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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 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, which 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, UAE and Indonesia. Halal Literacy and Its Influence on Consumer Behavior, Social Capabilities and Corporate Zakat Commitment, Multiscale Transmission of Volatility Between Short and Long-Term Investment Preferences, Green Behavior in the Workplace, Malaysian Urban Citizens' Perspectives on Urban Farming for a Sustainable Future, Sustained "Internet of Things" (IoT) Use in Malaysian Smallholder Farming and Corruption, Public Spending as Predictors of Tax Evasion, Twelve Years of Corruption Perception Index and Evaluating The Effectiveness of Emerging Technologies in Enhancing Tax Compliance 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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Halal Literacy and Its Influence on Consumer Behavior: Factors Driving Food Purchase Decisions

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Abstract: This study investigates the purchase intention of halal food products and how halal literacy moderates the relationship in a consumer behavior study. Attitude, subjective norms, and perceived behavioural control influence purchase intention. Halal literacy is vital in determining purchase intention and consumer behaviour of halal food. Data will be collected from 190 Muslim consumers aged between 20 and 50 years with purchasing power. Screening questions will be used to engage suitable respondents. Data will be analysed for descriptive analysis, and relationships between the independent and dependent variables will be determined. The moderating factor of halal literacy will also be analysed. The findings will stress the importance of attitude, subjective norms, and perceived behavioural control in consumer behaviour and its relations with purchase intention. Halal literacy in halal food purchases will be a contributing factor for food marketers to enhance their significance in consumer behaviour, according to a study of halal product purchases.

Keywords: *Halal, Purchase Intention, Halal Food, Customer Behaviour, Halal Literacy*

1. Introduction

Consumer behaviour has been a crucial component of economics (Prabhu, 2020; Mehta et al., 2020; Paz & Vargas, 2023). Customers are considered actors in the marketplace in consumer behaviour studies (Darmawan & Gatheru, 2021). Thus, manufacturers focus on their customers rather than their products, and they closely observe customer behavior (Roy & Datta, 2022). Due to the growing Muslim population worldwide, products endorsed as halal are critically aimed at the markets (Muhamed et al., 2019). Therefore, consumer behaviour for halal products is an important component in market analysis and critical to the success of the halal market (Djunaidi et al., 2021).

Because Muslims adhere to the teachings of Islam and their beliefs influence their consumption habits, marketers made efforts to customise products and services to meet the needs and wants of the Muslim population (Temizkan, 2022). While the halal food industry is expanding, Purwanto et al. (2021) noted that a critical area that requires in-depth research is understanding consumers' buying intentions for halal food products. When choosing halal goods and services, consumer comprehension of religion plays a critical role (Ngah et al., 2020; Nurhayati & Hendar, 2020).

Islamic teaching emphasises the connection between consuming halal food and human development, especially in the area of the soul and knowledge (Marzuki et al., 2020). Ariffin et al. (2023) stated that food consumption should be assessed based on its effect on a person's personality, spirituality, and ability to worship. These abilities serve as the basis for the expression of halal literacy (Maryam & Sumar'in, 2022). Halal literacy can be defined as the capacity to distinguish between goods and services that are allowed (halal) and prohibited (haram), resulting from a more profound comprehension of Islamic shariah law (Salehudin, 2010). Individuals' halal literacy can increase their propensity to consume halal items (Suparti et al., 2019). Some researchers indicate that halal literacy significantly increases purchasing intention (Pratama & Hartati, 2021; Maryam & Sumar'in, 2022).

Globalisation has recently caused foreign cultures to penetrate Malaysia (Pawi et al., 2020). "Korean wave," also known as "Hallyu," describes a rise in the exposure of Korean culture abroad (Ing et al., 2018). Additionally, with the surge in the appeal of K-pop culture, the popularity of Korean cuisine has been rising, particularly across Asia (Amin et al., 2020). Ramadani et al. (2023) state that some Korean items still lack the halal

certification label. However, Muslims' knowledge of halal food significantly influences their propensity to purchase (Mutmainah, 2018). A buyer's likelihood of purchasing only halal goods rises if they are aware of halal practices (Amalia et al., 2020).

According to the Theory of Planned Behaviour (TPB), attitudes, subjective norms, and perceived behavioural control (PBC) all have an impact on intention, which shapes behaviour (Basir, 2021). Moreover, PBC results from people's control beliefs, and they tend to act in ways they can control. This theory holds that people's intentions lead to their actual behaviours (Yener, 2022).

Therefore, the study objectives are to investigate the impact of attitude, subjective norms, perceived behavioural control, and the desire to purchase halal food. The influence of halal literacy in moderating attitudes, subjective norms, and perceived behavioural control on intention will also be investigated. The goal is to determine whether Muslims have sufficient halal literacy to purchase halal products. Given that Korea is a non-Muslim nation, some consumers may believe that these items contain components that are forbidden (Choi & Jeong, 2020).

2. Literature Review

Consumer behavior

Consumer behavior (CB) is defined as the study of how people choose, get, use, and dispose of goods, experiences, ideas, and services to suit their requirements. Roy. Anderson & Golden (1984) defined CB as the psychological processes that customers go through to determine their needs and wants, and how to satisfy those needs. An understanding of consumer behaviour aids marketers in choosing between various products and brands (Hanus, 2018); different customers may react differently to the same product (Sundararaj, 2021). Understanding consumer behaviour is crucial to understanding what they believe, feel, and desire from items (Szmigin & Piacentini, 2018).

The intention to buy halal products by Muslims has been investigated (Ali, 2021). In terms of the halal food products issue, many scholars applied the TPB to study the influence of intention and behaviour (Bashir, 2019). Many models were modified to add other factors, such as religiosity (Hendar, 2020); knowledge (Suparti et al., 2019); Nurhayati & Hendar, 2020); halal awareness (Vizano et al., 2021; Aslan, 2023); brands (Pratiwi, 2018); and trust (Khan et al., 2023). Research employing the TPB to examine behaviours related to Islam has demonstrated its considerable effectiveness in explaining such behaviours (Maduku & Mbeya, 2023).

Attitude

Attitude can be described as a psychological concept influenced by various factors, encompassing cognitive evaluation processes, beliefs, values, and emotional connections to a particular object (Khan et al., 2023). Attitude involves the assessment and judgment of an object, idea, or action along a spectrum of favourability, happiness, agreement, goodness, and liking or disliking (Ajzen & Fishbein, 2005).

Hence, attitude constitutes a psychological assessment of behaviour. (Ajzen, 2012). When the human mind assesses perceptions of behaviour, it results in the formation of either a positive or a negative attitude towards that behaviour. Attitudes are a strong indicator of how people will consume food (Choe & Kim, 2018). Setiawati et al. (2019), observed a positive correlation with the purchase of food products. Other studies confirm that consumer attitude towards halal food has a significant and positive influence on purchasing intention. (Bashir, 2019), thus worthy of future study.

Subjective norm

Subjective norm, or social norm, indicates the extent of perceived social pressure either to participate in or abstain from a particular behaviour (Bai et al., 2019). From individuals in their social circle and those integral to their daily existence (Khan et al., 2023). According to Kian, Boon, Fong & Ai (2017), social influence is the impact that other people's behaviours, such as those of friends, family, classmates, co-workers, and other individuals or groups with whom a person is associated. These behaviours can change a person's thoughts, feelings, and behaviours. Social influence or subjective norm represents the effect of social pressure on a person's behaviour (Ajzen, 1991).

Subjective norms play a role in the acceptance of a new product. Numerous researchers have investigated the impact of subjective norm in various contexts, particularly regarding fast food. (Didarloo et al., 2022), meats consumption (Çoker & Linden, 2022), organic foods (Canova et al., 2020) apparel and many more (Garg & Joshi, 2018). Nevertheless, it plays a crucial role in shaping the intention to purchase not only for other products and services but also for halal branding (Pasha, Wahab & Daud, 2019). Given that halal branding is a significant religious criterion to consider before making a purchase, consumers often seek additional subjective norms to authenticate their buying decisions (Aslan, 2023).

Perceived Behavioural Control (PBC)

Perceived behavioural control refers to people's perception of the ease or difficulty of performing the behaviour of interest (Azizan et al., 2022)**.** Perceived behavioural control involves an individual's judgement towards a behaviour by evaluating the available resources and identifying the opportunities that arise, which are nonetheless influenced by the extent of confidence and perception to behave (Ajzen, 1991). On the other hand, an individual who has control of all these available resources will be able to evaluate the opportunities that arise and could anticipate the obstacles faced if the behaviour is performed (Lim & Rasul, 2022).

PBC was measured based on the previous studies (Basir, 2021). It results in a positive impact on the intention to buy food products. According to Khan et al. (2019) One form of PBC pertains to an individual's assessments of the ease or difficulty in executing a behaviour. PBC has proven to be a substantial predictor of the intention to purchase halal products (Fuadi et al., 2022; Govaerts & Olsen, 2023). Bashir (2019) identified PBC as the third most effective predictor of the intention to purchase halal food, while other studies (Xin & Seo, 2019) Discovered PBC to be the second most significant predictor of halal food, following attitude.

Purchase Intention

Purchase intention refers to the decision made by customers to purchase a good or service after giving it some thought or even after gaining an appreciation for it (Naseri et al., 2021). Usually, people purchase food items to satisfy their physiological needs for hunger and thirst (Imtiyaz, et al., 2022). They want their food purchases to appear nice to others, which relates to social requirements (Canova et al., 2020).

Intention can affect a consumer's decision to buy in the future. According to Marzuki et al. (2020)Before making the actual purchase, the process was led by the consumer's intention to buy halal products because this intention predicts their future behaviour. Bashir (2019) found that consumers' aim to buy halal food goods significantly affects how they behave when making purchases.

There may be differences between the way products are produced in non-Muslim or Western countries and how they are envisioned from an Islamic standpoint (Rahim et al., 2021). A Muslim needs to be aware of the product categories they utilise and purchase. They must comprehend the halal notion as a result.

Halal Literacy

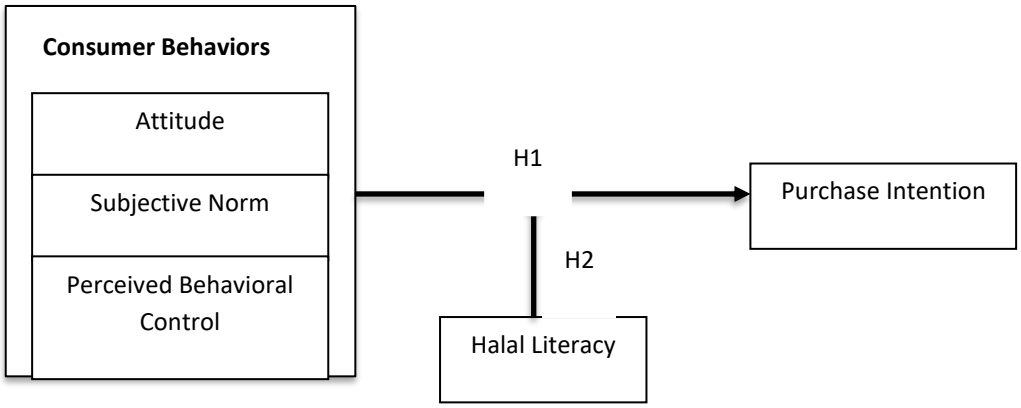
Halal literacy involves the knowledge and comprehension that an individual possesses of a product being consumed (Sahat et al., 2023). According to Shariah law, halal literacy exists as an individual's capacity to incorporate knowledge, awareness, and skills to discern between halal and haram goods and services (Siti Nurunnajwa Shamsudin et al., 2024). It is also characterized as the proficiency to distinguish between permissible (halal) and non-permissible (haram) goods and services, stemming from an enhanced understanding of Islamic law (Salehudin, 2010). The presence of a halal label does not solely determine the categorization of a product as halal or unlawful; it is also essential for consumers to comprehend the nature of the product they are consuming (Nurhasanah & Az Zahra, 2023). Muslim consumers with a deeper understanding of the halal concept will likely be more discerning about their food (Khan et al., 2020).

It serves as a crucial signal for the industry to recognize halal literacy and the factors influencing why consumers opt for a particular product or service (Siti Nurunnajwa Shamsudin et al., 2024). Jae and Delvecchio (2004) connect literacy to the proficiency or capability in utilizing written information. According to Pratama and Hartati (2021), halal literacy significantly impacts the consumption of halal products. Nonetheless, there is still a lack of studies that assess both conceptual and practical aspects of halal literacy (Sardiana, 2020).

Addressing the gap in halal literacy is crucial as many individuals remain unaware of its significance, often overlooking its potential impact on their lifestyle choices" (Saleh & Rajandran, 2024).

Therefore, the framework is hereby postulated,

Figure 1: Proposed conceptual framework adapted from (Khan et al., 2023)



3. Methodology

Population and sampling

This unit of analysis for this study will be Muslim consumers of halal food products aged between 20 and 50. They are selected based on maturity because the selection of age group as a sampling criterion is based on variations that may exist between age groups of generations (Salehudin, 2013). This study requires Muslim respondents because they are well-recognised as Muslim consumers regarding halal considerations. The respondents who live in the Klang Valley region, which is centred on Kuala Lumpur and encompasses other towns and cities within Selangor, will be selected.

Klang Valley's population is expected to reach nine million by 2023 (Statista, 2023). Therefore, the study will employ a power analysis calculator, G*Power, to determine the required sample size for statistical tests (Memon et al., 2020). Utilising the priori analysis function, the researcher needed to predefine values for the significance level (α), statistical power ($1 - \beta$), and population effect size (f^2) (Cohen, 1988). Considering default settings or pre-existing values ($\alpha = 0.05$, $\beta = 0.95$, and $f^2 = 0.15$) within G*Power version 3.1.9.4, a sample of 146 is considered appropriate for this research. Aiming for a 30% unresponsive outcome or any unforeseen circumstances, the final number of respondents anticipated will be 190.

Data Collection

Data collection for this research will be conducted through questionnaires distributed both on-site and online. The questionnaire will be adapted from prior studies (Bhutto et al., 2022; Usman et al., 2022). A structured questionnaire will be posed to consumers using closed-ended questions to assess attitudes, subjective norms, and perceived behavioural control towards halal food purchases, with halal literacy as a moderator.

