alpha	No of Items
Entrepreneurial Success	.901	10
Self-efficacy	.889	8
Locus of Control	.582	7
Innovativeness	.853	7
Risk-Taking Propensity	.702	5
Need for Achievement	.587	5
Religiosity	.725	6

Source: Authors' own data from survey

Pearson correlation analysis (Table 3) was used to examine bivariate associations among the study constructs. All six predictors were positively correlated with entrepreneurial success at the 0.01 level in the reported matrix. Religiosity showed the strongest bivariate association with entrepreneurial success (r = 0.549), followed by self-efficacy (r = 0.490) and innovativeness (r = 0.445). The largest reported intercorrelation among predictors was between self-efficacy and innovativeness (r = 0.427). These correlations provide preliminary evidence of association but do not, on their own, establish construct validity or rule out all multicollinearity concerns. The regression VIF values are therefore considered separately in the regression results.

Table 3: Correlation Analysis

Variables	1	2	3	4	5	6	7
Self-efficacy	1.00						
Locus of Control	0.126	1.00					
Innovativeness	0.427	0.221	1.00				
Risk-Taking	0.306	0.270	0.379	1.00			
Achievement	0.185*	0.145	0.275	0.343	1.000		
Religiosity	0.328	0.309	0.305	0.277	0.229	1.000	
Entrepreneurial	0.490	0.330	0.445	0.249	0.264	0.549	1.000

**Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Source: Authors' own data from survey

Multiple Linear Regression analysis was subsequently employed to simultaneously examine the relative contributions of Self-efficacy, Locus of Control, Innovativeness, Risk-taking Propensity, Need for Achievement, and Religiosity towards Entrepreneurial Success. The overall regression model was found to be statistically significant, producing an Adjusted R^2 value of 0.448. This indicates that approximately 44.8 per cent of the variance in Entrepreneurial Success is collectively explained by the six independent variables examined in this study, whilst the remaining 55.2 per cent may be attributable to other factors not included within the present investigation. The relatively substantial explanatory power of the regression model provides empirical support for the theoretical proposition that entrepreneurial success among productive zakat beneficiaries extends beyond financial capital assistance alone.

The overall regression model was statistically significant ($F = 21.392$, $p < 0.001$; Table 4). The adjusted R^2 of 0.448 indicates that the six predictors collectively account for 44.8% of the observed variance in entrepreneurial success in this sample. This is an in-sample explanatory result and should not be interpreted as evidence that the program caused entrepreneurial success. The reported VIF values range from 1.163 to 1.397, indicating no evident concern based on common VIF screening thresholds.

The regression coefficients indicate that four predictors are statistically significant at the 5% level. Religiosity has the largest standardized coefficient ($\beta = 0.354$, $p < 0.001$), followed by self-efficacy ($\beta = 0.282$, $p < 0.001$), innovativeness ($\beta = 0.189$, $p = 0.009$), and locus of control ($\beta = 0.151$, $p = 0.022$). Risk-taking propensity ($\beta = -0.076$, $p = 0.279$) and need for achievement ($\beta = 0.083$, $p = 0.210$) are not statistically significant when the other predictors are included in the model. The findings indicate context-specific associations within the study sample; however, the non-significant results should not be interpreted as evidence that these traits are irrelevant to entrepreneurial success in other contexts.

Table 4: Multiple Regression Analysis

Model	Unstandardized Coefficients B	Standardized Coefficients Beta	t	Sig.	VIF	Hypothesis Result
(Constant)	.247		.644	.521		
Self - Efficacy	.309	.282	4.066	.000	1.319	Supported
Locus of Control	.125	.151	2.322	.022	1.163	Supported
Innovativeness	.174	.189	2.651	.009	1.397	Supported
Risk Taking Propensity	-.071	-.076	-1.088	.279	1.345	Not supported
Need for Achievement	.076	.083	1.258	.210	1.182	Not supported
Religiosity	.391	.354	5.177	.000	1.275	Supported
R Square		.470				
Adjusted R Square		.448				
F Value		21.392				
R		.685				
*p-value		.000				

Source: Authors' own data from survey

Discussion

This study examined the associations between six individual-level predictors and entrepreneurial success among participants in LZNK's Skim Bantuan Jayadiri program. Four predictors—religiosity, self-efficacy, innovativeness, and locus of control—were statistically significant in the simultaneous regression model, whereas risk-taking propensity and need for achievement were not. These findings suggest that psychological and religious characteristics may help explain differences in reported entrepreneurial success in this setting. Because the study is cross-sectional and uses self-reported measures, the results do not establish causality and should not be interpreted as showing that these characteristics are more important than financial or institutional support, which were not directly compared in the model.

Religiosity emerged as the strongest predictor of entrepreneurial success, indicating a paradigm shift from conventional, profit-centric entrepreneurship to a holistic model grounded in ethics, spirituality, and social responsibility. For *asnaf* entrepreneurs, business performance is intrinsically linked to fulfilling religious obligations and contributing to community welfare (Kamarudin et al., 2013). This aligns with Max Weber's theory of social change, which posits that religious values profoundly influence economic activities (Mayuri, 2018). Specifically, Islamic values such as sincerity (*ikhlas*), trustworthiness (*amanah*), and perseverance bolster business resilience and life satisfaction (Bellu & Fiume, 2004; Fitri Yunus et al., 2019). Ultimately, this spiritual dimension is essential for achieving the broader socio-economic goals of productive zakat—namely, *hifz al-mal* (wealth preservation) and the successful transformation of zakat recipients into financially independent zakat contributors.

Furthermore, self-efficacy exerted a significant positive influence on entrepreneurial success. Consistent with Bandura's (2001) Social Cognitive Theory, *asnaf* entrepreneurs with a robust belief in their capabilities demonstrate greater resilience and persistence when navigating resource constraints and market uncertainties. This corroborates prior studies identifying self-efficacy as a crucial determinant of venture success (Kazumi & Kawai, 2017; Chatterjee et al., 2019). Given that many *asnaf* originate from low-income backgrounds, targeted psychological preparation is vital. Consequently, empowerment initiatives must transcend financial aid to include comprehensive coaching aimed at building entrepreneurial confidence.

Innovativeness and an internal locus of control also significantly drove business success. An internal locus of control fosters a strong sense of personal responsibility, prompting entrepreneurs to attribute business outcomes to their own efforts and skills rather than external circumstances (Mueller & Thomas, 2001; Asante & Affum-Osei, 2019). This proactive mindset is complemented by innovativeness, which enables micro-entrepreneurs to continuously adapt their products and services to survive in highly competitive markets (Razmus & Laguna, 2018). Together, these traits underscore the necessity of integrating practical problem-solving and innovation competencies into zakat training programs.

Risk-taking propensity was not a statistically significant predictor of entrepreneurial success in the present study. This finding suggests that, when the other predictors were considered simultaneously, willingness to take risks did not provide sufficient evidence of an independent association with entrepreneurial success among the sampled asnaf entrepreneurs. The finding is consistent with Gartner and Liao (2012), who reported no significant relationship between risk-taking propensity and successful new-venture formation. Similarly, research on small enterprises in Nigeria found no robust positive effect of willingness to take risks on business performance, highlighting the potential importance of risk perception and risk management rather than risk-taking willingness alone.

One possible explanation is that entrepreneurial success may depend not simply on an entrepreneur's willingness to accept uncertainty, but also on the ability to evaluate risks and make informed business decisions. For asnaf entrepreneurs, the consequences of unsuccessful decisions may be particularly important when financial resources are limited. However, the present study did not directly examine risk-management capability or financial vulnerability; these explanations should therefore be interpreted as possibilities rather than established findings. Overall, the result indicates that risk-taking propensity was not a significant independent predictor in the present regression model, rather than demonstrating that risk-taking is irrelevant to entrepreneurship in general.

Need for achievement was also not a statistically significant predictor of entrepreneurial success in the present study. Although achievement motivation may encourage individuals to pursue goals and improve their performance, the desire to achieve does not necessarily translate into measurable business success. This result is comparable to findings from research on informal micro-enterprises in Kelantan, Malaysia, in which need for achievement was not a statistically significant predictor of enterprise performance. The comparison suggests that the relationship between achievement motivation and business outcomes may vary across entrepreneurial settings.

In the context of asnaf entrepreneurship, achievement motivation may need to be accompanied by practical capabilities and opportunities, such as financial management skills, access to markets and the ability to respond to business challenges. Nevertheless, these factors were not directly tested as explanations for the non-significant coefficient in the present study. The result should therefore be interpreted as a lack of sufficient statistical evidence for an independent association between need for achievement and entrepreneurial success in this sample, rather than evidence that achievement motivation has no value. Future research could investigate whether business competencies, financial resources, or entrepreneurial experience help explain when achievement motivation translates into improved business outcomes.

Consequently, this study validates an opportunity-based, contextual application of Psychological Entrepreneurship Traits Theory intertwined with Islamic principles. The findings unequivocally refute the assumption that financial capital alone dictates entrepreneurial viability. To effectively transition beneficiaries from zakat recipients to self-sustaining, socially productive contributors, future productive zakat programs must be fundamentally redesigned as human and behavioral capital investments, prioritizing psychological readiness, innovativeness, and spiritual development alongside financial assistance.