The questionnaire will consist of three sections: Section A will focus on demographic backgrounds, including gender, age, race, and education. Section B will be the consumer behaviour, which consists of attitude, subjective norms, and perceived behavioural control; Section C will comprise purchase intention and halal literacy, while Section D will be the halal literacy components. The structured questionnaire will utilise a 7-point Likert Scale, chosen for its ease of understanding and broad acceptance among respondents (Malhotra & Dash, 2010).

Screening questions will be posed to the respondents to ensure the questionnaire reaches the correct target group. Accordingly, the following screening questions will be asked: i) Are you a Muslim?; Age – Between the range of 20-50 years old?; iii) Have you ever experienced or eaten any Korean food? If the answer is YES for all questions, the respondent will continue to answer the survey; otherwise, if one of the answers is NO, the respondent will be removed from the sample.

Table 1: Dimensions of Questionnaire

Dimensions	Items	Sources
Section A		
Demographic Background	5 items	Researcher
Section B		
Consumer Behaviours:		
Attitude	5 items	(Jannat & Islam, 2019; Amalia et al., 2020; Iranmanesh et al., 2020)
Subjective Norm	5 items	(Amalia et al., 2020; Iranmanesh et al., 2020; Vanany et al., 2020)
Perceived Behavioural Control	5 items	(Amalia et al., 2020; Iranmanesh et al., 2020; Vanany et al., 2020)
Section C		
Purchase Intention	5 items	(Amalia et al., 2020; Usman et al., 2022)
Section D		
Halal Literacy	5 items	(Salehudin, 2010; Bhutto et al., 2022)

Table 2: Likert Scale

Likert Scale – Measurement of Agreement						
Extremely Disagree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Extremely Disagree
(1)	(2)	(3)	(4)	(5)	(6)	(7)

The questions will be written in simple dual-language variants, i.e., Malay and English. A language expert will be appointed to endorse the language translation.

Plan for data collection

IBM SPSS Statistics version 20 will be used to examine the data gathered. The data will undergo a screening process to ensure that any unanswered or missing items from the acquired data collection are addressed. Descriptive data analysis will utilise the initial demographic profile of the respondents. After that, a descriptive statistic will be conducted to examine the mean score or central tendency. For statistical techniques, this study will use parametric methods, specifically multiple regression; the relationship between variables will be used whenever necessary to match the study's objectives, research questions, and hypotheses. Finally, moderation analysis will be used to evaluate whether attitude, subjective norm, and perceived behavioural control have the same effect on halal literacy. It is used to determine if a moderator modifies the direction or strength of the relationship between the independent variable and the dependent variable (Memon et al., 2019).

4. Conclusion

This research will significantly contribute to consumer behaviour, especially halal food purchase intention. As a marketer, knowing the reason behind halal food purchases could improve product positioning and, eventually, product acceptance and purchase.

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Social Capabilities and Corporate Zakat Commitment: Evidence from Mission-Driven and Stakeholder Management Perspectives

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Abstract: This study investigates the influence of social capabilities on corporate zakat commitment, drawing on the Social Resource-Based View (SRBV) framework. While corporate zakat represents an important Islamic social finance mechanism, its implementation remains largely voluntary, resulting in inconsistent participation among firms. This study focuses on two key dimensions of social capabilities, mission-driven capabilities and stakeholder management capabilities, to explain variations in corporate zakat commitment among zakat-paying companies in Malaysia. Using survey data collected from the senior management of 142 corporate Zakat payers, the study applies partial least squares structural equation modelling (PLS-SEM) to test the proposed relationships. The findings indicate that stakeholder management capabilities have a significant positive effect on corporate zakat commitment, whereas mission-driven capabilities do not exhibit a statistically significant influence. These results suggest that effective stakeholder engagement, communication, and accountability mechanisms are more critical to motivating corporate Zakat practices than the formal inclusion of Zakat within organisational mission statements. The study contributes to accounting and Islamic governance literature by providing empirical evidence on the role of social capabilities in shaping voluntary zakat commitment. From a practical perspective, the findings highlight the importance of stakeholder-oriented governance strategies for zakat institutions, regulators, and corporations seeking to enhance zakat compliance and reporting practices.

Keywords: *Social Capabilities, Corporate Zakat Commitment, Mission-Driven, Stakeholder Management Perspectives*

1. Introduction

Corporate zakat is an important Islamic social finance instrument with substantial potential to support poverty alleviation, social welfare, and sustainable economic development. Despite this potential, zakat collection from the corporate sector remains relatively low compared with individual zakat contributions. While governments and zakat institutions continue to encourage greater corporate participation, the absence of strict regulatory enforcement means that corporate zakat payments largely depend on voluntary commitments. This raises an important question as to why some companies are willing to commit to paying zakat, whereas many others are not.

According to the Director, Dato Dr. Azmi Omar of the International Centre for Education in Islamic Finance (INCEIF), the corporate sectors have a big potential to contribute to the zakat funding. Nevertheless, the government and zakat institutions are struggling to convince companies to commit to and pay zakat. Without company regulation and enforcement, the former parties do not have a concrete and clear basis to push the latter to commit to corporate zakat. The lack of clear push factors for corporate zakat commitment is the primary issue addressed in this study. Governments have widely discussed the reluctance of businesses and corporations to commit to and pay zakat. The government expects companies to commit to and pay corporate zakat to alleviate poverty, especially during economic crises. Corporations typically contribute a significant amount of zakat, and by committing to and paying zakat appropriately, they can significantly increase zakat collection. Understandably, during the global economic crisis, most companies focused on the survivability of their businesses, especially cash flows. It is also normal for companies' economic goals to maximize profits for the benefit of their shareholders. For these two reasons, many companies were seen as passively participating in voluntary activities, particularly committing to and paying zakat. According to the Mufti of Federal Territory,

Dr. Zulkifli, the government hopes that more companies will pay zakat during the introduction of the moratorium in 2021 (Amly, 2020).

In addition to fulfilling Islamic beliefs, it is unclear what makes certain companies willing to pay zakat, even though they are not obliged to do so. They will not be punished if they do not pay corporate zakat. Like CSR, since zakat payment is voluntary, this study expects that certain CSR driving factors could motivate companies to adopt corporate zakat commitment. In this study, corporate zakat commitment means that companies undertake certain strategies to perform duties related to zakat. Zakat commitment is not limited to zakat payments to zakat institutions, as it also includes other activities such as zakat contributions for education, microfinancing for businessmen, and health services provided to the community. The zakat contribution is part of CSR activity, which is considered Islamic CSR. The problem lies in the unclear drivers that are expected to motivate certain companies to pay zakat, whereas others do not. There has been little explanation in the literature on the relationship between CSR drivers' influence, which includes institutional pressures, social capabilities, and slack resources, as the motivational elements for companies to practice corporate zakat commitment. Therefore, this study aims to investigate the impact of social capabilities on corporate zakat commitment. The result of the study would help the zakat institutions to understand the impact, which could be used to encourage non-paying zakat companies to commit to zakat payments. The belief is that non-paying zakat companies might not practice the social capabilities of corporate zakat commitment as much as zakat-paying companies. Since corporate zakat enforcement is not strict, in which those who fail to pay zakat will not be penalized, many companies do not consider zakat commitment necessary. Thus, while it is difficult to push non-paying companies to pay zakat when it is not compulsory, it is even more important to show strategies that motivate others to do so.

The literature suggests that corporate zakat may be viewed as part of Islamic Corporate Social Responsibility (ICSR), where companies voluntarily contribute to social well-being beyond their financial objectives. However, existing studies provide limited explanations regarding the specific internal drivers that motivate corporations to commit to zakat payments. Particularly, the exploration of the roles of social capabilities, specifically mission-driven capabilities and stakeholder management capabilities, in the context of corporate zakat remains inadequate. Social capabilities refer to a company's ability to manage its internal and external relationships with stakeholders for the benefit of the company, particularly in terms of sustainability. Social capabilities enable companies to leverage their relationships with stakeholders, align organizational missions with social objectives, and generate shared value across economic and social dimensions. Nevertheless, empirical evidence on how these capabilities specifically influence corporate zakat commitments remains scarce. Therefore, this study examines the extent to which mission-driven and stakeholder management capabilities influence corporate zakat commitment among zakat-paying companies. By identifying the relevant social capability drivers, this study seeks to contribute to the theoretical advancement of the corporate zakat literature and offer practical recommendations to policymakers, zakat institutions, and corporations in strengthening zakat governance and compliance. The findings of this study will highlight the capabilities that affect a company's performance through the payment of corporate zakat. The identified capabilities can then help companies commit to and pay corporate zakat by utilising them. The utilization of capabilities could also encourage other non-zakat-paying companies to use them as a strategy to practise corporate zakat commitment, which will give them a competitive advantage.

2. Literature Review

Corporate zakat commitment

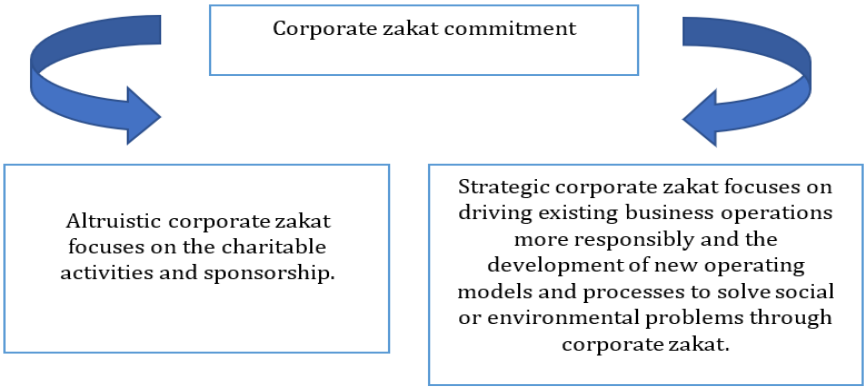
Companies with higher commitments to CSR activity prioritised their shareholders' requirements and their broader set of critical stakeholders to fulfil their needs (Dare, 2016). Anser et al. (2020) proclaimed that the higher the level of CSR commitment, the higher the chances of companies participating in and implementing CSR activities. In other words, CSR commitment involves how the company strategically engages in CSR to maximise benefits (Tang et al., 2012a), take a proactive approach towards stakeholders in terms of new organisational policies and invest the company's resources in CSR activities (Nwoba et al., 2021).

Corporate zakat commitment can be viewed as a component of the company's overall CSR commitment. Corporations in Saudi Arabia consider the payment of zakat both as an Islamic obligation and part of their CSR

practices. The literature has argued that organisations paying the zakat are already practicing CSR and supporting philanthropic aims (Jamali, 2014; Nurunnabi et al., 2019). The AAOIFI supported the treatment of corporate zakat as part of the CSR activity by introducing financial reporting and governance standards (AAOIFI 2010). According to the standard, IFIs are expected to disclose Islamic ethical behaviour, and good governance, including an efficient board of directors, Shariah supervisory board, and good customer relations (Bakar & Md Yusof, 2014; Rosman et al., 2019). Bakar & Md Yusof (2014) investigated the practice of corporate zakat as part of IFIs' CSR in Malaysia. Corporate zakat commitment will be used throughout the study based on the action-oriented strategy introduced by Halme & Laurila (2009) under the CSR context.

Following what had been recommended by Chtourou & Triki (2017) This study categorises corporate zakat commitment as altruistic and strategic. Altruistic corporate zakat focuses on charitable activities and sponsorship. In contrast, strategic corporate zakat drives existing business operations more responsibly and develops new operating models and processes to solve social or environmental problems. Companies can have either one or both types of corporate zakat commitment. Figure 1 illustrates the two types of corporate zakat commitment, as understood by this study.

Figure 1: Corporate zakat commitment



Source: Chtourou and Triki (2017)

The strategic corporate zakat could be achieved through the introduction of *wakalah* zakat by the zakat institutions. The concept provides a mandate to the companies to distribute the zakat by themselves. The *wakalah* zakat can be channelled to their CSR fund, benefiting the stakeholders (Sharif & Wahid, 2019). For example, BIMB practices strategic zakat using *wakalah* zakat to assist in surgeries at IJN, installing solar power systems in collaboration with the Institute Latihan Perindustrian Kepala Batas, and helping micro-entrepreneurs among B40 families in purchasing business equipment.

Corporate zakat commitment is the practice of corporate zakat based on the action-based typology. The corporate zakat commitment will be measured using an instrument by Chtourou & Triki (2017) that measures the concept of CSR commitment. The authors divided the CSR commitment into three categories: philanthropic, integration, and innovation. In order to accommodate the concept of corporate zakat, this study will use the term altruistic zakat to refer to philanthropic CSR and strategic corporate zakat that covers the integrations and innovation CSR. There are three items under philanthropic CSR and nine items under integration and innovation or strategic CSR. Since the motive of corporate zakat commitment is unknown between altruistic and strategic, the combination of altruistic and strategic commitment was asked to represent the corporate zakat commitment. The corporate zakat commitment measures whether the companies commit to paying zakat or if it is just a one-off payment, focusing mainly on religious duty. Companies committed to the corporate zakat placed zakat strategically in their business conduct to obtain a better impact from the zakat payment.

Social Capabilities

Scholars have identified the business benefits of CSR as existing only under certain conditions. These include the following: when CSR is integrated into a company's mission statement, where it is aligned to a company's

strategic orientation, when CSR is focused on the primary stakeholders of the company, when it is effectively communicated, when it is focused on shareholder value creation, or when CSR is proactively carried out (Torugsa et al., 2013a).

Company performance is driven by resources and capabilities that can be a source of competitive advantage (Hart, 1995). Therefore, companies must have certain capabilities to manage, control, and deploy various tangible and intangible resources in the economic, social, and environmental dimensions to enhance their performance (Sinthupundaja, Chiadamrong, et al., 2020). According to Freeman (1984), among valuable resources, companies have been human, physical, and organizational assets. In this context, social capabilities are explicitly meant for human resources. Under the social Resource-Based View Theory, Tate and Bals defined social capabilities as leveraging the relationship with internal and external stakeholders to gain mutual exchange. Information, products, labor force, financial means, and intangible elements, such as compassion, education, and care, can be exchanged. Companies must balance their financial performance by incorporating social and environmental performance to manage these capabilities effectively (Tate & Bals, 2018). Eventually, social capabilities could increase financial performance by improving relationships with stakeholders such as employees, customers, suppliers, and communities (Kao et al., 2018; Klassen & Vereecke, 2012; Rettab et al., 2009; Yoon & Chung, 2018). Therefore, this study examines two types of social capabilities: mission-driven and stakeholder management.

Mission-Driven Capabilities

A mission is an essential component of an organisational framework that aids the public in comprehending how corporations align their value with the values of stakeholders (Dee, 2016). Mission-driven management capability functions as a consistent guide for decision-making and a company's dedication to various activities, including corporate social responsibility initiatives (Tate & Bals, 2018). The mission acts as a navigational tool, directing corporate planning and averting the decline of CSR initiatives or strategies. Explicit missions that incorporate corporate principles and stakeholder interests have demonstrated efficacy in sustaining organisational objectives and benefiting society. Lashitew, Bals and van Tulder (2020) stated that mission-driven skills may serve as foundational elements that promote social innovation and validate organisations' objectives regarding economic and social purposes. The mission-driven capability underscores the importance of commitment and innovation within a company's competencies.

Overall, researchers have begun to acknowledge that it is essential for social enterprises to acquire resources and develop capabilities to obtain and maintain a competitive advantage to accomplish their social and environmental missions (Bacq & Eddleston, 2018). Sinthupundaja, Kohda, and Chiadamrong (2020) studied the capabilities of social entrepreneurship in shared value creation. They observe that social entrepreneurship encompasses a range of capabilities, including mission-driven strategies, stakeholder involvement, cross-sector collaboration, and environmental management. Companies with no proper mission for CSR activities most likely adopt CSR activities occasionally and are perceived as not having a genuine motive by stakeholders (Tang et al., 2012b). Donnelly and Wickham (2020) suggested that companies include strategic CSR principles in their mission as a powerful signal to internal and external stakeholders of their significance in the company's decisions. The mission becomes a signal of commitment to the company's stakeholders. Incorporating a clear mission into a company's strategy leads to positive responses from stakeholders, such as reputation and promotion of a respectable image from customers (Flota Rosado & Ocampo Figueroa, 2016).

The mission is a strategic resource in which companies build their identities and develop other resources, such as reputation and social capital. This mission-driven capability predicts that companies will have better financial performance with more commitment to CSR activities (Bacinello et al., 2020; He & Shen, 2019). When the stakeholder relationships are based on high-level confidence and a low threat of manipulation, CSR activities can increase companies' revenue (Flota Rosado & Ocampo Figueroa, 2016). Therefore, mission-driven capabilities enable companies to engage in social activities that create shared values in terms of financial gain, which benefits companies, and social gain, which benefits society (Porter & Kramer, 2006; Tlemsani & Matthews, 2020).

However, to achieve CSR activities' goals of bringing benefits to the company, companies need to build capabilities in all dimensions of CSR: economic, social, and environmental (Torugsa et al., 2013b). Researchers

believe that making significant commitments to various aspects of CSR (economic, social, and environmental) will make the outcomes of all CSR activities easier to detect (Pan et al., 2020). Without a clear CSR mission, companies are likely to engage in CSR activities only occasionally, leading stakeholders to perceive them as lacking genuine motivation (Tang et al., 2012b). Consequently, these companies do not obtain the expected benefits from CSR activities.

The concept of a mission in companies can be seen through the mission, activities, and reporting of the companies' social activities (Lashitew et al., 2020). Since CSR and corporate zakat are part of companies' voluntary activities, they are seldom disclosed in the company's annual report or any platform related to the companies. Thus, this study employs questionnaires to investigate the implementation of a zakat policy within a company's mission and its effect on zakat commitment.

M. Kabir Hassan and Mahlknecht (2011) suggested that in the application of a company's zakat policy, the ICSR standard mandates a zakat policy in every Islamic institution deemed to be an obligation of the IFI. The policy shall include an explanation of the collection and payment of zakat by the companies. The standard also acts as a recommended basis for ICSR for IFIs that do not have to pay zakat. This suggestion is meant to complement the existing standard (FAS 9) of AAOIFI, which does not include such requirements.

Public companies, specifically IFIs, place greater emphasis on incorporating the payment of zakat into their mission (Hafez, 2015), owing to the Shariah-based nature of their businesses. The mission statement demonstrated the IFIs' strong dedication to zakat commitment issues, which are fundamental principles of Islamic finance, as well as the banks' philosophy and core principles, highlighting their values and beliefs. The mission statement may also outline a desired and possible future state or long-term aim, setting a stage for the company's purpose and strategy. The importance of the mission statement is reflected in the positive relationship between the dimensions and the future financial performance of the examined banks (Platonova et al., 2018). Therefore, the mission statement motivates IFIs to fulfil their corporate Zakat commitments with greater dynamism.

This vision and mission statement are supposedly in line with the Syariah objectives (Mohammed, Tarique, & Islam 2015). This study attempted to measure the performance of IFIs using Maqasid Shariah measurement, which includes the preservation of religion, life, intellect, wealth, and progeny. The concepts of CSR and Zakat distribution were considered in line with the protection of human dignity, which is crucial. Therefore, a clear intention of wanting to help others is among the keys to Zakat distribution among IFIs.

Privately owned companies (normally operating as family businesses) are socially responsible for maintaining a reputable image. Yusof, Mohd Nor, and Edward Hoopes (2014) discovered that family businesses in Malaysia operate based on value and culture, which is not necessarily strategic all the time. The attention of the business was given to maintaining the virtues in the company practices and among family members. Hence, it is not surprising that family businesses have become more involved in social activities, given their basic values and virtues. However, Islam encourages Muslims to contribute money privately to receive greater rewards from God and to avoid riya (showing off), which is prohibited. Accordingly, the best i-CSR practice is to support society without involving the media to avoid riyas (Alfakhri et al., 2018). This might be why many companies pay zakat but choose not to report it (Rashid, 2017).

Stakeholder Management Capabilities

According to the RBV, complex social structures built over time are often key resources that contribute to company success (Wickham & Wong, 2009). Stakeholder management capability functions as corporate governance, requiring the company to prioritize the interests of its stakeholder groups at its core (Wickham & Wong, 2009). This is considered a strategic action by the manager, which requires extensive market research to understand the nature and source of interest. The process involves engaging stakeholders in the company's strategic decision-making process through boardroom discussions, allowing them to contribute to the company's resources.

Hart (1995) defined stakeholder management as an organizational capability that involves learning about product life cycles from suppliers and customers and developing environmentally friendly products and

services. Meanwhile, according to Freeman (1984)a company's value can be determined by its strategic action to satisfy stakeholders' expectations and interests. The challenge for a company is to develop this capability effectively with various stakeholders who have competing aims, claims, and demands (Harrison & Freeman, 1999). Companies that identify a wide range of stakeholders are more likely to be proactive in communicating with stakeholders than those focusing on a narrow range of stakeholders. A widely focused stakeholder management capability supports active engagement with the main stakeholders, such as partners, customers, and shareholders (Sinthupundaja, Kohda, et al., 2020). This capability also encompasses other stakeholder categories to manage and reduce CSR concerns (Sharma et al., 2007; Torugsa et al., 2013b).

Sharma and Vredenburg (1998) defined stakeholder management capabilities as establishing trust-based collaborative relationships with various stakeholders, especially those with non-economic goals. They highlighted several stakeholders' management capabilities, such as early sensing, positive relationships with environmental stakeholders, collaboration with stakeholders in the environmental domain, and the ability to steer new neighbors' developments effectively through CSR activities. When any stakeholder relationships are based on high-level confidence and a low threat of manipulation, the relationship can increase a company's revenue (Flota Rosado & Ocampo Figueroa, 2016).

Corporate philanthropy shapes stakeholder perceptions of a firm, encompassing investors, consumers, suppliers, current or prospective workers, and the nonprofit sector (Brammer et al., 2006). Engaging stakeholders is an essential developmental activity that improves mutual comprehension of sustainability and broadens the scope of cognitive, moral, and emotional growth. Centralising stakeholders in corporate sustainability and reconciling their interests to achieve equitable outcomes has proven essential to the methodological advancement of corporate sustainability. Gao & Zhang (2006) assert that stakeholder involvement fosters a more equitable understanding of the organization as a network of human interactions and competencies that extend beyond its boundaries. It may also provide the opportunity to establish a significantly larger and more dynamic idea of sustainable organization.

Corporate philanthropy can be managed in a variety of ways from a strategic standpoint. Top-down strategies are based on discretionary contribution, according to management preferences, and bottom-up strategies are based on managing stakeholder demands or considering the impact of companies' actions on them (Arco-Castro et al. 2020). Bhattacharyya (2020) stated that companies must align with non-business stakeholders such as NGOs and local communities to access valuable resources that fit the company's mission and values, which is important for shared value creation. Furthermore, stakeholder management considers communication and encourages the sharing of ideas, feedback, and collaboration regarding CSR activities.

Rettab, Brik, and Mellahi (2009) in their study on the relationship between CSR activities and financial performance, they argued that despite the company's motivation for stakeholder engagement, the company must eventually communicate its motives for CSR commitment to stakeholders. The study mentioned that factors leading to ineffective engagement with stakeholders in Dubai were due to companies failing to manage them strategically. The various interests and cultural backgrounds of stakeholders create numerous communication obstacles, which are further compounded by the difficulty of fostering enduring relationships and trust due to the frequent turnover of managers and employees. Therefore, CSR and financial performance are contingent on stakeholders' insights and responses to CSR activities. In short, the impact of CSR on companies' performance relies on stakeholders' reactions, which depend on the accessibility and clarity of information.

In alignment with the notion that philanthropy is becoming a more strategic endeavour, it is observed that it is frequently regulated by formal budgeting processes and plans, which typically engage board-level company representatives in either setting contribution levels or in operational roles. Companies are increasingly hiring specialists to oversee their philanthropic efforts, and philanthropy is often administered through externally focused business functions, where the necessary skills and competencies to derive benefits from philanthropy are generally anticipated to exist within most organisations. Conversely, strategic objectives seem to exert minimal influence on the volume of philanthropic contributions, which appear to be mostly determined by resource availability, existing commitments and relationships, and the discretion of top executives.

In the context of zakat, Sheriff (2014) asserts that it is crucial to view Zakat as a commitment made by organizations, regardless of obstacles, as opposed to expenses, such as taxes, which they often manipulate to evade. When a company views zakat as a commitment, it is obliged regardless of the situation. Stakeholder commitment is typically reflected in disclosure and zakat reporting. When companies are required to report on zakat and charity, these regulatory obligations primarily stem from the Shariah rules. However, if stakeholders, particularly the management of companies, prioritize reporting charitable contributions and benevolent loans over zakat, they may be the primary drivers of the overall company's reporting activity. On another note, the absence of zakat reporting could indicate that either the country lacks zakat standards or that the companies are not adhering to them. Thus, this study employs questionnaires to investigate the effect of stakeholder management capabilities on zakat reporting and, hence, zakat commitment.

Resource-Based View Theory

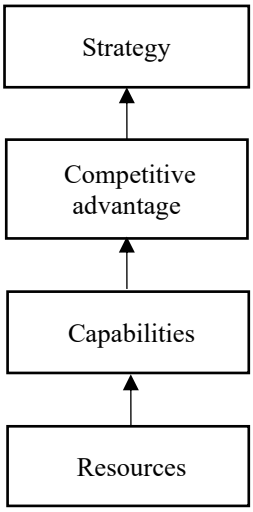
The Resource-Based View (RBV) paradigm is recognised in the literature as the most critical perspective for achieving sustained competitive advantage in accounting and strategic management (Bansal, 2005). The Resource-Based View (RBV) evaluates a company's resources and capabilities. This theory posits that resources serve as the fundamental units of analysis, encompassing physical and financial assets, employee competencies, and organisational social processes (Hart, 1995). RBV resources encompass tangible assets, including machinery, facilities, equipment, labour, and raw materials, as well as intangible assets, such as training, knowledge, intellect, experience, motivation, and organisational culture (Barney, 1991). The collection of resources employed for value-added activities enhances corporate capabilities. Examples of specific skills within the Resource-Based View (RBV) include research and development (R&D) and technological competencies.

The RBV is based on the belief that a company's success depends on how well a company can nurture its internal resources and mobilize them to a level of superior performance, leading to competitive advantage (Barney 1991). This means that companies that effectively control and manipulate their resources and capabilities, which are valuable, rare, inimitable, and non-substitutable, could generate sustainable competitive advantages and improve company performance (Barney 1991; Grant 1999).

Branco and Rodrigues (2006) claimed that one can help companies create resources and capabilities. To gain this advantage, companies must implement CSR activities that exploit their internal strengths by responding to environmental opportunities, neutralizing environmental threats, and avoiding internal weaknesses. These resources and capabilities enhance companies' competencies to achieve their social and economic purposes effectively (Bansal, 2005; Sharma & Vredenburg, 1998). Additionally, companies with proactive environmental and societal strategies would generate valuable capabilities that may lead to competitive benefits (Hart, 1995; Sharma & Vredenburg, 1998). Aragón-Correa and Sharma (2003) proposed that following RBV, companies need to identify resources that generate proactive strategies and that companies' resources are determined as drivers of company strategy. Consequently, companies must strategize and allocate available resources by identifying primary stakeholders and addressing their needs. The theory addresses pressures from organizational slack, internalization, position in the value chain, managerial attitudes, motivations, and strategic priorities (Bansal, 2005).

Figure 2 shows how resources can lead to capabilities and increase company performance through competitive advantage.

Figure 2: Resources-Based View of Competitive Advantage



Source: Grant (1999)

The Natural Resource-Based View (NRBV) Theory

Alongside the RBV, the NRBV structure was introduced. The Resource-Based View (RBV) underscores the significance of precious, uncommon, inimitable, and non-substitutable resources as essential for a company's competitive advantage, although it overlooks environmental restrictions (Hart & Dowell, 2011). The NRBV increases a company's context by linking natural resources with its resources and capabilities, hence extending the RBV to encompass the essential competencies required for managing environmental conditions (Cristina De Stefano et al., 2016). Population and economic expansion result in heightened consumption of natural resources, including fossil fuels, in global industrial production. The NRBV underscores the significance of the complexities, limitations, and challenges associated with maintaining the natural environment (Tate & Bals, 2016).