5. Managerial Implications and Recommendations

The findings provide context-specific evidence on the factors associated with entrepreneurial success among asnaf entrepreneurs participating in the Skim Bantuan Jayadiri administered by Lembaga Zakat Negeri Kedah (LZNK). The results indicate that self-efficacy, locus of control, innovativeness and religiosity were statistically significant predictors in the regression model, whereas risk-taking propensity and need for achievement were not statistically significant. These findings suggest that individual psychological characteristics and religiosity may be relevant considerations when examining entrepreneurial outcomes within this program context. However, given that the sample was drawn from one state, the findings should not be assumed to represent all asnaf entrepreneurs or productive zakat programs in Malaysia. Further research involving different states, zakat institutions and beneficiary groups is needed to assess the broader applicability of these relationships.

The findings offer several practical considerations for LZNK in designing and refining entrepreneurship support initiatives for asnaf beneficiaries. Given the significant associations observed for self-efficacy, locus of control, innovativeness and religiosity, LZNK may consider incorporating activities that strengthen entrepreneurial confidence, decision-making, problem-solving, and responsible business practices into its existing support programs. Such activities could complement financial assistance and business training, although their effectiveness should be evaluated before wider implementation. The findings also suggest that entrepreneurship support should not rely solely on encouraging risk-taking or achievement motivation. Instead, program providers could explore approaches that help beneficiaries assess business risks, identify market opportunities and translate entrepreneurial motivation into practical business activities. These recommendations represent potential applications of the findings rather than interventions whose effectiveness has been established by the present study.

Although collaboration among zakat institutions, government agencies, financial institutions and business support organizations may offer opportunities to strengthen entrepreneurial assistance, the current study did not directly evaluate collaborative ecosystems or compare different program models. Such collaboration is therefore presented as a potential direction for program development rather than a conclusion established by the empirical results. Pilot initiatives, followed by systematic evaluation, would help determine whether these approaches improve business sustainability among asnaf entrepreneurs.

Among the core internal drivers identified by the study, religious commitment emerged as the primary and most robust predictor of entrepreneurial success. This indicates that for *asnaf* entrepreneurs, business ventures transcend strictly economic pursuits; they are deeply intertwined with ethical and religious obligations. Driven by profound Islamic values such as *sabr* (patience) and social accountability, these individuals maintain high integrity in their daily operations. This finding significantly extends Max Weber's Theory of Social Change by confirming that religious conviction acts as a direct catalyst for entrepreneurial activity and economic development. Complementing this spiritual foundation is the vital role of self-efficacy. Given the inherent uncertainties and resource constraints typical of micro-enterprises, *asnaf* with high self-efficacy demonstrate far greater persistence, resilience, and proactive problem-solving capabilities, enabling them to weather economic hardships that might otherwise derail their ventures (Bandura, 2001).

In addition to faith and self-efficacy, an internal locus of control and a capacity for innovativeness serve as critical pillars for long-term sustainability. *Asnaf* possessing a strong internal locus of control naturally attributes their business outcomes to their own efforts, skills, and decisions rather than external forces or sheer luck. This psychological mindset fosters a heightened sense of personal ownership and responsibility, which is absolutely critical for executing business objectives and maintaining a sustainable enterprise (Asante & Affum-Osei, 2019). When this sense of ownership is paired with innovativeness, entrepreneurial outcomes are significantly boosted. Importantly, within the context of micro-enterprises, innovation does not necessarily require high-tech advancements or massive capital disruption. Rather, it involves practical, incremental improvements in everyday problem-solving, product diversification, and customer engagement (Razmus & Laguna, 2018). Flexible and innovative *asnaf* are thus much better positioned to capitalize on shifting market opportunities and remain competitive.

Interestingly, the findings also challenge several conventional entrepreneurial theories by revealing that certain widely accepted traits do not significantly impact the success of *asnaf* entrepreneurs within the productive zakat framework. For instance, aggressive risk-taking—often hailed as a hallmark of the quintessential entrepreneur—was not found to be a significant determinant of success. Because productive zakat programs inherently provide a supportive safety net comprised of financial grants, training, and ongoing mentoring, the necessity for high-stakes risk is substantially diluted. Success in this highly structured context relies far more on psychological preparedness and controlled, calculated risk management than on bold financial gambles (Rauch & Frese, 2007). Similarly, while a high need for achievement generally indicates strong personal motivation, this study found it insufficient on its own to guarantee success among zakat beneficiaries. This compelling result suggests that mere ambition and the desire to succeed must be deeply grounded in self-confidence, creativity, and religious commitment to successfully translate into tangible economic prosperity.

To effectively transition *asnaf* from dependent zakat beneficiaries to empowered, self-sustaining zakat contributors, institutions must urgently implement multidimensional policy strategies. Zakat institutions should pivot from strictly focusing on technical business skills to actively integrating Islamic business ethics, the principles of *maqasid al-Shariah*, and spiritual fortitude into their training modules. Regular mentorship by successful Muslim entrepreneurs and religious leaders is highly recommended to bridge the gap between theory and practice (Fitri Yunus et al., 2019). Furthermore, to combat historically high dropout rates, these programs must include targeted behavioral interventions that actively foster ownership, independent decision-making, and self-efficacy. Incorporating experiential learning, continuous coaching, and post-funding site visits can significantly strengthen an *asnaf*'s business confidence and operational competence (Kazumi & Kawai, 2017).

Finally, training programs should be modernized to incorporate practical micro-innovation skills, such as digital entrepreneurship, social media marketing, and modern customer relationship management, which are essential for enabling beneficiaries to remain competitive in today's economy. Policymakers should also mandate comprehensive entrepreneurial profiling to accurately assess the psychological readiness of beneficiaries prior to program enrollment, ensuring that resources are allocated to those genuinely prepared for the rigors of business. Establishing a collaborative ecosystem—where zakat institutions provide the funding, universities offer innovation mentoring, and industry agencies grant critical market access—will create a robust and impenetrable support network. Ultimately, these findings forcefully advocate for a

paradigm shift: productive zakat initiatives must be fundamentally reframed not merely as short-term poverty reduction schemes, but as comprehensive, long-term human capital development programs.

Conclusion

This study examined the associations of five psychological entrepreneurial traits and religiosity with entrepreneurial success among 152 participants in LZNK's Skim Bantuan Jayadiri program in Kedah. The regression results show significant positive associations for self-efficacy, locus of control, innovativeness, and religiosity, while risk-taking propensity and need for achievement were not significant in the simultaneous model. Religiosity had the largest standardized coefficient, although the cross-sectional design does not establish a causal effect. The results support considering psychological capability development and ethical business guidance alongside financial assistance, while recognizing that the study did not directly test program interventions or compare the relative impact of financial support.

The study's contribution is to bring psychological traits and religiosity together in an empirical model of entrepreneurial success among asnaf in a specific productive-zakat setting. The Islamic entrepreneurship perspective provides contextual interpretation for religiosity, while Social Cognitive Theory helps explain the relevance of self-efficacy. Practical recommendations should remain proportionate to the evidence: LZNK may consider pilot training components focused on confidence, innovation, and ethical practice and assess their outcomes systematically. The findings should not be generalized automatically to all Malaysian asnaf or treated as proof of nationwide program effectiveness.

Several limitations should be considered. First, the sample was drawn from one program administered by LZNK in Kedah, limiting generalizability to other states and institutions. Second, the cross-sectional, self-reported design limits causal interpretation and may be affected by common-method and social-desirability bias despite the procedural safeguards described. Third, Cronbach's alpha was below 0.70 for locus of control and need for achievement, and the current analysis does not report factor-based convergent and discriminant validity evidence. Future research should examine item-level measurement properties, replicate the model in other states, and use longitudinal or mixed-method designs. Financial literacy, digital competencies, and social capital are useful future variables because they represent financial decision-making capability, the ability to access digital markets, and access to resources through relationship factors that may help explain how psychological traits translate into business outcomes. Future studies could also compare program graduates and discontinuers and evaluate specific training interventions.

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Factors Influencing Artificial Intelligence Implementation Among Customer Agents in Airline Call Centres

Muhammad Akmal Ishak[1] ,*Shatina Saad[2], Nor Azian Binti Abdul Rahman[2], Nurazwa Ahmad[3]
[1]Department of Postgraduate and Professional Studies, Universiti Teknologi MARA (UiTM) Shah Alam, Selangor, Malaysia
[2]Faculty of Business and Management, Universiti Teknologi MARA (UiTM) Puncak Alam, Selangor, Malaysia
[3]Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia (UTHM), Batu Pahat, Johor, Malaysia
Email: akmalishak93@yahoo.com, *shatinas@uitm.edu.my, norazian9829@uitm.edu.my, nurazwa@uthm.edu.my
Corresponding Author: Dr Shatina Saad

Abstract: Airlines' traditional call centres utilize a human workforce to manage customer interactions. Despite this, various challenges have been experienced, including prolonged waiting times and inconsistent service delivery. Although the integration of Artificial Intelligence (AI)-driven chatbots offers a potential solution to these challenges through their automated nature, it also comes with a new set of complex issues that surround workforce efficiency, information security, and service efficacy. Although sufficient literature is available concerning the perceptions of AI systems regarding their utilization and usability, a research gap exists in AI and airlines**.** To address these gaps, a study applied a quantitative method using convenience sampling, targeting 103 call centre employees of Malaysian-based airlines. This research adopted the Technology Acceptance Model (TAM) via factor, reliability, correlation, and regression analysis, as the implications of this study were portrayed towards a digitalized format. The analysis illustrated that the human workforce influenced the AI Implementation, while perceived ease of use showed no significant effect. The study is limited by its small sample size, convenience sampling method, and focus on Malaysian-based airlines, which may reduce the generalizability of the findings. Additionally, the cross-sectional design and limited TAM variables may not fully capture the factors influencing AI implementation. This study addresses a research gap by examining AI chatbot implementation in airline call centers from employees' perspectives. It extends TAM in the airline context and highlights the significant influence of the human workforce on AI implementation, providing practical insights for digital transformation initiatives.

Keywords: *Airline call centres, artificial intelligence, human workforce, perceived ease of use*

1. Introduction

Artificial Intelligence (AI) integration has completely changed the customer service perspective for airlines, essentially forcing a move from the traditional call centre model to a human-AI hybrid collaboration. Airlines increasingly rely on AI-powered technologies such as chatbots, virtual assistants, and automated customer support platforms to improve service efficiency, reduce operational costs, and enhance customer satisfaction through personalized and real-time interactions. Industry evidence suggests that AI chatbots can handle up to 70% of customer inquiries in real time, allowing airlines to provide continuous 24/7 support while reducing the workload of frontline employees and improving service responsiveness. As indicated by Trawnih et al. (2022), this paper uses the Technology Acceptance Model to understand how perceived ease of use and the human workforce play their role in the successful integration of AI. While there is no doubt about the potential behind AI, which diminishes waiting times by up to 80% (Sai & Karnam, 2025), along with huge cost savings, the challenges relating to job losses (Mazingue, 2023), data security, and emotionless algorithms operating on high-stakes customer complaints are issues that remain at stake. The research therefore surveys responses from airline managerial and executive employees in call centres on how organizations can balance automated efficiencies with much-needed human empathy to create a more customer-focused service quality and leverage their competitive advantage in the digital-first marketplace.

This study contributes to the growing body of knowledge on AI adoption in Malaysia's aviation industry, an area that remains relatively underexplored from an employee perspective. As Malaysian airlines accelerate digitalization efforts to meet rising customer expectations for faster and more personalized services, the findings can assist policymakers, airline operators, and human resource managers in developing effective AI

implementation strategies. The study also provides practical recommendations for workforce training, change management, and customer service enhancement, ensuring that AI technologies complement rather than replace human capabilities. Ultimately, the research supports Malaysia's broader digital transformation agenda by promoting responsible and effective AI integration within the aviation sector.

2. Literature Review

This study focuses on two factors influencing AI implementation, as the Technology Acceptance Model (TAM) theory has been adapted to determine the perceived ease of use and usefulness towards AI technology intention utilization (O'dea et al., 2025). AI implementation is the automation derived from the human workforce (Morandini et al., 2023) and the perceived ease of use of technology (Lee et al., 2018).

Human workforce is defined as a group of human beings engaged in work, especially in companies or industries. Categories of workforce determine by the ability and individual by the organizations (Hameed & Waheed, 2011). Human workforce remains relevant in this global economy even though increasingly usage of automation machine or AI. Meanwhile, perceived ease of use refers to the technology implemented in customer service influencing the attitude to perceived (Payne & O'Brien, 2024). Technology is a process where implementation of basic knowledge to transform into a development using tools, systems and machines to improve human efficiency. It has been referred to as not naturally occurring, as it is based on human-made systems (Carroll, 2017).

Human Workforce towards AI Implementation in Airlines Call Centres

While there have been several claims that AI can revolutionize the handling of repetitive tasks through improved efficiencies in operations (Barmer et al., 2021), human input is still crucial in complex situations that require the adoption of emotional intelligence, ethical reasoning, and high brainpower activities. Nevertheless, several complaints have emerged over the years about human reliability in the management of AI technology, hence the need for workforce preparedness for AI systems (Nurlia et al., 2023). In this context, the organization becomes very instrumental in ensuring that the workers are well-trained in AI technology readiness to improve productivity. Quite unquestionably, human success rests in an empowered workforce that can thrive along with AI systems and thereby yield superior opportunities in a digital world.

H1: There is a significant relationship between human workforce and AI implementation in airlines call centres.

Perceived Ease of Use towards AI Implementation in Airlines Call Centres

Technology Acceptance Model component referred to as perceived ease of use is an essential factor as identified by Vebrianti et al. (2025). This has significant implications for the success of implementing AI in call centres which easy usage interface, not only reduces the workload on the employees, but customers too will be able to use the services independently. This has already been seen in industries such as airlines and hospitality, where AI has the potential to greatly enhance efficiency and cut down on work-related expenses (Li et al., 2021; Gürsoy et al, 2019). The initiative contributes importantly to airline operations, as AI will be able to handle repetitive operations such as flight details confirmation and booking-related tasks.

H2: There is no significant relationship between perceived ease of use towards AI implementation in airlines call centres.

3. Methodology

Research Design

A quantitative method was adopted to determine the factors influencing AI Implementation in airline call centres towards the human workforce and perceived ease of use, with data analysis carried out through SPSS software version 30.0. A structured sequence of analysis used, including descriptive analysis and factor analysis, as the analysis carried out to ascertain that factors were statistically well-defined. To ensure integrity, reliability analysis, as well as correlations with multiple regression analysis, was examined to validate the hypotheses and indicated the best factor predicting AI Implementation, with findings reported and discussed further in Results and Discussions.

Data Collection Procedures
The data were collected via Google Forms as a medium to deliver a structured questionnaire, and a total of 103 responses were received and kept for analysis. The survey collected information on respondents' demographic profiles and the factors contributing to comprehensive AI Implementation. The data obtained were supported by academic journals providing theoretical evidence to strengthen the findings.

Sampling Method
The population of this study comprised of both managerial and call centre agents from Malaysian-based airlines, focusing on customer service frontliners aged 20 to above 40 years old who are familiar with the digitalization of AI usage throughout CRM platforms. A non-probability (convenience sampling) method was implemented due to time and resource constraints (Vasileiou, 2018) as the questionnaire was distributed to the Malaysian-based airlines' call centres and customer service personnel. The total of 103 valid responses collected exceeded the minimum sample size of 85, with a statistical power of 0.80 by Bujang et al. (2024), for an 80% chance of statistical significance.

Research Framework
The conceptual framework demonstrates how independent variables relate to the dependent variable, which is AI Implementation in airlines' call centres. It was constructed based on the Technology Acceptance Model (TAM), which highlights the tech-savvy acceptance of perceived ease of use (O'dea et al., 2025) that influences AI Implementation. Furthermore, the insights on the factors of AI Implementation towards the human workforce are embedded in this framework to further investigate their relationship and contribution to AI Implementation.

Research Instruments
The study was executed through a structured survey as a data collection tool. The questionnaire was comprised of two main parts: the first part on respondents' demographic profile, such as age, gender, work experience, and CRM tools integrated with AI usage. The second part covered on independent and dependent variables which it has been evaluated using the seven-point Likert scale ranging from 1 to 7 which represents "strongly disagree" to "strongly agree" respectively (Ameen et al., 2021), adapted from the call centre survey on service quality performance as to apply AI in their daily scope. The independent variables contained 4 items each, while the dependent variable had 6 items.

Data Processing and Analysis
The data collected were processed and analyzed using SPSS version 30.0. Descriptive analysis summarized the demographic profile, such as age, gender, working experience, and the AI usage integrated into CRM tools, which were presented using tables. Further analysis on the variables was performed using factor analysis to indicate the sampling adequacy of the study, then reliability analysis of Cronbach's alpha for data accuracy. Finally, on the correlation analysis on indicating its linear relationship based on the correlation coefficients as well as regression on testing the hypothesis validity.

4. Findings and Results

Demographic profile of the respondents was summarized in general were aged 20 to above 40 years old, number of 43 was the highest within the range age 31-35 years old. In total of 103 respondents, categorized into 58.3% female and 41.7% male respectively, which all have the experience on using the AI integrated CRM tools.

Factor Analysis
Factor analysis has been conducted on identifying the sampling adequacy using the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity which the coefficient value must be exceeding to 0.50 significantly (Ahmed & Maruod, 2025). KMO for this study indicated 0.91, as this fulfilled the requirement of an adequate sampling frame, whereby Bartlett's Test of Sphericity was significant ($p<0.05$), proving that the relationship between variables was possible and interconnected.

Reliability Analysis

Reliability was measured by the consistency of the elements measured via Cronbach's alpha, exceeding 0.7 (Tavakol & Dennick, 2011) to accept its validity. It showed that the coefficient obtained was more than 0.7, as the items in this study were suitable for use.

Table 1: Summary of reliability analysis

Variables (Items)	Total Items	Cronbach's Alpha
Human Workforce	4	0.788
Perceived Ease of Use	4	0.874
AI Implementation	6	0.814

Correlation Analysis

The correlation analysis highlighted that coefficients constructed between 0.4 and 0.5 were moderate correlations, 0.5 to 0.7 were high correlations and above 0.7 were very strong correlations (Senthilnathan, 2019). All components were acceptable, with the strongest recorded values of 0.723 and 0.694 respectively, for human workforce and perceived ease of use towards AI Implementation in airline call centres.