Table 1: Previous studies related to Resource-Based View Theory

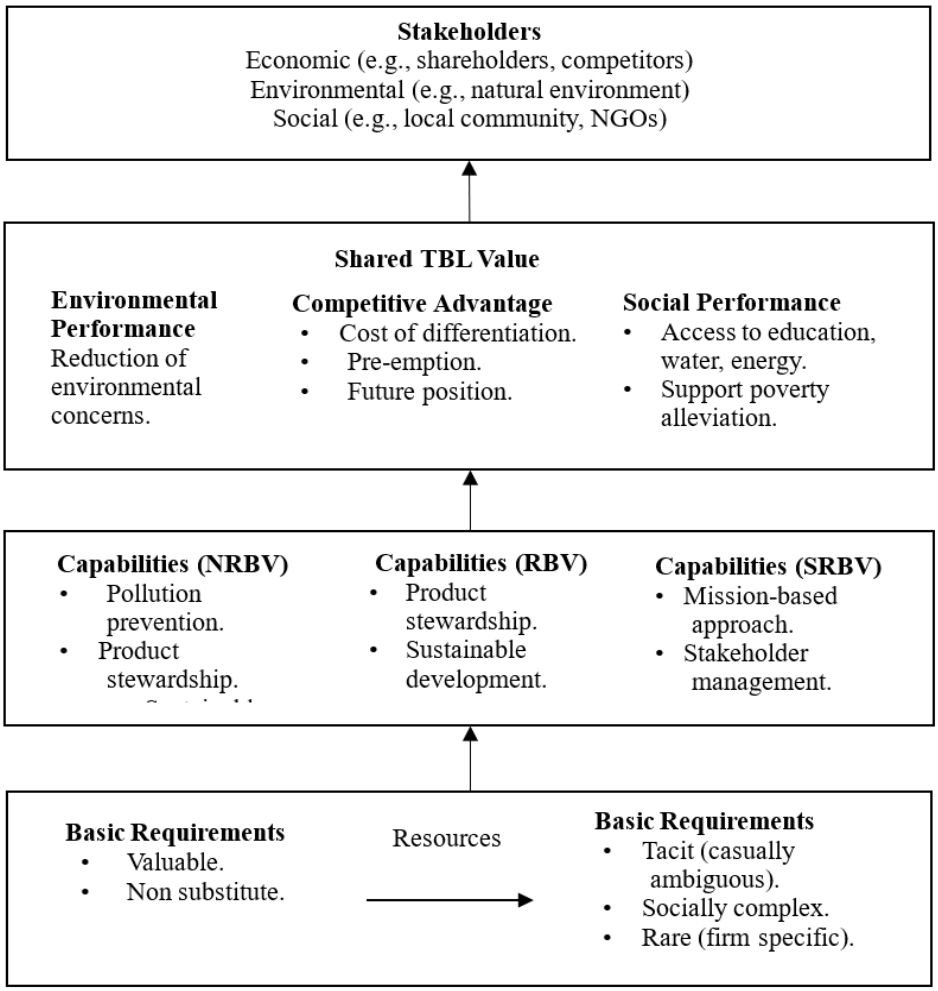
Authors (Year)	Independent variables	Mediating/moderating variables	Dependent variables	Context
Mattingly and Olsen (2018)	Slack resources	CSR & Mechanism	Firm performance	U.S based firm
Alshorman et al. (2022)	Corporate social disclosure	Slack resources	Firm market value	Amman
Vitale, Cupertino and Taticchi, (2023)	Managerial commitment to sustainability	CSR strategy Innovation Intensity Operational Slack Resources Financial Slack Resources	Environmental performance	United Kingdom
Buchholtz, Amason and Rutherford (1999)	Firm resources	Managerial discretion	Corporate philanthropy	Medium-sized companies in the United States
Lin et al. (2020)	Corporate social performance	Financial slack	Firm performance	United States
Hasan and Habib (2017)	Corporate life cycle	Financial resources	CSR	United States

The Social Resource-Based View (SRBV)

The RBV and NRVB are conceptually expanded to the SRBV to emphasise social resources, specifically addressing the mitigation of social constraints within the social resource-based framework. It underscores stakeholder management and delineates the connections between social capabilities and the generation of shared value (Tate & Bals, 2016). The SRBV emphasises how enterprises can achieve their social objectives through collaboration and engagement with diverse stakeholder networks that address social capabilities and limitations. Social capacities are essential for generating shared value from economic, social, and environmental factors, as they are closely and directly associated with societal issues such as poverty, inequality, and social conflict (Jenkins & Fries, 2012). In conclusion, a company's capacity to develop, integrate, use, and oversee resources and competencies across economic, social, and environmental spheres delineates its impact on the creation of shared value, as posited by the Resource-Based View (RBV), Natural Resource-Based View (NRBV), and Stakeholder Resource-Based View (SRBV) theories (Sinthupundaja, Chiadamrong, & Kohda, 2019).

For SRBV, social competence is defined as the ability to utilise relationships with internal or external stakeholders to facilitate reciprocal trade. The exchange encompasses information, goods, workforce, financial resources, and intangible factors such as empathy, education, and caring. Integrating these talents requires a compromise that may demand additional altruistic motivations rather than solely economic ones (Tate & Bals, 2018). Figure 3 illustrates the SRBV concept presented by Tate and Bals (2018).

Figure 3: Towards an emergent SRBV (complementing RBV and NBV)



Source: Tate and Bals (2018)

Social Capabilities and Corporate Zakat Commitment

As discussed earlier, RBV Theory explains that companies that can nurture their resources can gain a competitive advantage. SRBV further explains that companies focusing on social capabilities can overcome social constraints and gain a competitive advantage. Previous studies have shown that both resource- and social-based capabilities influence CSR activities. However, very few studies explain their effects on corporate zakat commitment. As zakat is socially based, this study focuses on social capabilities and develops the following hypotheses to test its effects.

Hypotheses

Social Capabilities and Corporate Zakat Commitment

According to the RBV Theory, companies that nurture their resources can gain a competitive advantage. SRBV further explains that companies focusing on social capabilities can overcome social constraints and gain a competitive advantage. Previous studies have shown that both resource- and social-based capabilities influence CSR activities. However, very few studies explain their effects on corporate zakat commitment. As zakat is socially based, this study focuses on social capabilities and develops the following hypotheses to test its effects.

A. The Effect of Mission-Driven Capabilities on Corporate Zakat Commitment

Mission-driven management capability functions as a consistent guide for a company's decision-making, encompassing social activities (Tate & Bals, 2018a). These mission-oriented capabilities direct all ensuing advancements and ensure that planning is not neglected throughout time. To achieve the objectives of corporate social initiatives, it is imperative to deliberately cultivate additional competencies across all dimensions, including economic, social, and environmental aspects. Effective mission-driven competencies can enhance social entrepreneurship by generating shared value (Grant & Sumanth, 2009). Explicit missions that incorporate corporate principles and stakeholder interests have demonstrated efficacy in sustaining the objectives and aims of socially oriented enterprises that positively influence society (Flota Rosado & Ocampo Figueroa, 2016).

Islamic banks exhibit a robust dedication to their 'mission and vision,' as this aspect reflects adherence to the fundamental principles of Islamic banking. The mission and vision statement emphasises the values and beliefs of an institution, which "may delineate an aspirational and feasible future state or long-term objectives of a company, reflect the bank's philosophy and core principles, and serve as a foundation for its purpose and strategy" (Platonova et al., 2018). By contrast, companies with no proper mission in their CSR activities most probably adopt CSR activities occasionally and are perceived by stakeholders as not having a genuine motive (Tang et al., 2012). Donnelly and Wickham (2020) suggested that companies include strategic CSR principles in their mission as a powerful signal to internal and external stakeholders of their significance in companies' decisions. Thus, the mission becomes a signal of commitment to the companies' stakeholders.

In the case of corporate zakat, the IFI stated that the payment of zakat is part of their mission statement and of how they conduct their businesses (Platonova et al., 2018). The mission statement impacts the corporate zakat commitment of the IFI, whereby they create a zakat committee, allocate a budget for corporate zakat as part of their identity, and report their zakat commitment to stakeholders. Based on the discussion of the effect of mission-driven capabilities on CSR activities, this study proposes a fourth hypothesis:

H1: Mission-driven capabilities positively motivate companies to engage in corporate zakat commitment.

B. Effect of stakeholder management capabilities on corporate zakat commitment

Companies with better relationships with employees, customers, suppliers, and communities can increase their financial performance. Sharma and Vredenburg (1998) defined stakeholder management capability as establishing trust-based collaborative relationships with stakeholders, especially for non-economic goals. The challenge for a company is to develop this capability effectively with various stakeholders who have conflicting goals, priorities, and demands (Harrison & Freeman, 1999). Scholars suggest that companies that recognize their various stakeholders are likely to be more proactive than those that focus on a narrow range of stakeholders.

Companies that identify a wide range of stakeholders are also likely to be more proactive in communicating with them than those that focus on a narrow range of stakeholders. A widely focused stakeholder management capability supports active engagement with main stakeholders, such as partners, customers, and shareholders (Sinthupundaja et al., 2020b). This capability also concerns the remaining stakeholder categories in managing and decreasing CSR activities (Sharma et al., 2007; Torugsa et al., 2013).

In the case of corporate zakat in Malaysia, companies with good stakeholder relationships are more likely to commit to corporate zakat. The stakeholder relationship can be observed through corporate zakat reporting to stakeholders (Ibrahim & Sheriff Muhammad Ibrahim, 2015). Therefore, stakeholder management is highly dependent on the standards governing corporate zakat (Noor et al., 2017). Based on the discussion of the effect of stakeholder management capabilities on CSR activities, this study proposes the following hypotheses:
H2: Stakeholder management capabilities positively motivate companies to practise corporate zakat commitment.

3. Method

This study administered questionnaires to the senior management of companies that fulfilled their zakat obligations in 2019, hereafter referred to as corporate zakat payers. Senior management served as the official respondents, representing their respective organizations in providing the required information. In publicly listed companies, this role is typically assumed by the Chief Executive Officer (CEO), while in private firms, it is commonly held by the Managing Director (MD). The contact details, including email addresses and telephone numbers, were sourced from the official websites of the respective companies. These contact channels generally correspond to corporate communications units, which subsequently redirect inquiries to finance or Shariah departments responsible for zakat matters. Follow-up telephone calls were conducted to verify the appropriate contact persons and obtain accurate email addresses for survey distribution. Survey invitations were sent via email outlining the purpose of the study.

The collected data were analyzed using SmartPLS version 4.0, employing a variance-based structural equation modelling approach through partial least squares (PLS-SEM). Given the study's emphasis on prediction, PLS-SEM was selected over covariance-based SEM (CB-SEM). This approach offers higher statistical power and is robust to violations of assumptions (Hair et al., 2017). Multivariate normality was assessed using the WebPower online tool, following the procedures outlined by Hair et al. (2017) based on Mardia's skewness and kurtosis statistics. Based on Mardia's skewness and kurtosis, the multivariate skewness value was 34.95519 ($p < 0.001$), while kurtosis reached 166.12513 ($p < 0.001$), indicating significant non-normality. Consequently, SmartPLS was retained for subsequent non-parametric analysis.

4. Results

We examined the significance of the model's structural path. The researcher applied the bootstrapping procedure (n=142, sample=5000) proposed by Hair et al. (2017). Table 2 describes the results of the proposed structural model about the path coefficient standard error and *t*-statistics. The table describes whether the hypotheses developed were supported or not supported. The Critical values for the one-tailed test were 1.645 (significant level=5%), 2.326 (significant level=10%), and 3.090 (significant level=1%) (Hair et al., 2014). According to Hair et al. (2014), researchers should consider a path coefficient with a 5% or less probability error of ≤ 5 % %as significant. As such, all the direct hypotheses proposed in this study are significant.

Table 2 shows the results for all 142 companies, combining public and private companies, as in other studies.(Al-Samman & Al-Nashmi, 2016). In addition, in this study, the number of respondents from public companies was only 30, which was not sufficient to be analyzed separately (Cohen, 1992), leading to the findings not being generalized. To reiterate, nine hypotheses for the direct relationship were tested in this study.

Table 2: Path coefficient (ALL) n = 142 companies

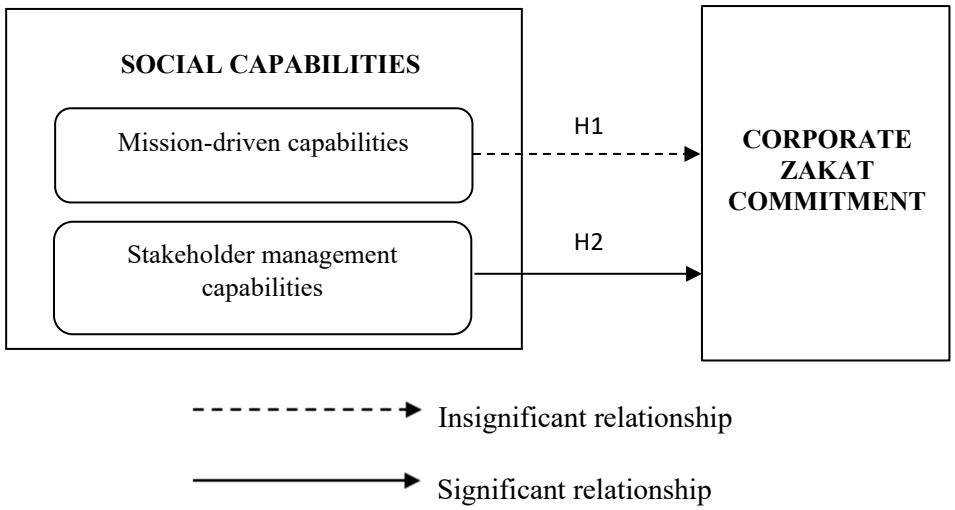
Hypo	Path	β beta	t-value	CI - min	CI - max	*p*-value	Decision
H1	SM → ZC	-0.088	0.743	-0.280	0.103	0.230	Not supported
H2	SS → ZC	0.229	2.487	0.088	0.387	0.006	Supported

Notes: SM = Mission-driven capabilities, SS = Stakeholder management capabilities, SR = Slack resources, ZC = Zakat commitment.

H1 represents the relationship between SM and ZC (β= −0.088) and is not significant with a confidence level of 5% (p<0.05). H2 represents the relationship of SS towards ZC (β=0.229) as the largest path coefficient and significant with a confidence level of 5% (p<0.05). The statistical analyses concluded that H2 is supported.

Findings

Figure 4: Direct effect of social capabilities on corporate zakat commitment.