Table 2: Summary of correlation analysis

	Artificial Intelligence Implementation	Human Workforce	Perceived Ease of Use
Artificial Intelligence Implementation			
Human Workforce	.723**		
Perceived Ease of Use	.694**	.725**	

** Correlation is significant at the 0.01 level (2-tailed).

Regression Analysis

The provided analysis utilized multiple regression to evaluate how various factors influence AI implementation within airline call centres, revealing that the model explains 67.6% of the variance ($R2 = 0.676$) and is statistically significant overall ($p < 0.05$). Among the variables tested, human workforce ($\beta = 0.28$) influenced the factors of AI Implementation; however, perceived ease of use was found to have no significant relationship with the adoption of AI in this specific context.

Table 3: Summary of regression analysis

Model	AI Implementation				
	Unstandardized Beta	Coefficients Std. Error	Standardized Beta Coefficient	t	Sig.
(Constant)	0.49	0.319		1.538	0.127
Human Workforce	0.245	0.082	0.28	3.009	0.003
Perceived Ease of Use	0.066	0.084	0.078	0.786	0.433

ANOVA, Significant value = <0.001

Discussion

The incorporation of AI technology in the call centre industry is a paradigm shift in the human workforce because it automates manual jobs and data input, which has been proven to increase first call resolution by up to 27% (Sahoo, 2025). Increased incorporation of digital technology in the workforce, which has been disrupted by the COVID-19 pandemic, has led to fears of replacement by technology, the environment is ripe for human-AI collaboration. This is because the human aspect is left to perform high-value jobs such as emotional intelligence, flexibility, and problem-solving. To stay relevant in the future, the human workforce is encouraged to explore other high-tech fields such as AI engineering and data analysis.

The introduction of AI systems in airline call centres may provide a strategic opportunity to increase

productivity by automating routine tasks and facilitating a smooth flow of information for routine inquiries, but it is also challenged by issues such as operational costs and "perceived ease of use." In this study, we predicted that the perceived ease of use would positively influence the AI Implementation among customer agents airlines call centres despite its convenience, however, insufficient training courses (Shamim et al., 2023) will contribute towards low confidence level and trust (Vuori & Burkhard, 2025) of AI usage in daily scopes. Although AI systems have moved from being static robots to highly personalized assistants that can perform multi-level tasks with minimal human intervention, they still fail to understand complex human behaviors and emotional intelligence, which often results in anxiety and trust problems for users. Moreover, AI systems are only as effective as the information they retrieve from their respective databases in real time and require robust systems to ensure that there is no disruption to their services (Selvanathan, 2025). Although AI systems have been successful in reducing customer handling times and clerical workload, there is still a challenge to achieve a perfect balance between robots and human touch for high-level customer satisfaction.

5. Conclusion and Recommendations

The implementation of Artificial Intelligence (AI) in airline call centres is a move towards a new hybrid model that changes from a technological support system to a workforce that is supplemented by AI. The success of this integration depends on two factors: human intelligence, which provides a level of empathy and complex problem-solving that AI cannot provide; perceived ease of use, which ensures the adoption of AI by ensuring that it is easy to use; perceived usefulness, which ensures that both the workforce and the consumer are aware of its value as a tool for increasing productivity and round-the-clock support. By upskilling the workforce, airlines can harness the power of AI while still being committed to the human aspect that is required for customer satisfaction.

Future Direction and Limitation

Future research should involve a larger and more diverse sample, including additional AI adoption factors beyond TAM, and adopt a longitudinal approach to provide a more comprehensive understanding of AI implementation in the airline industry, increase customer satisfaction, and improve operational cost-effectiveness.

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Sustainable Digital Healthcare: A Systematic Literature Review on E-Service Quality and Customer Satisfaction

Nurkhairun Shuhada Razali[1], *Nazura Mohamed Sayuti[1], Muhammad Hafizi Zamri[1], Siti Norida Wahab[1], Aimi Anuar[2]
[1]Faculty of Business and Management, University Teknologi MARA, Selangor, Malaysia
[2]Faculty of Business Management and Professional Studies, Management and Science University (MSU), Selangor, Malaysia
Email: khrnrzli@gmail.com, *nazura139@uitm.edu.my, muhamm9811@uitm.edu.my, sitinorida23@uitm.edu.my, aimi_anuar@msu.edu.my
Corresponding Author: Dr Nazura Mohamed Sayuti

Abstract: This study investigates the impact of e-service quality on customer satisfaction in private hospitals in the Arab world. As more medical service providers rely on e-services to improve patient experience, it is essential to study the determinants of satisfaction with the aim of identifying the e-service quality factors predicting customers' satisfaction with services of private hospitals. A cross-sectional study was conducted among 300 outpatients who had experienced the hospital services using a 5-point Likert scale to rate their experience on different dimensions of e-service quality. The data were analyzed through various statistical methods such as reliability analysis to find the reliability of measurement scales, descriptive statistics to present the demographic and service-related characteristics, correlation analysis for hypothesized relationships, and multiple regression analysis to identify significant relationships and the strongest determinant. It was found that website design, responsiveness, security, and reliability contributed positively and significantly to patient satisfaction among those who accessed e-services rendered by the private hospitals in Klang Valley. These elements underscore the necessity of easy to navigate, safe, and responsive web-based services within the healthcare environment. On the other hand, dimensions such as reliability, enjoyment, ease of use, and customization were insignificantly related to the patient's satisfaction. This research report offers useful knowledge to the provider of healthcare services that enhancing investment in website design, response time and security can greatly improve patient satisfaction with e-services. The results provide actionable implications for enhancing the digital service in private hospitals, which improves the patient experience and service quality in return.

Keywords: *E-Service Quality, E-SERVQUAL, Customer Satisfaction, Private Hospital, Healthcare Industry.*

1. Introduction and Background

Without overcoming substantial challenges, the globe would have been unable to traverse the current pandemic. The global pandemic has shaken the world, and people are still adjusting to their new normal. The loss of life has caused concern and tragedy (Juliet Orji et al., 2022). Given the virus's quick spread and widespread impact, the implications of this disaster may far outweigh anything witnessed in recent history. As the scientific community prepares for essential prevention measures and long-term recovery, the business and management sectors must deal with the economic consequences. The recession has not only left many businesses barely alive, but it has also prompted them to pursue new strategic directions. Even huge firms have had substantial hurdles in this environment. On the other hand, innovation has become critical for organisations to create new business models in order to survive the crisis (Bouncken et al., 2021). With the rise and popularity of online technologies, businesses have created websites to reach a larger audience. The growth of internet applications has had a significant impact on several businesses, including the private hospital industry.

Traditionally, hospitals rely on common hospital services to stay in business, providing services such as medical check-up packages, appointment scheduling, insurance verification, and promoting special events to their customers. In recent years, the internet has grown in popularity, allowing for low-cost, direct contact from nearly anyone, converting the global economy into a more integrated and competitive environment. According to Al-Hawary & Al-Smeran (2017), the competitive global market and cognitive explosion have fuelled the growth of websites and online services, necessitating an emphasis on e-service quality. The notion of electronic service quality (E-SERVQUAL) has grown in importance, making it easier to provide superior services via

websites by assuring user-friendliness, efficiency, and access to necessary information. However, quantifying service quality in e-services remains more difficult than in real commodities sold in shopfronts (Van Dat, 2020). The first attempts to quantify service quality were made by Parasuraman et al. (1985).

Healthcare is one of the fastest expanding areas in the service economy (Andaleeb, 2001; Dagger et al., 2007). Although giving health services via the internet is becoming increasingly popular, as observed by Sun et al. (2016), little empirical research has been conducted in this field. There are seven private hospitals in the Shah Alam area, each of which provides e-services such as appointment booking through their websites, e-consultations with doctors at set times, and video chats for advice or counselling. E-services were not previously prevalent in the private hospital sector, but the current scenario has caused a shift in focus. Moore et al. (2022) report patients being more reluctant to visit healthcare facilities for routine medical consultations during the COVID-19 pandemic as a result of fears of infection. Hospitals upgraded their online platforms and websites to allow patients to quickly access critical information and services of health care as the need for digital health care services became evident.

2. Literature Review

Web Design: The Internet has rapidly grown into a commercial channel. A previous study mentioned a relationship between web design and customer satisfaction (Rita et al., 2019). Efficiency is rising, and companies are questioning what to do to get the best results. The starting point of the answer is to understand what the user wants. A large amount of research has focused on the factors that influence the success of e-commerce websites from a user perspective (Hendricks & Mwapwele, 2024; Ramya N & Kowsalya A, 2019). Many studies have identified web design as critical for good interface development to meet users' needs (Smits & van Turnhout, 2023). Good design is relevant for companies to survive in a highly competitive market.
H1: Web design has a positive relationship with customer satisfaction towards private hospital services.

Responsiveness: Past studies mentioned a positive relationship between responsiveness and e-service (Nandankar et al., 2023; Younus et al., 2011). Customer service refers to the level of service and policies for handling returns during and after sales. Offline businesses always have staff who assist customers during the purchase process (Grewal et al., 2023). In online businesses, users do the whole purchasing process independently without the help of customer service (Hossain et al., 2024; Umar & Uddin, 2011). Some online companies provide customer service that allows customers to request more detailed information about the product they want to purchase (Toha & Supriyanto, 2023).
H2: Responsiveness has a positive relationship with customer satisfaction towards private hospital services.

Reliability: Reliability is defined as the ability to consistently deliver the expected standard, how the organization handles customer services, first performing the right services, providing services within the promised time, and maintaining a record free of errors (Sunny et al., 2024). The requirement and technical reliability of the private hospital e-service environment are equated with reliable, functional design also suggests that the quality of service should include service output uniformity around an ideal customer-determined target value (Kang, 2019; Nguyen et al., 2021). The changing needs of private hospital need to be addressed predictably and consistently, such as the website crash or the changing of the hospital emergency number to call.
H3: Reliability has no relationship with customer satisfaction towards private hospital services.

Enjoyment: The enjoyment construct refers to how using the new technology is perceived to reinforce its right, apart from any performance consequences that may be anticipated (Camilleri, 2024; Teo & Noyes, 2011). This supports the idea of the dual characterization of consumers' motivations, which describes consumers as either problem-solvers or seekers of fun, fantasy, sensory stimulation, and enjoyment (Chow & Zhan-Ming, 2017; Fowler, 2022).
H4: Enjoyment has no relationship with customer satisfaction towards private hospital services.

Ease of Use: Studies found that the perceived ease of use is the degree to which a person accepts as accurate that it would be at no cost to that person to use an exacting method (Addison & Addison, 2021). Likewise, Zeithaml et al. (1996) stated that it is possible to consider the degree to which an innovation is easily

understood or used as perceived ease of use. Correspondingly, Zhang et al. 2017) noted that perceived ease of use refers to the ability of customers to experiment with innovation and quickly evaluate its benefits; the paper also stated that the drivers of growth in electronic services are determined by the ease-of-use dimension, which is a combination of convenience provided to those with easy internet access and the availability of safe, high availability.
H5: Ease of use has no relationship with customer satisfaction towards private hospital services.

Security: Every day, websites get hacked. Every day, the numbers continue to increase, and the importance of website security is constantly growing. Every day, it becomes increasingly essential to be secure online, and it is vital to protect the website and the information it retains. Security refers to the security of credit card payments and the privacy of shared data (Andala, 2019; Kleisiari et al., 2021). Web security keeps hackers and cyber thieves from accessing sensitive information. To improve the integrity and quality of website services, websites must emphasize security and security that privacy and security must feature on effective websites (Beheshtifar, 2015; Ojambo, 2020). In other industries, such as online shopping, customers must enter personal data, such as name, address, contact number, and credit card information, when purchasing items from online websites.
H6: Security has a positive relationship with customer satisfaction towards private hospital services.

3. Research Methodology

This study utilized a stratified random sampling method to obtain a sample of 300 respondents from a population of 4,200 outpatients occupying beds in private hospitals in Klang Valley. A stratified random sample was selected to guarantee appropriate representation of diverse client backgrounds. Data were gathered using a standardised questionnaire sent using Google Forms, employing a five-point Likert scale to record replies (Jalagat & Bashayre, 2017, Jafri et al., 2020). The questionnaire, evaluated and sanctioned by academic experts, was created to meet the research objectives and guarantee clarity for participants. The gathered data were examined utilising SPSS version 26, applying frequency distribution, descriptive analysis, reliability analysis, correlation analysis, and regression analysis to assess the correlations between e-service quality aspects and customer satisfaction. Descriptive statistics, such as mean, standard deviation, and frequency, were computed to summarise the study variables.

4. Results

This section presents sets of results relating to the profile of respondents' experiences towards network operators, the characteristics of the total sample, and the comparison of participants regarding their experience based on the demographic characteristics (gender, education level, marital status, race and job title).

Profile of Respondents: Table 1 displays a summary of the characteristics of the total sample of customers or subscribers who participated in the study.

Table 1: Demographic and Geographic Information About Respondents (n=300)

Demographic	Categories	Frequency	Percentage (%)
Gender	Male	147	49.0
	Female	153	51.0
Education Level	SPM	3	1.0
	Diploma	51	17.0
	Bachelor's degree	166	55.3
	Master's Degree	82	26.7
Age	18-25 years old	82	27.3
	26-35 years old	107	36.0
	36-45 years old	59	19.7
	46-55 years old	46	15.0
	56 years old and above	6	2.0
Marital Status	Single	121	40.3
	Married	179	59.6

Race	Malay	179	59.6
	Chinese	57	19.0
	Indian	59	19.7
	Bumiputera	2	0.7
	Non-Bumiputera	3	1.0
Job Title	Student	70	23.3
	Civil Servants	81	27.0
	Non-Government	146	48.7
	Retiree	3	1.0

Descriptive Statistics: Table 2 presents the descriptive analysis of seven variables: customer satisfaction, web design, responsiveness, enjoyment, reliability, ease of use, security, and customization.

Table 2: Descriptive Statistics

	Descriptive Statistics		
Variables	**Factor Name**	**Mean**	**Std. Dev.**
CS	Customer satisfaction	4.2829	.80286
WD	Website design	4.3286	.77144
RS	Responsiveness	4.2971	.78499
EJ	Enjoyment	4.3219	.78996
RB	Reliability	4.3279	.76901
EU	Ease of use	4.3529	.73507
SC	Security	4.3190	.74829
CM	Customization	4.3310	.75975

The descriptive analysis table shows the mean and standard deviation values for seven e-service quality variables. Ease of Use has the highest mean (4.3529), indicating that users found it relatively easy to use, with a low standard deviation (0.73507), showing consistent responses. Customer Satisfaction has the lowest mean (4.2829) and the highest standard deviation (0.80286), indicating more variability in satisfaction levels among respondents. Website Design and Customization also scored highly in terms of mean values, showing they are important factors for users, while Reliability and Security had slightly lower variability, implying consistent perceptions across these dimensions.

Multiple Regression Analysis: Tables 3 and 3a present the multiple regression. Regression analysis is used to identify whether there is a significant relationship between dependent and independent variables. Regression analysis is a reliable technique used to determine which variables influence a selected question. The regression procedure enables you to confidently establish which variables are most important, which factors may be ignored, and how these factors interact.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.899[a]	.808	.804	.35565
Predictors: (Constant), TWD, TRS, TEJ, TEU, TSC, TCM				
Dependent Variable: TCS				

Table 3a: Multiple Regression Analysis-Coefficients

Model	Standardized Coefficients Beta	t	Sig.
Website Design	.275	4.669	.000
Responsiveness	.359	4.525	.000
Enjoyment	-.086	-.963	.336
Reliability	.069	.811	.418
Ease of Use	.074	1.043	.298
Security	.251	3.358	.001

Customization	.275	.826	.409
R Square .808			
Adjusted R Square .804			
F change 206.117			

Note: p <0.01 (**)

The multiple regression analysis in the table demonstrates how numerous factors influence the dependent variable, TCS (Total Customer Satisfaction). The model has a good explanatory power, with an R-squared value of 0.808, indicating that the independent variables account for about 80.8% of the variance in TCS. Responsiveness has the strongest positive impact on TCS, with a standardised coefficient (Beta) of 0.359 and a statistically significant result ($p < 0.001$). Website design and security had significant positive benefits, with Beta values of 0.275 and 0.251, respectively. Overall, the model is statistically significant (F-change = 206.117), and the study identifies responsiveness, website design, and security as the significant predictors of customer satisfaction towards private hospital services.

Discussion

This study examined the factors that influence the performance of e-services in private hospitals, focusing on the relationship between customer satisfaction (the dependent variable) and seven independent variables: website design, responsiveness, reliability, enjoyment, ease of use, security, and customization. Among the seven variables, responsiveness emerged as the most significant predictor of customer satisfaction, with the highest beta coefficient ($\beta = 0.359$). This result suggests that the timeliness and effectiveness of responses to patients' needs play a crucial role in shaping their overall satisfaction. Website design also demonstrated a significant influence on satisfaction (sig. = 0.000), highlighting the importance of an appealing and user-friendly interface in enhancing the patient's online experience. Furthermore, security was identified as another key determinant (sig. = 0.001), as patients are more likely to feel comfortable and confident when their personal and medical information is securely protected during online transactions. In contrast, the variables reliability, enjoyment, ease of use, and customization did not show a statistically significant impact on customer satisfaction. The lack of significance for reliability may suggest that patients are dissatisfied with the content provided on the private hospitals' websites, particularly with respect to outdated or incomplete information, such as updates on critical services like COVID-19 vaccinations. Addressing this issue by providing more frequent updates and improving the quality of essential information may enhance user perceptions of reliability.

Similarly, customization was not a major contributor to satisfaction, possibly because many healthcare services require patients to consult a doctor before customizing their options. The negative beta coefficient for enjoyment ($\beta = -0.086$) suggests that increasing the entertainment or enjoyment aspects of e-services may not be relevant to improving patient satisfaction in a healthcare context. Overall, the findings indicate that responsiveness, website design, and security are the most important factors driving patient satisfaction with e-services in private hospitals. These results suggest that healthcare providers should prioritize improving their response mechanisms, enhancing website design, and ensuring stringent security measures to elevate the overall patient experience. The study tested seven hypotheses to evaluate the influence of these factors on customer satisfaction. The regression analysis confirmed the acceptance of hypotheses related to responsiveness, reliability, and customization, while the hypotheses concerning enjoyment, ease of use, and reliability were not supported. Among all the variables, responsiveness had the most substantial influence on patient satisfaction, particularly in the context of private hospitals.