The first finding of this objective is the relationship between mission-driven capabilities and corporate zakat commitment. The results reflected an insignificant positive relationship between the constructs (p=0.230). Although the relationship was based on consistent positive relationships in the past literature, the current results did not support the referred past relationships of significant positive relationships. For instance, one of the studies on companies' missions Mallin, Farag and Ow-Yong (2014) highlighted that zakat-paying Islamic banks are concerned and show more commitment towards their vision and mission statements. According to the study, the vision of these Islamic banks, based on the mandatory obligations according to the Shariah, among others, is the screening and dealing responsibly with clients, action on earnings, and expenditures prohibited by Shariah, paying due attention to employees' welfare, and establishing terms and conditions for zakat.

Supposedly, for companies to pay zakat, the mission is clearly stated. Otherwise, it reflects corporate zakat commitment as an unplanned act by companies. Companies' decisions depend on the consensus of the Board of Directors, which involves input from many companies' divisions. The lack of corporate zakat standards and guidelines (Obaidullah, 2016) provides an unclear direction for the BOD to include corporate zakat in the company's operation. Most zakat-paying companies are not only Islamic banks; therefore, they are lost because of the lack of standards on these matters. Since past studies on Islamic banks are equipped with proper standards on corporate zakat (e.g., AAOIFI), including the mission statement, the inclusion of all companies in those studies provides a different result. In past studies on Islamic banks Mohammed et al., (2015) asserted that standards and company policies have played a role in guiding company directions.

Therefore, increasing awareness and imposing zakat should be part of the organizational goals. Charity needs to be planned and not performed by chance. It shall be part of the company's focus and be integrated into the company's strategic planning. Companies need to have a proper mission that serves as a guideline and directs their course of action. For instance, Islamic corporate culture influences how a company operates its Islamic CSR. In this case, the cultural formation of Islamic organizations is not only molded by all members of the organization but must also be supported and run by the owner of the organization. The owner holds the key role and is the determinant of how the system in the organization will run. Therefore, if the owner of an organization forms an Islamic organizational culture and all members of the organization implement the work following the commands of Allah with high commitment, it could influence the Islamic CSR strategy (Ifada, Ghozali, & Faisal, 2019).

If Islamic banks disclose their zakat donations, stakeholders will perceive this as a favourable advancement in the implementation of Shariah, and conversely. A different perspective is from an ethical viewpoint. Ethical identity is essential for Islamic banks to uphold their creditworthiness in the product and equity markets (Rashid, 2017). Mission-driven skills did not inspire corporate zakat contributors to engage. In Malaysia, there is no standardised framework for the reporting of corporate zakat, and the implementation of mission-driven capabilities in Islamic Financial Institutions (IFI) varies because of the existence of superior regulatory norms, such as those established by AAOIFI and Bank Negara (M. Kabir Hassan & Mahlknecht, 2011).

The next finding is the relationship between stakeholder management capabilities and corporate zakat commitments. Stakeholder management is a strategic process that considers stakeholders while making decisions. The stakeholders of corporate zakat commitment are shareholders as business owners who pay corporate zakat (Ahmadi et al., 2023), customers as part of the Muslim community (Sarif & Zainudin 2020) and zakat institutions (Migdad, 2019). The result of the positive and significant impact of stakeholder management capabilities on corporate zakat commitment is in line with, Freeman and Dmytriyev (2017), who mentioned that Stakeholder Theory must explain CSR practices more. This shows that stakeholders play a critical role in encouraging companies to embark on CSR. Stakeholder involvement is imperative through better communication, which involves disclosure and reporting. Companies should disseminate information through various channels, such as CSR reports, web pages, social networking, and advertising, to enhance awareness of their commitment to social activities, which is usually low (Zhang & Ouyang, 2021).

The disclosure encourages proper communication among the internal stakeholders of the companies, namely, employees. As expected, employees are vital to running a company (Hoque et al., 2014). Employees who are clear about the mission and direction of the company feel that they belong and work towards achieving the company's aim. In contrast, vagueness and a lack of communication about the company's plan and direction hinder the motivation of employees and become a barrier to achieving the company's mission. Communication with stakeholders is crucial because it determines the decision-making process. Thus, the disclosure of zakat is important for stakeholders and shareholders to be aware of whether the company makes a zakat payment. The concept of corporate zakat is against agency costs, which only benefit managers. On the other hand, the payment of zakat benefits shareholders in terms of their obligations as Muslims who pay zakat on their wealth. The reporting of zakat and charity is a regulatory obligation for Islamic banks, typically grounded in Shariah law. Nevertheless, if Islamic banks prioritise the reporting of charitable contributions and benevolent loans over zakat, the overall reporting activities may predominantly reflect their impression control efforts. Rashid, M. (2017) proposed that zakat reporting should be integrated with other charitable, environmental, and social reporting methodologies to convey a holistic representation of the bank's character to society. Conversely, the absence of zakat reporting may indicate that the country lacks zakat obligations or that Islamic banks do not adhere to them. For instance, Islamic banks in Bangladesh lack zakat or charity reporting obligations or laws, as they exclusively adhere to the principles and recommendations of the AAOIFI and IFRS.

5. Conclusion

This study provides empirical evidence of the influence of social capabilities on corporate zakat commitment by applying a Social Resource-Based View framework. The insignificant role of mission-driven capabilities highlights the absence of clear corporate zakat standards and enforcement mechanisms, particularly outside of the Islamic financial sector. Without formal guidelines and regulatory pressure, the inclusion of zakat in

corporate missions alone may be insufficient to guarantee consistent zakat compliance. Despite the weak regulations, corporate which are Muslim own particularly encouraged to aim for a high payment of zakat, rather than just focus on profit maximisation only. Success stories, awards, recognition, awareness, and friendly reminders could always be done to help the corporation to set this target of paying zakat as their strategic planning agenda.

Social capabilities are more suitable for social enterprises where their mission is more focused on the benefits of society. Therefore, the companies that pay zakat are deemed to be a social enterprise, but the implications of the benefits towards society are not that impactful. Therefore, without informing the stakeholders of their mission of paying zakat, it can cause information asymmetry, which has been highlighted by the signaling theory as not benefiting the stakeholders.

The findings reveal that stakeholder management capabilities have a significant positive effect on corporate zakat commitment, whereas mission-driven capabilities do not exhibit a statistically significant influence within the sampled companies. These results suggest that effective engagement, communication, and relationship management with stakeholders play a more dominant role in motivating corporate zakat practices than formal integration of zakat into organizational mission statements. Strong stakeholder relationships, particularly with shareholders, customers, employees, and zakat institutions, emerge as critical drivers of commitment through enhanced accountability, transparency, and reputational considerations.

From a practical perspective, the findings imply that zakat institutions and policymakers should prioritize stakeholder-based engagement strategies, including disclosure requirements, reporting standards, and governance mechanisms that strengthen corporate accountability. For companies, proactive stakeholder management can serve as a strategic approach not only to enhance zakat compliance but also to improve corporate legitimacy and social trust.

Overall, this study extends the application of SRBV to the domain of Islamic social finance and demonstrates that social capabilities, particularly stakeholder management, are key determinants of corporate zakat commitment. Future research could further explore the interaction between regulatory frameworks, organizational culture, and social capabilities across different industries and jurisdictions.

Limitations and Future Research

There are several limitations to this study. This study's respondents were exclusively from firms that already pay zakat, excluding non-paying companies. This limits the study's ability to explain why firms do not commit to Zakat, which is a central problem statement of the paper. By focusing only on zakat payers, the findings may fail to capture the barriers, resistance, or strategic trade-offs faced by non-compliant firms.

Second, a cross-sectional research design restricts causal inference. While the study discusses commitment as a strategic and capability-driven process, the data captures only a single point in time. Social capabilities, particularly mission-driven and stakeholder management capabilities, are inherently dynamic and evolve. Without longitudinal data, it is difficult to determine whether stakeholder management capabilities lead to zakat commitment or whether zakat commitment itself strengthens stakeholder relationships.

Third, the reliance on self-reported data from senior management raises concerns about social desirability and impression management bias, especially given the religious sensitivity of zakat. Managers may overstate their firm's commitment or stakeholder engagement to align with socially acceptable norms, potentially inflating observed relationships. Future studies are advised to use triangulation using archival data (e.g., zakat disclosures, financial reports) to improve the robustness of the findings.

Finally, the contextual limitation of focusing solely on Malaysia constrains the external validity of the study. Malaysia has relatively developed zakat institutions and governance structures compared to many other Muslim-majority countries. The findings may not readily apply to contexts where zakat is informal, weakly institutionalized, or governed by different legal frameworks.

In conclusion, while the paper offers valuable insights into the role of stakeholder management in corporate zakat commitment, its theoretical alignment, construct clarity, sampling strategy, and research design limit the explanatory power of its conclusions. Addressing these issues in future research, particularly by incorporating non-paying firms, refining zakat-specific measures, and employing longitudinal or mixed-method approaches, would significantly strengthen the contribution to Islamic accounting and governance literature.

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Multiscale Transmission of Volatility Between Short and Long-Term Investment Preferences: Evidence from Malaysia's KLCI

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Abstract: This study examines how short-term and long-term investments in Malaysia's stock market influence each other through volatility spillovers. Using daily data from the KLCI index from 2014 to 2024, the research applies a combination of wavelet analysis and the Dynamic Granger Causality Multivariate Stochastic Volatility (DGC-t-MSV) model. This method allows us to study market behavior across different time periods and frequencies. The results show that there are significant volatility spillovers between short-term and long-term investments, with stronger effects coming from long-term (institutional) investments to short-term (retail) investments. Both types of investments also show strong persistence in volatility, meaning that once volatility appears, it tends to last. These findings are important for investors who need to manage risks and returns more effectively. They also provide useful insights for policymakers who aim to improve the stability of financial markets. By introducing a new approach to analyzing volatility spillovers, this research contributes to a better understanding of risk management in emerging markets like Malaysia.

Keywords: *Volatility Spillovers, Wavelet Decomposition, Multivariate Stochastic Volatility (MSV), Malaysian Stock Market*

1. Introduction and Background

In the rapidly evolving financial landscape of Malaysia, market volatility presents a constant challenge for investors. Market volatility, defined as the conditional standard deviation of asset returns, reflects the degree of risk and unpredictability associated with financial instruments (Tsay, 2010; Brooks, 2008). The phenomenon of volatility spillovers, where fluctuations in one market impact another, plays a pivotal role in shaping investment decisions. This interconnectedness underscores the importance of understanding and managing these spillovers to optimize investment outcomes and mitigate risks. In recent years, this concern has intensified globally, driven by macroeconomic uncertainties, geopolitical tensions such as the Ukraine–Russia conflict, and inflation shocks following the COVID-19 pandemic.

An important turning point in the development of regional financial integration was the Asian Financial Crisis of 1998, which demonstrated the degree to which return and volatility spillovers might spread shocks throughout markets (Yilmaz, 2010). Key factors affecting volatility spillovers include market integration, interest rate fluctuations, exchange rate movements, and broader global economic conditions. As such, investors must comprehend the potential impact of these spillovers on their portfolio returns and manage associated risks accordingly.

Financial market volatility, particularly stock market volatility, can undermine the efficient functioning of economic systems (Merton & Bodie, 1995; Mala & Reddy, 2007). Malaysia's capital market is recognized for its relatively high volatility and its strong interconnectedness with global financial systems. This makes it particularly vulnerable to external shocks and foreign capital movement. Events such as the sharp rise and fall in glove-related stocks during the COVID-19 pandemic, and capital flight driven by domestic political instability, exemplify how both international developments and internal factors can amplify local market volatility. In the context of investor behavior and preferences in Malaysia, understanding the nature and extent of volatility spillover transmission is essential for achieving risk-adjusted portfolio performance and policy stability.

Factors such as global interest rate hikes, fiscal policy shifts, and geopolitical uncertainties can trigger significant volatility episodes in Malaysia. Between 2015 and 2022, the KLCI index demonstrated recurring patterns of volatility clustering, particularly during periods of US Federal Reserve policy normalization and foreign capital outflows. These dynamics affected investor confidence and altered portfolio allocation strategies for both institutional and retail investors. Identifying how these volatility episodes emerge and

persist can help market participants design more effective hedging strategies and risk mitigation frameworks. Numerous studies have explored volatility spillovers and risk behavior in global and emerging markets. Dutt and Humphery-Jenner (2013) highlighted the link between price volatility, firm operating performance, and stock returns, finding that low-volatility stocks with strong operational fundamentals tend to outperform. Weng et al. (2018) examined how trader attention and online financial information platforms influence investment behavior, leading to the development of predictive models for short-term stock price forecasting. Abdullah et al. (2022) and Alfreedi (2019) used a multivariate volatility framework to study the effect of return shocks on volatility in developed markets, revealing how return shocks propagate through conditional variance-covariance structures. Gee and Karim (2010) emphasized that international portfolio managers increasingly focus on stock volatility in emerging markets for diversification and return enhancement opportunities. Beirne et al. (2013) reinforced the relevance of the Malaysian stock market to global investors due to its reform-driven structure and openness to cross-border capital flows.

Furthermore, investors increasingly recognize the sensitivity of financial markets to extreme events such as natural disasters, systemic financial crises, war, and global pandemics. The Global Financial Crisis and the COVID-19 pandemic have demonstrated the disruptive impact of such systemic events on traditional equity indices (Sahoo & Kumar, 2023). Despite these insights, few studies have rigorously explored the dynamics of volatility spillovers between different investor classes, particularly within the same national market. For instance, Li Yu et al. (2023) noted the lack of quantitative investigations into volatility behavior across investment preferences. More recently, a 2025 study published in Qual Quant employed wavelet coherence and the Diebold–Yilmaz spillover index to examine volatility dynamics across financial, cryptocurrency, and commodity markets from 2017 to 2023. This work reaffirms the importance of multiscale methods in capturing spillovers across diverse asset classes and offers methodological support for the current paper's multiscale volatility approach.

The Asian Financial Crisis of 1998 marked a critical juncture in the evolution of regional financial integration. Building upon this historical context, the present study examines multiscale volatility spillovers between short-term and long-term investment preferences in Malaysia's stock market. Utilizing a wavelet-based Dynamic Granger Causality Multivariate Stochastic Volatility (DGC-t-MSV) model and drawing on daily KLCI index data from 2014 to 2024, the analysis captures both the directional influence and persistence of volatility across different time–frequency domains.