5. Theoretical, Managerial Implications and Recommendations

This study reveals that web design, responsiveness, and security are three independent factors that are highly associated with e-service performance, while reliability, enjoyment, ease of use, and customisation are not. The findings highlight the importance of web design in engaging consumers with an attractive image and layout. Responsiveness is important, as consumers want numerous options to contact the company, such as live chat and call centers, to answer their questions. Security is an important factor because individuals are confident that their private information is protected when making online transactions.

This research presents theoretical and managerial implications with which Private Hospitals in Klang Valley can enhance their e-service quality. The findings refine the measuring scales for e-service quality and provide insight into reliability, enjoyment, usability, and customization as areas that need improvement. These findings in turn can be used by managers and marketers to more effectively allocate resources toward the components that shape users' perceptions of their own e-service quality, which in turn will help with attracting and retaining customers. The research highlights the importance of critical factors, such as security, in safeguarding customers' credit card details while transacting.

Private hospitals can improve patient satisfaction by addressing security concerns and making their online services easier to use. Features such as live chat and options for sharing feedback can help create a smoother experience. Offering rewards, including discounts for patients who share their experiences, may also encourage word-of-mouth recommendations and bring more visitors to hospital websites. Future studies could extend beyond Shah Alam to include other parts of the Klang Valley and examine both public and private hospitals. Comparing online service quality across the two sectors, or exploring other factors that influence patients' experiences, could lead to a fuller understanding of the topic. The findings may help hospitals build online platforms that are efficient, user-friendly, and better suited to patients' expectations.

Conclusion

To conclude, this research provides valuable information regarding the key factors influencing e-service performance in the context of private hospitals, mainly on the aspect of customer satisfaction. Several factors were identified through multiple regression analysis, of which timeliness, website design, and security have the greatest impact on customer satisfaction. Responsiveness, with the largest beta value, highlights the importance of quick and efficient answers to patients' queries, suggesting hospitals give more attention to upgrading communication systems (e.g., through live chat or help desks) to enhance the patient experience. Website design is also a substantial contributor to satisfaction, meaning that it is necessary for hospitals to develop user-friendly and visually attractive online sites that facilitate use and patient interaction. Security is a factor, too, as individuals want to feel their personal and medical information is protected when it exchanges hands online, particularly in the highly regulated healthcare environment. However, reliability, enjoyment, convenience of use, and customisation were not found to be significant predictors of consumer satisfaction in the present study. Non-significance in reliability also means that provision of accurate and current information is required on the hospital website. Likewise, the negative beta of enjoyment indicates that the entertainment aspects may not enhance satisfaction in the context of healthcare, as patients tend to prioritize the functional aspects of the service over fun. This research is quite challenging for healthcare practitioners. Private hospitals, on the other hand, can leverage the data to prioritize their resources to focus more on enhancing their response systems by increasing the website's usability and implementing robust security protocols. By focusing on these key areas, hospitals can increase patient satisfaction and engagement, and create a loyal patient base. Future studies may also consider generalizing to other regions and different types of hospitals to gain further insight into the performance of e-service in other healthcare service context. In summary, the results highlight the significance of responsiveness, website design, and security in enhancing patient satisfaction and thus guide private hospitals to improve e-service in meeting consumer expectations of e-HC in the digital healthcare environment.

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Artificial Intelligence and Consumer Purchase Behavior: A Bibliometric Analysis of Research Trends and Emerging Directions

Zatul Fahany Harun
Faculty of Business and Management, Universiti Teknologi MARA, Puncak Alam Campus, Selangor, Malaysia
Email: zatulfahany@uitm.edu.my, fahany11@gmail.com

Abstract: This study maps the academic research landscape on artificial intelligence (AI) and consumer purchase through a bibliometric analysis of Scopus-indexed journal articles from 2020 to 2025. A structured search of titles, abstracts and keywords in Scopus yielded 343 journal articles after excluding conference proceedings, book chapters and other source types. We examined the corpus along five dimensions: document and source types, the evolution of published studies since 2020, the distribution of subject areas, keyword co-occurrence, and citation metrics for highly cited articles. The publication output grew gradually from 2020 to 2023 and increased significantly from 2024 onwards, with 2025 recording the highest number of publications. This growth coincides with the mainstreaming of conversational AI and the advent of generative AI. The field is interdisciplinary, spanning business and management, computer science, the social sciences, psychology and decision sciences. Keyword co-occurrence analysis indicates that purchase intention, consumer behavior, marketing and sales are the conceptual anchors and the most cited articles focus on technology acceptance, trust, chatbot purchase intention, virtual influencer marketing and environmental sustainability. This study provides a quantitative map of the literature on AI and consumer purchase for 2020-2025 and highlights the dominant role of trust and perceived value in the literature, as well as open questions about long-term effects and cross-cultural generalizability.

Keywords: *Artificial intelligence, consumer behavior, purchase decision*

1. Introduction

The intersection of artificial intelligence (AI) and consumer behavior has become an increasingly important area of marketing research. In the last two decades, machine learning, natural language processing, and more recently, generative AI have revolutionized how firms interact with consumers and how consumers form purchase intentions, from personalized recommender systems and conversational chatbots to virtual influencers and AI generated material (Davenport et al., 2020). Traditionally, consumer purchase behavior is understood through rational and effective decision-making models. However, purchase behavior is mediated by algorithms that predict needs, personalize offers, and even act on behalf of consumers (Dellaert et al., 2020). In the Malaysian context, the integration of AI into the digital sphere has become increasingly important, particularly in e-commerce and customer interaction. Previous studies have explored various ways in which AI influences consumer purchasing behaviour. Abdullah et al. (2024) examined how consumer purchase intentions are impacted by AI tools and personalisation marketing in the Malaysian e-commerce industry. Similarly, Kanapathipillai et al. (2024) explored how AI can help improve personalisation, trust, convenience and service quality for Malaysian consumers. This shows the increasing academic interest in AI powered technologies and how they will impact consumer purchasing behaviour. Understanding the global research landscape surrounding AI and consumer purchasing behaviour can help identify new trends, key contributions and potential research areas within this field. The academic response has been rapid and interdisciplinary.

AI and consumer purchase research are now dispersed across marketing, consumer psychology, information systems, human-computer interaction and business ethics, resulting in a vast and fragmented collection of published work (Dwivedi et al., 2021). Growth accelerated sharply from 2020 onwards, driven by advances in conversational and generative AI and the rapid expansion of digital commerce. However, the breadth and speed of publication make it difficult to understand the overall structure of the field through a conventional narrative review. Bibliometric analysis helps to overcome this problem by quantitatively mapping the intellectual and social structure of a research domain to identify its most influential works, thematic clusters and the evolution of its vocabulary over time (Donthu et al., 2021). This research performs a bibliometric analysis of AI and consumer purchase research. The analysis limits the corpus to journal articles indexed in Scopus from 2020 to 2025 and excludes conference proceedings, book chapters, and other source types. A structured query of titles, abstracts, and keywords led to a final set of 341 documents, which form the analytical basis of this paper. The

findings are classified into five analytical sections: (i) types of documents and sources, (ii) evolution of publications from 2020, (iii) subject areas, (iv) keyword co-occurrence analysis and (v) citation metrics of highly cited articles. Together, the components give a general map of the academic landscape of AI and consumer purchase research for the period.

2. Literature Review

Artificial Intelligence and Consumer Purchase Behavior

The application of artificial intelligence (AI) in marketing and consumer-related contexts has revolutionized the way customers seek information, evaluate alternatives, engage with organizations, and make purchase decisions. The use of artificial intelligence (AI) in marketing and consumer-related contexts has transformed the way consumers search for information, evaluate alternatives, interact with firms and make purchase decisions. The early work conceptualized AI as a generic technological development with implications for marketing strategy and consumer behavior. The effect of AI on marketing depends on variables such as the level of intelligence, the task accomplished, and whether the technology is incorporated into a physical product, claim Davenport et al. (2020). They also expressed concern about privacy, bias and ethics. Likewise, Dwivedi et al. (2021) defined AI as an interdisciplinary field of business, management, social science, government and technology. These studies provided an important basis for future research on the influence of AI-enabled technologies on consumer decision-making and purchase outcomes.

Subsequent research has demonstrated that the relationship between AI and consumer buying is influenced by both the technology's capabilities and how consumers respond to AI interactions. Artificial intelligence can help reduce the effort of information search, provide product recommendations, offer personalized assistance and support consumers through different stages of decision-making. Dellaert et al. (2020) argued that AI-enabled voice assistants are changing traditional online decision-making by introducing conversational and voice-based interactions. Other empirical studies have found that consumers' responses to AI-mediated purchasing can be related to usefulness, ease of use, trust, interactivity and social presence. Hsieh and Lee (2021) used data from 391 smart-speaker users to find that media richness and parasocial interaction had a significant positive effect on trust, perceived usefulness, and perceived ease of use, which in turn were associated with continuance intention and online purchase intention. Yen and Chiang (2021) also found that credibility, competence, anthropomorphism, social presence, and informativeness affected trust in chatbots, which in turn affected purchase intention. These studies suggest that the influence of AI on purchasing is not limited to automation. The characteristics and quality of the interaction between consumers and AI agents also matter.

Another strand of research considers AI as a social and relational agent rather than simply a tool for processing information. AI technologies can provide human-like interaction as well as emotional, social, and informational support. Kim et al. (2022) found that human likeness and attachment were associated with perceived interactivity and purchase intention among users of AI speakers. Lee et al. (2022) found that social support from the chatbot was related to interactant satisfaction, affective attachment, and purchase intention. These findings indicate that consumers may respond to AI partly according to how socially interactive and relational technology appears to be. Similar patterns have been reported in research on voice-assisted shopping. Kautish et al. (2023) found that functional, hedonic, social, and cognitive motivations were associated with purchase-related outcomes, while experiences such as awe and electronic word-of-mouth may also help explain these relationships. The effects of AI on consumer purchasing can also vary according to consumer and contextual factors. Zhu et al. (2022) found that certainty about consumer needs influenced chatbot acceptance through perceived effectiveness, with the relationship varying across product types. In the travel context, Zhu et al. (2023) examined how AI chatbot interactivity and information quality influence consumer trust and purchase intention.

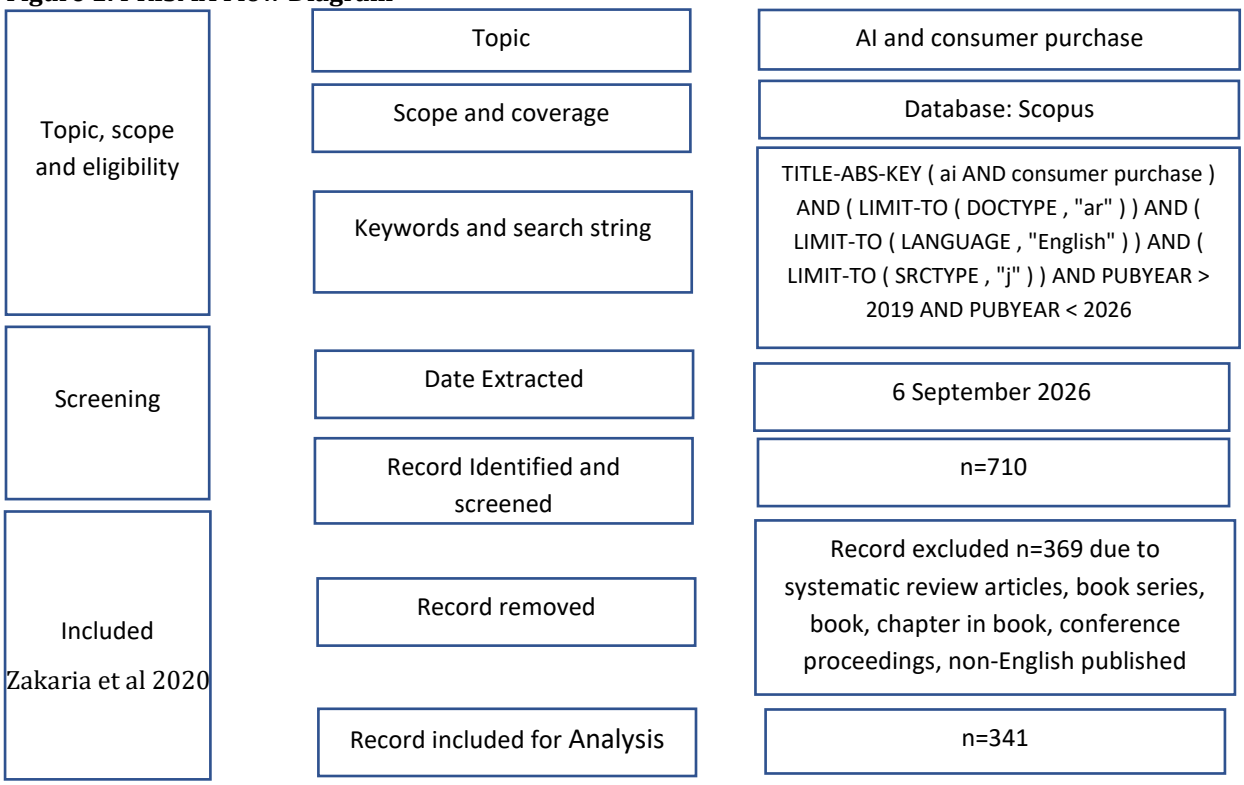
The most recent research expands into virtual influencers and generative AI. Kim et al. (2024) examined how virtual influencers' form realism and behavioral realism shape consumer ambivalence and marketing performance. Gerlich (2023) found that virtual influencers are increasingly perceived as trustworthy and credible, raising purchase intention among 357 survey respondents. In the fashion domain, Sohn et al. (2020) showed that consumers are willing to pay a premium for GAN-generated fashion products, and that this is most pronounced when the use of GAN technology is not disclosed, raising a question about transparency. Two more

streams extend the field beyond functional purchase drivers. On morality, Garvey et al. (2023) found that consumers are more positive toward negative offers made by an AI, partly because AI agents are perceived as lacking selfish or benevolent intentions. Giroux et al. (2022) found that consumers have lower moral intention, such as reporting errors at checkout, toward machines than toward humans. In terms of sustainability, Frank (2021) discovered that consumers are more likely to buy AI-enabled products that offer both static and autonomous environmental benefits, but that the effects of this vary by product type, geography, and individual consumers.

3. Methodology

The PRISMA flow diagram of the data retrieval procedure used in this bibliometric analysis is presented in Figure 1. The review starts by defining its scope in terms of two key constructs, "artificial intelligence" and "consumer purchase". These constructs set conceptual boundaries for the study and guide the following phases of the literature search and selection process. The search was conducted using Scopus, a multidisciplinary bibliographic database. The query was applied without field restriction ("all fields"), so records were retained in which the search terms appeared in the title, abstract or keywords of a document. Three further limits were applied; the publication window was restricted to 2020-2025, the document type to journal articles, and the language to English. The following search string was used: TITLE-ABS-KEY (ai AND consumer purchase) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j")) AND PUBYEAR > 2019 AND PUBYEAR < 2026. The search was executed on 6 September 2026 and returned 710 records, all of which advanced to the screening stage. At screening, 369 records were removed, records outside the conceptual scope and non-qualifying document types, leaving the final analytic corpus. Because the query required both constructs to co-occur within the same searchable metadata fields and applied the document-type and language limits at source, the initial retrieval was already tightly focused, and relatively little manual filtering was needed beyond screening. The procedure is made systematic, visible and replicable by presenting the search strategy through a flow diagram, with the volumes at each stage, enabling future researchers to reproduce the analysis under the same criteria or to extend it to other databases.

Figure 1: PRISMA Flow Diagram



4. Results

The findings of the bibliometric analysis are presented across five main areas: document and source types, trends in publications since 2020, the distribution of subject areas, keyword co-occurrence patterns, and citation performance of the most highly cited articles. Collectively, these elements provide a general picture of the academic terrain of AI and consumer purchase research during the study period.

Types of documents and sources

The advantages of restricting the corpus to journal articles indexed in Scopus, in terms of credibility, quality control and topical fit, are clear. Scopus uses formal selection criteria and an ongoing re-evaluation process by an independent advisory board to accept content; therefore, its indexed articles are peer-reviewed, methodologically vetted, and demonstrably citable contributions to the scholarly record (Baas et al., 2020). Journal articles are thus a sound basis for a bibliometric inquiry, as they typically offer the complete reporting of methods and findings required for a focused review. The review is limited to journal articles, excluding grey literature, conference proceedings, industry reports or practitioner commentary; and there is no single index that is comprehensive. Large-scale comparisons of bibliographic databases confirm that all major sources have gaps in their coverage, which is why comprehensive coverage and flexible filters should be used in tandem when assembling a corpus (Visser et al., 2021). Therefore, the current analysis may lack applied perspectives, real-time industry developments, and emerging trends that have not yet entered the peer-reviewed literature.

Development of published studies

The first years of the window saw modest publication activity on AI and consumer purchase. Between 2020 and 2023, the field saw a period of slow but steady growth, with less than thirty articles per year, reflecting limited early academic endeavours. The initial low output can be explained by two contextual factors: the multidisciplinary challenges of AI across business, government and science were being mapped (Dwivedi et al., 2021), and the transformative potential of AI for marketing strategy and customer behaviour was only being theorised in mainstream marketing journals (Davenport et al., 2019), so the field had just begun to crystallise as a distinct research area. The number of publications started to increase rapidly after 2024. The year 2025 was found to have the highest number of publications (189 articles; 55.4%) in the corpus. The acceleration is consistent with the mainstreaming of conversational AI and the rise of generative AI and virtual influencers as consumer-facing technologies, which brought renewed scholarly interest in how specific AI agents affect purchase decisions (Gerlich et al., 2024). Table 1 presents the yearly spread of scholarly publications on Ai and consumer purchase from 2020 to 2025, offering useful insights into the evolution of academic interest in the field.