This investigation is theoretically grounded in the Intertemporal Capital Asset Pricing Model (ICAPM), the Fractal Market Hypothesis (FMH), and the Heterogeneous Market Hypothesis (HMH). Together, these frameworks offer a robust lens for understanding how diverse investor types (with varying risk tolerances, information processing behaviors, and investment horizons) contribute to the transmission and amplification of volatility across time scales. By integrating these theoretical perspectives with a multiscale modeling approach, the study aims to generate meaningful implications for portfolio risk management, enhance the behavioral segmentation of financial market participants, and support more informed decision-making by policymakers and institutional stakeholders navigating Malaysia's increasingly complex and globally exposed investment environment.

This research contributes to the literature in three significant ways. First, it offers empirical insights into volatility clustering and persistence at different investment scales, which have direct implications for asset allocation, hedging strategies, and regulatory oversight. Second, the methodological adoption of the DGC-t-MSV model enables the integration of nonlinear structures, regime shifts, and multiscale behavior, the features commonly overlooked by traditional GARCH-type models. Third, the study bridges an important gap by examining intra-market volatility spillovers between investor classes rather than across countries or sectors. While previous studies (Dutt and Humphery-Jenner, 2013; Weng et al., 2018; Alfreedi, 2019; Abdullah et al., 2022) have investigated spillovers using multivariate models, few have contextualized these dynamics within a single national market differentiated by investment horizon. As such, this research provides both theoretical and practical advancements in understanding market behavior and managing financial risk.

The article is organized as follows: The "Literature Review" section reviews preceding literature; the "Research Methodology" section describes the data and methodology used in this study; the "Empirical Analysis" section

presents preliminary analysis and empirical results; and the "Discussion and Conclusion" section concludes the article.

2. Literature Review

Volatility spillovers are a major topic in the field of financial economics since they involve the exchange of information between various financial markets (Long et al., 2021). It relates risks transferred from different markets to spillovers, which have important ramifications for risk management, asset allocation, and option pricing (Khalfaoui et al., 2015; Naeem et al., 2023; Wang & Wu, 2012). Some researchers have previously examined various facets of this market interaction. Because of the steadily rising financial integration over the past fifteen years, which may have contributed to the greater risks brought on by the financial crisis, Diebold & Yilmas (2009) find that volatility spillovers exhibit clear bursts associated with financial crises. According to Nishimura et al. (2018), there is a greater degree of spillover effect in accessible markets compared to inaccessible markets, as stock investors' transactions across international markets primarily cause volatility spillovers to intensify with increased openness.

According to Liu et al. (2020), the majority of volatility spillovers are produced during long-term trade and are susceptible to significant financial events, helping explain how financial crises continue to propagate through directional volatility channels. Given that health and geopolitical risks significantly impact the return-volatility system, studies suggest that spillovers intensified during the COVID-19 pandemic and the Russia–Ukraine war (Naeem et al., 2023; Chen et al., 2023; Hanif et al., 2023). Extending this theme, Chen et al. (2025) employed wavelet coherence and time-varying causality analysis to assess volatility spillovers between climate risk and stock markets, reinforcing the value of multiscale decomposition in understanding transmission effects under systemic shocks. While much of the existing literature focuses on cross-market contagion, this study narrows in on volatility spillovers within the stock market, specifically between different investor segments operating at divergent time scales.

To conceptualize these interactions, this study draws on three interrelated theories: the Intertemporal Capital Asset Pricing Model (ICAPM), the Fractal Market Hypothesis (FMH), and the Heterogeneous Market Hypothesis (HMH). The ICAPM (Merton, 1973) posits that investors allocate wealth not only for immediate gains but also to hedge against future uncertainties, particularly volatility shifts, highlighting the temporal dimension of risk in investment behavior. This aligns with the view that institutional investors, with longer horizons, may be more sensitive to intertemporal volatility changes. Meanwhile, the FMH (Peters, 1994) emphasizes that financial markets are made up of heterogeneous participants with differing time horizons whose coexistence contributes to market stability, but whose imbalance can induce volatility. This is especially relevant when analyzing multiscale volatility through wavelet decomposition. Similarly, the HMH (Müller et al., 1997) suggests that market dynamics emerge from the asynchronous reactions of investors to information and shocks, reinforcing the importance of modeling volatility transmission between retail and institutional segments. These theories collectively form the backbone of this study's empirical strategy.

From a methodological perspective, early studies often adopted observation-driven approaches such as univariate GARCH-type models (Gao et al., 2021; Zhang et al., 2022). Liu et al. (2017), for example, used a BEKK-GARCH model to analyze the evolution of volatility spillovers during financial crises. The intensification of volatility spillovers across sectors revealed contagion patterns during the Global Financial Crisis. However, limitations persist within these models, notably the rigid assumptions on error structures and the inability to fully capture regime shifts and multiscale behavior (Chen et al., 2023; Belhassine, 2020).

To overcome these constraints, multivariate stochastic volatility (MSV) models have gained prominence. These models treat error variance as a stochastic process, offering a more flexible and accurate representation of financial time series dynamics (Tsionas et al., 2022; Zhang & He, 2021). Asai et al. (2006) highlight the diagnostic strength of MSV models using Markov Chain Monte Carlo (MCMC) estimation, which is now standard in this literature. Tian and Hamori (2016), using the SVAR-MSV framework, demonstrate temporal lags in spillover effects across U.S. markets. Wu et al. (2020) applied the DGC-MSV model to show persistent volatility links between stock and exchange rate markets, features not adequately captured by GARCH models.

This research extends the MSV framework through the integration of wavelet analysis, allowing for simultaneous decomposition of financial data in the time and frequency domains. Rua and Nunes (2012) first demonstrated how wavelet methods can isolate spillovers across sectors at different time scales. Volatility patterns often differ substantially across wavelet scales, suggesting that spillovers operate asynchronously across investment horizons (Liu et al., 2017). To capture these dynamics, this study introduces the wavelet-based DGC-t-MSV model, which integrates maximum overlapping discrete wavelets with MSV estimation to analyze volatility transmission between short-term (retail) and long-term (institutional) investors in the same market. This model is supported by recent evidence from Wang (2024), where DGC-t-MSV was successfully applied to capture structural transformation effects in carbon and energy markets.

Over the last decade, multiscale volatility in Malaysia's KLCI index has become increasingly evident, reflecting economic shocks, political instability, and sector-specific disturbances, such as the glove industry's rapid boom and bust. Understanding volatility spillovers across investor types is therefore critical for market resilience. For instance, Younis et al. (2023) documented bi-directional causality between Malaysian and Chinese equity markets across time scales during crises, while Lestari et al. (2023) found a negative correlation between KLCI movements and China's Economic Policy Uncertainty index. Building on the foundation laid by Yu et al. (2023), who used the DGC-t-MSV model to assess institutional–retail volatility spillovers in China, this study offers a novel contribution by applying the same framework to Malaysia's capital market, where such intra-market volatility segmentation remains underexplored.

3. Research Methodology

Wavelet Decomposition of the Original Series: The study utilizes the Maximum Overlap Discrete Wavelet Transform (MODWT) for wavelet decomposition, following the methodology proposed by Percival and Walden (2000). MODWT was chosen for its advantages over traditional Discrete Wavelet Transform (DWT), including the ability to analyze any number of samples without special provisions for data selection starting points, constant data amounts in each scale post-decomposition, translation invariance, and time-varying wavelet coefficients. These features enable a more refined capture of low-frequency information and improved resolution.

In this study, the MODWT is applied to the daily returns of the KLCI Index from March 13, 2014, to March 13, 2024, encompassing decomposing the original time series into multiple scales. The Symlet wavelet with a width of eight, an improvement over the Daubechies wavelet, is selected for its nearly symmetric, tightly supported, regular, and smooth characteristics, making it ideal for noise reduction and orthogonal wavelet decomposition of financial time series.

Multivariate Model of Volatility: DGC-t-MSV: To investigate the volatility spillovers between different investment preferences, the study employs the Dynamic Granger Causality Multivariate Stochastic Volatility (DGC-t-MSV) model, based on the Student's t-distribution. This model allows for the characterization of both mean and volatility spillovers as well as dynamic correlations between short-term and long-term investment returns. The DGC-t-MSV model is defined as follows:

$$y_t = \text{diag}\,(\exp(h_t / 2)) * \varepsilon_t$$

$$h_t = \mu + \Phi(h_{t-1} - \mu) + \eta_t,\ \eta_t \sim N(0, \text{diag}(\sigma^2_{\eta 1}, \sigma^2_{\eta 2}))$$

$$q_t = \psi_1 + \psi(q_{t-1} - \psi_0) + \tau z_t,\ z_t \sim N(0, 1)$$

Where y_t represents the vector of returns for short-term and long-term investments, ε_t is the random error term following a Student's t-distribution with a time-varying correlation matrix Σ_t. The parameters of volatility persistence and spillovers are captured in the matrix Φ, and the dynamic correlation persistence is represented by ψ. The Markov Chain Monte Carlo (MCMC) method with Gibbs sampling is employed to estimate all model parameters, ensuring the robustness and accuracy of the results.

Convergence Check and Granger Causality: The convergence of the MSV model is assessed using the Gelman-Rubin statistic, which approaches 1 when the sample iterations are sufficient, indicating model stability. Granger causality is tested to determine the presence of volatility spillovers between the different wavelet

scales. The significance of the spillover coefficients is evaluated using a t-statistic:

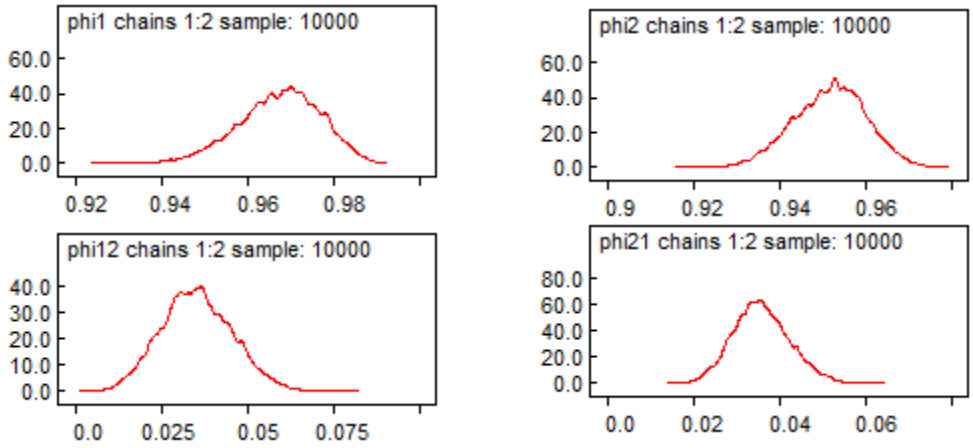
$$t = \varphi_{ij} / SE(\varphi_{ij}),\ SE(\varphi_{ij}) = \sqrt{(Var(\sum \varphi_{ij}))}\ (i \neq j)$$

Where φ_{ij} represents the estimated parameter of volatility spillovers, and its significance is determined by comparing the t-statistic with critical values.

4. Results

To ensure the accuracy of the results, the DGC-t-MSV model estimations are performed using the MCMC method and a Gibbs sampler. For posterior computing in the multivariate stochastic volatility model, we use the WinBUGS software, which offers a specialized implementation of the MCMC technique as well as an effective Gibbs sampler. When it comes to the volatility spillovers between short-term and long-term investments of the D1 and D3 scales, the parameters ϕ_1, ϕ_2, ϕ_{12}, and ϕ_{21} are involved. The iteration and convergence are as follows:

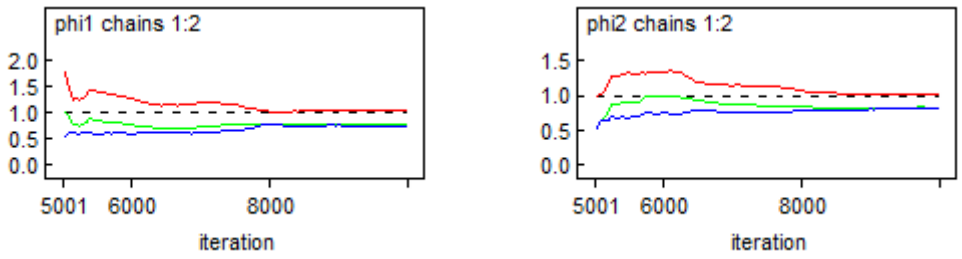
Figure 1: The density curves for the short-term and long-term investments' volatility spillovers

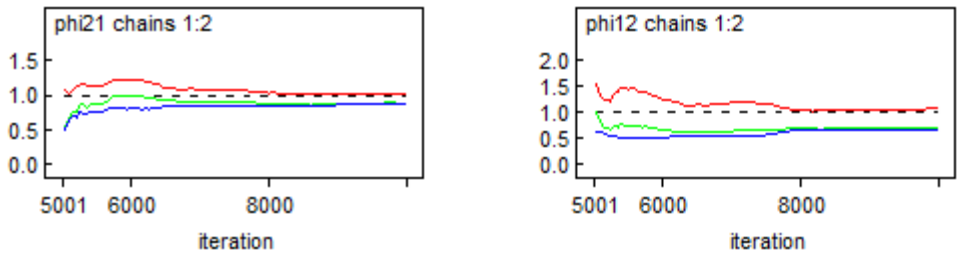


Source: Author's calculations from WinBUGS.

The parameters' posterior density curves for the volatility spillovers between KLCI's short-term and long-term investments are shown in Figure 1. Given that the sample data iterations increase and the curves are generally smooth, the approach's efficacy and good convergence are confirmed. It tends toward asymptotic normality.

Figure 2: The Markov Chain of DGC-t-MSV Model





As illustrated in Figure 2, every Markov chain of parameters quickly approaches 1, indicating that the Gibbs sampler-based MCMC methodology fits the marginal posterior distribution. As a result, it demonstrates that the DGC-t-MSV model is suitable for characterizing the KLCI's short- and long-term volatility spillovers in the Malaysian stock market.

Estimation results: The DGC t MSV model estimation results for the whole 2014–2024 period of KLCI original data are shown in Table 1. It presents the pairwise combined MODWT decompositions. In the daily return of KLCI, wavelet decompositions D1 and D3, which represent short-term retail investor investment and long-term institutional investment, respectively, are studied for their mean and volatility spillover dynamics. Additional estimations at the remaining decomposition scales are included only as a point of reference.

Table 1: The Pairwise Combined MODWT Decompositions

Coefficient	Prior distribution	Scale	Mean	Standard Deviation	MC error	Distribution interval
ψ	Beta (20, 1.5)	D1-D2	0.1359	0.0685	0.005754	(0.03742, 0.3022)
		D1-D3	0.8171	0.1553	0.01298	(0.5273, 0.9830)
		D2-D3	0.7347	0.1052	0.008616	(0.5009, 0.8866)
μ_1	N (0, 25)	D1-D2	0.5043	0.1746	0.007444	(0.1547, 0.8489)
		D1-D3	0.5025	0.1968	0.005331	(0.1127, 0.8830)
		D2-D3	0.3953	0.1925	0.007249	(0.00741, (0.7678)
μ_2	N (0, 25)	D1-D2	-0.02914	0.1713	0.00762	(-0.3768, 0.3030)
		D1-D3	-0.1148	0.1850	0.005995	(-0.4810, 0.2440)
		D2-D3	-0.05753	0.1796	0.0058883	(-0.4142, 0.2949)
$\sigma_{n^1}^1$	Inverse-Gamma (2.5, 0.025)	D1-D2	0.4197	0.03850	0.003049	(0.3349, 0.4907)
		D1-D3	0.3855	0.03038	0.002372	(0.3350, 0.4459)
		D2-D3	0.3061	0.02735	0.002169	(0.2633, 0.3678)
$\sigma_{n^2}^2$	Inverse-Gamma (2.5, 0.025)	D1-D2	0.2745	0.02168	0.001682	(0.2379, 0.3200)
		D1-D3	0.3423	0.02703	0.002094	(0.2966, 0.3951)
		D2-D3	0.3404	0.02584	0.001991	(0.2903, 0.3927)

Note: There are partial estimations of the parameters in the DGC-t-MSV model run by the MCMC method with Gibbs sampler. Each parameter between different wavelet scales consists of a total of 2464 observations, respectively.

The Monte Carlo (MC) errors of all the parameters are less than their standard deviations. It is therefore possible to conclude the DGC t MSV model's applicability and validity for the MODWT decompositions of different investment preferences, specifically between short-term (D1) and long-term (D3) investment horizons. This approach is grounded in the Intertemporal Capital Asset Pricing Model (ICAPM), which emphasizes how investors allocate assets over multiple periods under uncertainty (Merton, 1973). Moreover, the Fractal Market Hypothesis (FMH) and Heterogeneous Market Hypothesis (HMH) support this analysis by positing that financial markets consist of investors with differing investment horizons and reactions to volatility, causing fluctuations across various time scales (Peters, 1994; Müller et al., 1997).

To analyze investment dynamics over a range of time periods, financial modeling requires an understanding of time-varying coefficients. Five coefficients ψ, μ_1, μ_2, $\sigma_{n^1}^1$ and $\sigma_{n^2}^2$ are the subject of this research which analyzes their mean values in relation to institutional investors' long-term investments and individual investors' short-term investments. The persistence of correlation dynamics across investor groups is represented by the time-varying coefficients ψ. Table 1 presents the average values and standard deviations of ψ, which progressively decrease from the low decomposition scale of pairwise pairings to the high level. In terms of dynamic correlation, the correlation persistence on the D1–D3 scale ranges from 0.5273 to 0.9830, confirming a positive relationship between short-term and long-term returns. This persistence mirrors recent findings in the literature, such as Chen et al. (2025), who observed multiscale volatility transmissions under systemic risk using wavelet and causality approaches in the context of climate and financial market linkages. Similarly, a 2024 study by Wang et al. (2024) validated the DGC t MSV model's power to capture temporal volatility spillovers between carbon and energy markets, which reinforces the methodological robustness of the current approach.

The detail coefficients' mean μ1 and μ2 are shown in Table 1 together with their average values and standard deviations. It demonstrates that, on the same decomposition scale, μ1 is essentially greater than μ2. In particular, the D1–D3 scale estimation results show that the average return on short-term investments in Malaysia's stock market is larger than that of long-term investments. The findings in daily stock market return forecasts (Zhong and Engke, 2017) are partially in line with this observation. These results also correspond with HMH assumptions, suggesting that short-term investors react more aggressively to market signals, hence creating sharper return dynamics than long-term investors who tend to stabilize volatility.

Table 1 also reports the conditional variances $\sigma_{n^1}^1$ and $\sigma_{n^2}^2$ of the detail coefficients at various wavelet scales. The conditional variances exhibit high average values and standard deviations, particularly in the D1–D2 scale and progressively diminish with low wavelet decomposition. In fact, the short-term investment's departure from the standard value is greater than that of the long-term investments, as indicated by the higher value of $\sigma_{n^2}^2$. This is essentially consistent with observed behavior in the Chinese stock market, where high-yield, high-risk assets attract short-term trading due to volume volatility (Yu et al., 2023).

To sum up, the average values of the time-varying coefficients offer both institutional and individual investors insightful information. These coefficients can be used by institutional investors to improve long-term portfolio management, and by short-term investors to maximize their trading strategies. Comprehending these coefficients aids both types of investors in navigating the intricacies of market dynamics and aligning their strategies with their financial objectives. These insights reinforce the importance of multiscale modeling for dynamic portfolio management, especially in emerging markets like Malaysia, where investor heterogeneity significantly influences volatility behavior.

Mean spillovers: The mean spillovers are captured by the ϕ_1 and ϕ_2 coefficients in Table 2. Regarding short-term volatility persistence, the mean value of ϕ_1 (= 0.9673) is significantly positive. Strong persistence in volatility is indicated by this high score, which is close to 1, meaning that once volatility arises, it usually lasts for a considerable amount of time. The persistence value indicates that variations in short-term returns do not soon abate, which is consistent with the result that short-term investments are more volatile. Comparably, the mean value for long-term volatility persistence, ϕ_2 (= 0.9516), is likewise significantly positive and only slightly lower than that of ϕ_1. This suggests that long-term volatility shows an even greater level of persistence. Long-term investors should anticipate volatility, which is more persistent than short-term investments. This variation in persistence highlights how volatility dynamics differ over various investment horizons.

Table 2: The Mean Spillovers of Φ_1 and Φ_2

Coefficient	Prior distribution	Scale	Mean	Standard Deviation	MC error	Distribution interval
ϕ_1	Beta (20, 1.5)	D1-D2	0.9307	0.01963	0.0014490	(0.8912, 0.9691)
		D1-D3	0.9673	0.009523	0.0005983	(0.9472, 0.9841)
		D2-D3	0.9788	0.009826	0.0006589	(0.9571, 0.9944)

ϕ_2	Beta (20, 1.5)	D1-D2	0.9164	0.01112	0.0007513	(0.8953, 0.9378)
		D1-D3	0.9516	0.008470	0.0004767	(0.9345, 0.9675)
		D2-D3	0.9368	0.009385	0.0005671	(0.9166, 0.9538)

Note: Table 2 provides the estimations of the mean spillover parameters $\phi 1$ and $\phi 2$ in the DGC-t-MSV Model with the posterior distribution run on the whole periods of daily returns. Each parameter is estimated by the MCMC method with the Gibbs sampler and consists of a total of 2464 observations.

These observations are well aligned with the Fractal Market Hypothesis (FMH) and Heterogeneous Market Hypothesis (HMH), both of which suggest that financial markets are composed of agents operating at various temporal horizons with distinct risk perceptions and behavioral responses (Peters, 1994; Müller et al., 1997). The observed persistence in both short- and long-term volatilities further validates the assumption that investor reactions are not uniform across timeframes. This is echoed in recent findings by Chen et al. (2025), who employed wavelet and causality techniques to demonstrate the long-lasting impact of systemic risks on volatility patterns, reinforcing the argument for multiscale modeling in capturing persistent shocks. Similarly, the Wang et al (2024) study confirms that volatility dynamics across investment horizons, when modeled through DGC t MSV frameworks, exhibit unique, time-dependent persistence that conventional models often overlook.

The need for investors to understand the behavioral patterns of volatility across various investment horizons is highlighted by the high persistence values for both ϕ_1 and ϕ_2. Short-term investors must manage the risks associated with immediate returns by realizing that volatility can stay high for extended periods of time. The possibility that long-term volatility will continue to exist must also be taken into consideration by long-term investors, as this could have an impact on their long-term risk management and strategic planning strategies. These insights are consistent with the Intertemporal Capital Asset Pricing Model (ICAPM), which posits that forward-looking investors adjust their asset allocations over time in response to changing volatility expectations (Merton, 1973). Understanding the duration and consistency of volatility across time scales enhances decision-making under uncertainty, supporting more adaptive and time-sensitive risk management strategies.

The standard deviation values for coefficients ϕ_1 (= 0.009523) and ϕ_2 (= 0.008470) shed light on the variability of volatility spillovers. The higher standard deviation for ϕ_1 suggests that the short-term spillover effects are more erratic and prone to more fluctuations. Accordingly, short-term investors can encounter more abrupt shifts in how market or asset volatility propagates, necessitating more responsive and tactical risk management. Long-term investors may find it easier to predict and control these impacts over time if the standard deviation of ϕ_2 is lower, which suggests that long-term volatility spillovers are steadier and more reliable. Overall, more consistent and predictable risk exposure is made possible by the reduced variability in long-term spillovers, whereas short-term investors need to be ready for a more dynamic market environment with greater volatility uncertainty. This further reinforces the premise of market heterogeneity, as highlighted in the FMH and HMH, where differing investor behaviors across scales create divergent volatility responses, calling for customized investment strategies depending on horizon and risk appetite.

Volatility spillovers: Estimations in Table 3 reflect that the volatility spillover effects are captured by the ϕ_{12} and ϕ_{21} coefficients, and the means of which vary within a certain range in all the sectors. The positive mean values of ϕ_{12} (from short-term to long-term) and ϕ_{21} (from long-term to short-term) suggest that there are notable volatility spillovers between short-term and long-term investments, though the positive value is not so high. Compared to ϕ_{12} (= 0.03525), the mean value of ϕ_{21} (= 0.03560) is slightly higher, indicating stronger spillovers from long-term to short-term investments. This result is consistent with the original study's finding that there are important interactions between different kinds of investments. These spillovers are bidirectional, meaning that fluctuations in one investment horizon may have an impact on the other. For example, higher volatility in long-term investments may have an impact on the stability of short-term investments and vice versa. This interdependence emphasizes how crucial it is to take both investment horizons into account when assessing market circumstances and possible hazards.

Table 3: The Volatility Spillover Parameters ϕ_{12} and ϕ_{21} in the DGC-T-MSV Model

Coefficient	Prior distribution	Scale	Mean	Standard Deviation	MC error	Distribution interval
ϕ_{12}	N (0, 25)	D1-D2	0.06729	0.01907	0.0013990	(0.02839, 0.1048)
		D1-D3	0.03525	0.01024	0.0006462	(0.01619, 0.05622)
		D2-D3	0.01604	0.00901	0.0005924	(0.000494, 0.0154)
Φ_{21}	N (0, 25)	D1-D2	0.07792	0.01022	0.0007007	(0.05902, 0.0986)
		D1-D3	0.03560	0.006546	0.0003375	(0.02345, 0.04922)
		D2-D3	0.05815	0.009081	0.0005289	(0.04066, 0.07692)

Note: Table 3 provides the estimations of the volatility spillover parameters $\phi 12$ and $\phi 21$ in the DGC-t-MSV model with the posterior distribution run on the whole periods of daily returns, which are based on the prior distribution N (0, 10) according to previous literature. Each parameter is estimated by the MCMC method with the Gibbs sampler and consists of a total of 2464 observations.

The observed bidirectional spillover pattern is theoretically supported by the Heterogeneous Market Hypothesis (HMH), which posits that financial markets comprise investors with different time horizons and informational processing speeds, thereby contributing to cross-horizon volatility dynamics (Müller et al., 1997). The fact that ϕ_{21} slightly exceeds ϕ_{12} supports the idea that institutional investors (typically long-term) can exert structural influence over short-term investor sentiment, consistent with the Fractal Market Hypothesis (FMH). According to FMH, markets are stable only when investors with diverse time horizons coexist; any imbalance in this structure, such as increased institutional reallocation, may propagate through shorter time-scale behaviors. The asymmetry in volatility transmission also lends empirical support to the Intertemporal Capital Asset Pricing Model (ICAPM) framework, which emphasizes that rational investors adjust their portfolios in anticipation of future risk-return trade-offs, affecting current volatility levels across horizons (Merton, 1973).

Understanding the asymmetry in the spillover effects, where ϕ_{21} is greater than ϕ_{12}, is crucial to comprehending the interactions between various assets or marketplaces. For investors with lengthy time horizons, the moderate value of ϕ_{21} indicates that volatility contagion is more possible over longer time horizons, particularly from particular assets or markets with wider implications. Nonetheless, the numbers are still low enough to imply that, even while spillovers occur, it does not control the dynamics of overall volatility. These findings are in line with Chen et al. (2025), who demonstrated that volatility spillovers stemming from climate risks affected both short- and long-term stock market behavior through multiscale feedback channels. Additionally, the Wang et al (2024) study using the DGC t MSV model emphasized how volatility initiated in structurally sensitive long-horizon markets could cascade into more reactive short-horizon instruments, mirroring the modest but persistent spillover seen here.

The comparatively low standard deviations for both coefficients suggest that these spillover effects are steady and reliable throughout time. Both short-term and long-term investors can accurately forecast the degree of volatility transmission between assets or markets due to this low variability. This stability, which implies that there are spillover effects but that they do not fluctuate greatly, is essential for short-term investors to manage immediate risks. Because they can predict how volatility in one area of the portfolio may affect other assets, long-term investors can improve risk management and portfolio adjustment over time thanks to the relative constancy of spillover patterns. The complex relationship between markets and assets is ultimately highlighted by these coefficients, where spillover effects are present but kept within an acceptable range for both short-term and long-term investors.

By integrating behavioral heterogeneity, forward-looking portfolio theory, and time-scale-specific market dynamics, the study's findings advance the conceptualization of volatility spillovers beyond simplistic contagion models. Together, these grounded theories offer a robust lens through which to interpret the observed multiscale interactions and enhance volatility forecasting and policy implications in Malaysia's stock market.