Table 1: Distribution of Academic Publications

Year	Documents	Percentage
2025	189	55.4%
2024	72	21.1%
2023	28	8.2%
2022	25	7.3%
2021	19	5.6%
2020	8	2.3%
Total	**341**	**100%**

Distribution by Subject Area

The interdisciplinary nature of the field is demonstrated by the distribution of publications on AI and consumer purchase across subject areas. Table 2.0 shows the distribution of publications on AI and consumer purchase across different subject areas, giving insights into the interdisciplinary nature of the field. Business, Management and Accounting shows the highest research concentration with 184 publications (27.6%), which is expected as purchase behaviour is central to management and marketing scholarship. Computer Science is the second prominent area, corresponding to the technical foundations of artificial intelligence systems, with 107 publications (16.1%), followed by Social Sciences (13.5%) and Economics, Econometrics and Finance (7.1%), together with Psychology (5.4%) contributing behavioural theory and Engineering (5.3%) contributing

system design perspectives. The addition of Decision Sciences (5%) indicates the field's reliance on modelling and optimisation approaches. Environmental Science, the least contributing at (3%) and Arts and Humanities at (2.3%) indicate nascent or peripheral interest in AI and consumer purchase from sustainability and cultural angles respectively, a trend that reflects the growing interest in AI-enabled environmental benefits in consumer research (Frank, 2021).

Table 2: Distribution of subject areas

Subject area	Total publications	Publication (%)
Business, Management and Accounting	184	27.6
Computer Science	107	16.1
Social Sciences	90	13.5
Economics, Econometrics and Finance	47	7.1
Psychology	36	5.4
Engineering	35	5.3
Decision Sciences	33	5.0
Environmental Science	20	3.0
Arts and Humanities	15	2.3
Energy	16	2.4
Others	73	12.5

Co-occurrence analysis of keywords

The most frequently used author keywords offer insight into the central themes, conceptual priorities and changing research directions of the AI and consumer purchase literature. Unsurprisingly, the term "artificial intelligence" appears in 140 publications, reaffirming its role as the anchor concept around which the research is structured. The second most prominent keyword is "Purchase intention", appearing in 61 publications, followed by "Consumer behavior" in 35 publications, "Consumption behavior" in 28 publications and "Sales" in 29 publications. This keyword structure mirrors the empirical literature: purchase intention is the field's dominant dependent variable (Yin & Qiu, 2021; Yen & Chiang, 2021), consumer behavior is examined through engagement and usage frameworks (Hsieh & Lee, 2021; Kautish et al., 2023) and the marketing and sales focus is carried by studies of chatbots and voice assistants as promotional and transactional agents (Lee et al., 2022; Zhu et al., 2023). Table 3 outlines the most frequently used author keywords in the corpus of AI and consumer purchase literature.

Table 3: Top Keywords

Keywords	Total Publications (TP)
Artificial intelligent	140
Purchase Intention	61
Consumer Behavior	35
Consumption behavior	28
Sales	29
Purchasing	28
Marketing	25

Citation metrics of highly cited articles

Citation analysis was performed using the Scopus citation overview. Table 4 reports the citation record for the articles published between 2020 and 2025. The journal count of 315 is in the citation overview due to some articles lacking citation data.

Table 4: Citation Metrics

Metrics	Data
Publication years	2020-2025
Citation years	5
Paper	315

Citation papers	10428
h-index	54

The ten most cited articles

The most cited publications on AI and consumer purchase from 2020 to 2025 are presented in Table 5. The table not only ranks scholarly impact but also highlights the key contributors that have shaped the field. The articles in this set have informed the theoretical accounts of how AI affects consumer purchasing as well as the empirical approaches that have been used to study it. Their insights have carried over into marketing strategy and consumer behaviour research.

Table 5: Highly cited articles

No	Author	Title	Year	Cites
1	Sohn, K., & Kwon, O.	Technology acceptance theories and factors influencing artificial Intelligence-based intelligent products	2020	604
2	McLean, G., Osei-Frimpong, K., & Barhorst, J	Alexa, do voice assistants influence consumer brand engagement? – Examining the role of AI powered voice assistants in influencing consumer brand engagement	2021	317
3	Garvey, A., Kim, T., & Duhachek, A.	Bad News? Send an AI. Good News? Send a Human	2023	299
4	Yen, C., & Chiang, M.-C.	Trust me, if you can: a study on the factors that influence consumers' purchase intention triggered by chatbots based on brain image evidence and self-reported assessments	2021	268
5	Sung, E., Bae, S., Han, D. I. D., & Kwon, O.	Consumer engagement via interactive artificial intelligence and mixed reality	2021	239
6	Yin, J., & Qiu, X.	AI technology and online purchase intention: Structural equation model based on perceived value	2021	203
7	Giroux, M., Kim, J., Lee, J. C., & Park, J.	Artificial Intelligence and Declined Guilt: Retailing Morality Comparison Between Human and AI	2022	186
8	Klaus, P., & Zaichkowsky, J. L.	AI voice bots: a services marketing research agenda	2020	182
9	Kim, I., Ki, C.-W. C., Lee, H., & Kim, Y.-K.	Virtual influencer marketing: Evaluating the influence of virtual influencers' form realism and behavioral realism on consumer ambivalence and marketing performance	2024	171
10	Frank, B.	Artificial intelligence-enabled environmental sustainability of products: Marketing benefits and their variation by consumer, location, and product types	2021	159

The most cited article in the dataset is "Technology acceptance theories and factors influencing artificial Intelligence-based intelligent products" by Sohn and Kwon (2020) with 604 citations. This study addressed the fundamental question of which theoretical model is most appropriate for explaining consumer acceptance of AI products.

Another article is "Alexa, do voice assistants influence consumer brand engagement? Examining the role of AI powered voice assistants in influencing consumer brand engagement" by McLean et al. (2021) with 317 citations. Other publication "Bad News? Send an AI. Good News? Send a Human" by Garvey et al., (2023) with 299 citations. Next article: "Trust me, if you can: a study on the factors that influence consumers' purchase intention triggered by chatbots based on brain image evidence and self-reported assessments" by Yen and Chiang (2021) with 268 citations.

Sung, Bae, Han and Kwon (2021) are highly cited with 239 citations because they study AI engagement in a fully immersive, real-world retail setting: a large AI-embedded mixed reality exhibit in a retail and entertainment complex. Articles on "AI technology and online purchase intention: Structural equation model based on perceived value" by Yin and Qiu (2021) have 203 citations. Giroux et al. (2022) rank highly with 186 citations on "Artificial Intelligence and Declined Guilt: Retailing Morality Comparison Between Human and AI

". Klaus and Zaichkowsky (2020) are highly cited with the article "AI voice bots: a services marketing research agenda" with 182 citations.

Next, Kim et al. (2024) attract high citations with 171 citations for the article "Virtual influencer marketing: Evaluating the influence of virtual influencers' form realism and behavioral realism on consumer ambivalence and marketing performance ". Frank (2021) ranks among the top ten because it connects AI and consumer purchase to environmental sustainability, a dimension largely absents from the rest of the corpus with 159 citations. This article is widely cited because it shows that environmental benefits of AI are themselves a purchase driver, expanding the field beyond functional and hedonic value (Sohn et al., 2020).

Discussion

The body of Scopus-indexed literature identified in this review indicates a broadening research landscape at the intersection of artificial intelligence (AI) and consumer purchase behavior between 2020 and 2025. Early studies examined the applicability of established technology-acceptance frameworks to AI-based products and their implications for purchase intention (Sohn & Kwon, 2020), while subsequent research increasingly investigated consumer responses to specific AI-enabled applications, including voice assistants (McLean et al., 2021), chatbots, interactive AI and mixed reality (Sung et al., 2021).

More recent studies have further extended this research stream to emerging AI-mediated marketing contexts, such as virtual influencers, where characteristics such as form and behavioral realism have been examined in relation to follow and purchase intentions (Kim et al., 2024). Overall, the literature reflects a shift from examining general AI acceptance and its determinants toward more application-specific investigations of how AI-enabled technologies shape consumer engagement, attitudes, and purchase-related outcomes.

A notable geographic limitation of literature is the concentration of several empirical studies within specific national and market contexts. For example, Zhu et al. (2023) examined consumers who had used AI chatbots in online travel agencies in China, while Bilal et al. (2024) investigated Chinese social-media users with experience in online purchasing and AI technologies. Such concentration limits the extent to which existing findings can be generalized across national and cultural contexts.

In addition, the previous studies have paid less attention to the moral and ethical implications of AI-mediated consumption. There is evidence from previous research that shows customers react differently to human and AI agents when they are given positive or negative information (Garvey et al., 2023), that they experience lower levels of guilt and have weaker moral intentions when interacting with self-service technologies and AI (Giroux et al., 2022).

5. Conclusion and Recommendations

This study contributes to the growing literature on AI and consumer purchasing behaviors by providing a complete bibliometric analysis of the research landscape based on Scopus-indexed publications. A detailed overview of how the research topic has developed is provided by examining the different subject areas, key authors, keywords and citation analysis. Identifying current and emerging research trends can provide valuable information regarding the knowledge structure and potential future research opportunities.

From a policy perspective, the growing research interest in AI-driven consumer interactions highlights the need for appropriate policies and procedures to be put in place to help facilitate responsible and ethical use of AI in businesses. Policymakers should prioritise consumer data protection, privacy, transparency and ethical AI practices to strengthen consumer confidence in AI driven purchasing.

The findings suggest several areas for future research, including the need for longer-term evidence, wider cross-cultural representation and increased focus on the ethics of AI-mediated consumer decision-making. The results suggest that in practice, AI-enabled marketing should consider consumer trust, relevance, experiential value, and characteristics of the AI agent in the specific purchase context. The current analysis could be further extended in future bibliometric studies by incorporating additional databases and covering a longer publication period. The combination of techniques based on structural mapping and techniques based on

content could also provide a more detailed understanding of how this rapidly developing research field continues to evolve.

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