5. Conclusion

This study investigates the dynamic and multiscale nature of volatility spillovers between short-term and long-term investment preferences in the Malaysian stock market using a wavelet-based Dynamic Granger Causality Multivariate Stochastic Volatility (DGC t MSV) model. By decomposing daily KLCI index data (2014–2024) across multiple frequency bands, the study identifies persistent yet asymmetric volatility spillover effects, with long-term investment segments exerting marginally stronger transmission onto short-term behavior. The analysis reveals meaningful time–frequency interactions in volatility patterns, reaffirming that institutional and retail investor behaviors are interlinked and that market volatility is not uniform across horizons. These findings reinforce the applicability of multiscale approaches in financial modeling and align with grounded theories such as the Intertemporal CAPM, Fractal Market Hypothesis, and Heterogeneous Market Hypothesis, which explain investor segmentation and market persistence.

The implications of these findings are twofold. First, for institutional investors and portfolio managers, the results emphasize the importance of accounting for multiscale volatility structures when designing long-term investment strategies, particularly during periods of systemic shocks or political uncertainty. Second, for regulators and policymakers, the bidirectional spillover dynamics underscore the need for surveillance tools that capture temporal interdependencies and horizon-based vulnerabilities. This study contributes to the expanding body of literature on intra-market volatility transmission by offering a novel empirical framework that bridges theoretical insights and applied risk modeling in an emerging market context. Future research can extend this work by integrating cross-country spillover analysis, high-frequency trading signals, or behavioral factors to deepen our understanding of volatility co-movements in interconnected financial systems.

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Green Behavior in the Workplace: The Role of Authentic Leadership and Psychological Capital in Shaping Environmental Citizenship in the Sri Lankan Public Sector

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Abstract: This study investigates both the direct and mediated influences of authentic leadership on organizational citizenship behaviour toward the environment (OCBE), with psychological capital serving as an intervening mechanism. Using a quantitative approach, data were gathered from 396 frontline employees across six public sector institutions in Sri Lanka through a survey questionnaire. The findings reveal that psychological capital plays a partial mediating role in the association between authentic leadership and OCBE. This indicates that authentic leadership affects OCBE not only directly but also indirectly by fostering employees' psychological capital. The observed relationships highlight the pivotal role of authentic leadership in enhancing positive psychological resources and promoting environmentally responsible discretionary behaviours among employees. The proposed research framework offers practical insights for senior management in Sri Lankan public sector organizations, particularly in the development of leadership initiatives aimed at cultivating authentic leaders who can encourage environmental sustainability through employees' OCBE.

Keywords: *Authentic Leadership, Organizational Citizenship Behaviour toward the Environment, Psychological Capital, Public Sector, Sri Lanka*

1. Introduction

Public institutions in many countries play a prominent role in environmental policy decisions and implementation (Bansal & Roth, 2000; Kulin & Sevä, 2019; Armstrong, 2019; Handoyo, 2024). These public institutions, at both the federal and local levels, try to solve environmental problems to ensure sustainable development. Problems, like air and water quality, biodiversity, population and climate change, and resource conservation, are some of the main problems that people expect public institutions to resolve (Voulvoulis & Burgman, 2019; Yuan, Masron, Chen & Azman, 2025). In this regard, discretionary pro-environmental behaviour, or organizational citizenship behaviour toward the environment (OCBE) among employees of public institutions, has not been researched in-depth (Boiral, 2009; Daily, Bishop & Govindarajulu, 2009; Stritch & Christensen, 2014). In fact, to date, no study has specifically examined public employees' involvement in OCBE.

According to Cheema, Afsar and Javed (2020), OCBE is considered to be of immense importance to the environmental performance of organizations. However, since pro-environmental behaviour at the workplace involves voluntary participation of employees, making it a part of their job description is difficult (Zhang, Zhang & Daim, 2023). Further, the effectiveness of formal environmental management practices often depends on voluntary pro-environmental behaviour because OCBE compensates for the weaknesses of formal practices, systems, and technologies (Luu, 2018). Although OCBE is cost-effective and may seem insignificant, over time, OCBE can have a substantial impact on the environmental performance of the organization. OCBE among public sector employees, in particular, is important since they are responsible for executing and enforcing policies related to environmental performance (Dahl & Lindblom, 1953; Vigoda-Gadot & Cohen, 2004).

Several researchers suggest that a leader's support plays a key role in pro-environmental behaviour (e.g., Maqsoom, Prasittisopin & Ullah, 2025; Ramus & Killmer, 2007; Daily et al., 2009). Robertson and Barling (2017) noted that research on how managers can encourage employees to demonstrate pro-environmental behaviour is still in its infancy. Therefore, there have been increasing calls for identifying leadership styles that could encourage employees' pro-environmental behaviour, consequently reducing the detrimental effects on the environment (Aguilera, Rupp, Williams & Ganapathi, 2007; Boiral, Talbot & Paillé, 2015; Afsar, Badir & Kiani, 2016). Although several studies have investigated the impact of various leadership styles on OCBE, studies on the influence of the authentic leadership style on OCBE are lacking (Robertson & Barling, 2013; Afsar et al., 2016; Ying, Faraz, Ahmed & Raza, 2020).

The rapidly escalating environmental problems globally have contributed to more attention being given to authentic leadership (Walumbwa, Avolio, Gardner, Wernsing & Peterson, 2008). Avolio and Gardner (2005) and Luthans and Avolio (2003) argued that authentic leadership is characterized by high ethical standards that guide decision-making and behaviour. Bound by their moral values and ethical behaviour (Lussier & Achua, 2013), authentic leaders can have a significant influence on employees' OCBE. Authentic leaders are emotionally intelligent and possess integrity, resilience, courage, and a genuine desire to serve others (Valsania, León, Alonso & Cantisano, 2012). According to Avolio and Mhatre (2012), authentic leaders lead by example and are often role models to others. They champion environmental causes, which then motivates their employees to display OCBE. Authentic leaders have been identified as having attributes, such as being genuine, honest, and sincere, and these attributes inspire employees to be engaged in pro-environmental behaviour, in turn, leading to the achievement of environmental sustainability of the organization (Northouse, 2010).

Additionally, the underlying mechanisms through which authentic leadership is related to OCBE have not been adequately studied. Consistent with the findings of previous studies, this study believes the occurrence of OCB (organizational citizenship behaviour), such as pro-environment-specific OCB, mainly depends on the psychological capital of individuals. Psychological capital, as a form of personal resource, could stimulate emotions towards the environment and motivate employees to engage in voluntary behaviour, such as OCBE (Luthans, Avolio, Avey & Norman, 2007). To date, the role of psychological capital as a mechanism through which authentic leaders influence their subordinates' OCBE has received scant attention. This study, therefore, believes that psychological capital can help in generating other resources that are positively related to OCBE (Avey, Luthans & Jensen, 2009). Accordingly, psychological capital is introduced as a mediator to investigate how authentic leadership predicts employees' OCBE.

Drawing on conservation of resources (COR) theory (Hobfoll, 1989), this study explains how authentic leadership may stimulate employees' organizational citizenship behaviour toward the environment (OCBE) through the enhancement of psychological capital. COR theory emphasizes the importance of resources, proposing that individuals invest in resources to prevent losses, recover from depletion, and accumulate further resources (Hobfoll, 2001). These resources encompass elements that employees value, including job-related resources (e.g., leader support, autonomy, and performance feedback) and personal resources (e.g., self-efficacy, resilience, and knowledge) (Xu, Liu & Chung, 2017). Within the present study, authentic leadership is conceptualized as a job resource that supports the development of psychological capital. Psychological capital reflects an individual's positive psychological state of development (Luthans et al., 2007; Avey et al., 2009; Norman, Avey, Nimnicht & Pigeon, 2010). Enhanced psychological capital enables employees to better regulate their work environment and to pursue goals beyond formal role requirements, including OCBE (Laschinger & Fida, 2014). Accordingly, this study proposes that authentic leadership behaviour, as a specific form of job resource, strengthens employees' psychological capital, a key personal resource, which subsequently promotes OCBE.

This study makes several contributions. First, unlike other leadership styles, the impact of the authentic leadership style on OCBE has not been fully understood. This study enriches the understanding of the antecedents of OCBE. Secondly, the mechanisms through which leaders' authentic leadership behaviour influences OCBE are unclear. Hence, the examination of psychological capital as a mediating variable can shed light on how employees' OCBE occurs. Third, research involving authentic leaders has been conducted in a number of settings, but is scant in the public sector, especially in developing countries. Issues, such as emission of greenhouse gases, lack of ecosystem integrity, deforestation, urbanization, reduction of biodiversity, and lack of recycling and reuse practices, have been reported in Sri Lanka (Opatha & Arulrajah, 2014). Such issues should not be the obstacles to rebuilding the country after a prolonged civil war that dragged on for nearly three decades (1983-2009). These issues need effective and urgent attention. In this regard, pro-environmental behaviour among public sector employees in Sri Lanka is highly sought after to address the current environmental degradation.

2. Literature Review

Authentic Leadership and Psychological Capital: Authentic leadership is seen as a central aspect of diverse forms of positive leadership and serves as an important explanatory model of leadership (Valsania et al., 2012).

Authentic leadership is defined as, a pattern of leader behaviour that draws upon and promotes both positive psychological capacities and a positive ethical climate, to foster greater self-awareness (in values, identity, emotions, objectives, and goals, and their consequences on employees); balanced information processing (objectively analysing facts and data, both external and self-referential); moral perspective (upholding moral and ethical standards in the face of the possible group, social, or organizational pressure); and relational transparency (maintaining a relationship with the employees based on sincerity and honesty) (Walumbwa et al., 2008).

The influence of authentic leadership on followers' psychological capital can be explained through several interrelated mechanisms. To begin with, the practice of authentic leadership encourages followers' personal development and self-growth by fostering positive self-concepts and developmental experiences (Ilies, Morgeson & Nahrgang, 2005; Atwijuka & Caldwell, 2017). By cultivating trust-based relationships, authentic leaders generate positive affective states, strengthen commitment, and enhance followers' sense of autonomy and growth orientation (Macik-Frey, Quick & Cooper, 2009; Coxen, Van der Vaart & Stander, 2016). In addition, authentic leaders leverage their own positive psychological resources to facilitate similar capacities in their followers (Gardner, Avolio & Walumbwa, 2005). Prior studies suggest that authentic leadership both relies on and reinforces followers' positive psychological capacities while simultaneously promoting an ethical work climate (Walumbwa et al., 2008; Rego, Júnior & Cunha, 2015). Moreover, through psychological contagion processes, the strengths displayed by authentic leaders may be transmitted to employees, thereby enhancing their overall psychological capital (Norman, Luthans & Luthans, 2005; Rego, Sousa, Marques & Cunha, 2012). Drawing on the above arguments, this study proposes the following hypothesis:
H1: There is a positive association between authentic leadership and psychological capital.

Authentic Leadership and OCBE: OCBE is defined as "individual and discretionary social behaviours that are not explicitly recognized by the formal reward system and that contribute to a more effective environmental management by organizations" (Boiral, 2009, p.223). Boiral and Paillé (2012) viewed OCBE as comprising eco-civic engagement (voluntarily engaging in environmental activities of the organization); eco-helping (voluntarily helping other co-workers address environmental concerns); and eco-initiatives (discretionary behaviour and solutions to enhance environmental performance). Eco-initiatives reflect the individual initiative dimension, while eco-helping is consistent with the interpersonal helping dimension. Eco-civic engagement reflects not only the personal industry dimension but also loyal boosterism through employees' discretionary behaviour to promote the green image of their organization to outside stakeholders, such as customers and the community (Luu, 2018).

This study looks into various ways by which authentic leaders could influence OCBE among their followers, like positive modelling, emotional contagion, personal and social identification, increased trust, positive social exchanges, and support of self-determination (Ilies et al., 2005). Authentic leaders can facilitate positive behaviour toward the environment by increasing integrity and positive modelling (Avolio, Gardner et al., 2004; Walumbwa et al., 2008). According to Northouse (2010), an authentic leader can understand problems from various perspectives, including environmental concerns, which is one way these leaders support and encourage sustainable development. Invariably, the consistent display of care for the environment is likely to be emulated by the followers to engage in eco-initiatives to meet their supervisor's expectations without any hope of reward (Paillé, Boiral & Chen, 2013). Furthermore, as a type of job resource, support from authentic leaders plays an extrinsic motivational role in the attainment of organizational goals, such as OCBE (Avey et al., 2009). Based on the above reasoning, the following hypothesis is formulated:
H2: There is a positive association between authentic leadership and OCBE.

Psychological Capital and OCBE: Occupational psychologists consider that voluntary workplace behaviour, such as OCBE, is normally exhibited by high psychological capital employees because they simultaneously invest their physical and cognitive energies into their work (Pradhan, Jena & Bhattacharya, 2016). Raineri and Paillè (2015) claimed that employees' OCBE is not based on expectations of rewards. It is premised on personal values, cognitive capabilities, and interpersonal awareness, which can be attributed to a positive psychological state. Bamberg and Möser (2007) argued that, besides environmental attitude and perceived behavioural control, individuals' personal moral norms and psychological state regarding the environment are important predictors of their intention to engage in voluntary environmental behaviour. Hence, there is a likelihood that

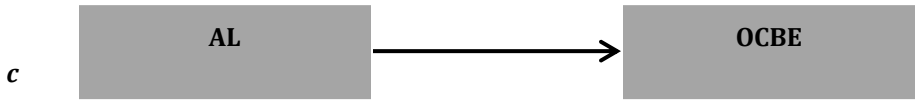
positive psychological capital may lead to a desirable OCBE, not as part of the employee's job description, but as support offered voluntarily by the individual employee to the organization (Norman et al., 2010). Based on the above discussion, this study hypothesizes that:
H3: There is a positive association between psychological capital and OCBE.

Mediation Effect of Psychological Capital: This study positions psychological capital as a mediating variable for several key reasons. To begin with, psychological capital represents a positive psychological resource that is relatively malleable and capable of being enhanced over time (Luthans, 2002). It is therefore argued that authentic leadership can contribute to the strengthening of employees' psychological capital, which subsequently affects their organizational citizenship behavior for the environment (OCBE). As a form of job resource, authentic leadership is likely to foster a supportive and encouraging work context that facilitates the growth of employees' psychological capital. In addition, authentic leaders demonstrate attributes such as self-awareness, internalized moral perspectives, balanced information processing, and relational transparency in their everyday interactions (Walumbwa et al., 2008). These leader behaviors are expected to transmit positive emotions to employees (Isen, 2000), which, when accumulated over time, can develop enduring psychological resources (Fredrickson, 2001). As employees' psychological capital strengthens, they become more inclined to engage in higher levels of OCBE. Thus, this study proposes the following:
H4: Psychological capital mediates the relationship between authentic leadership and OCBE.

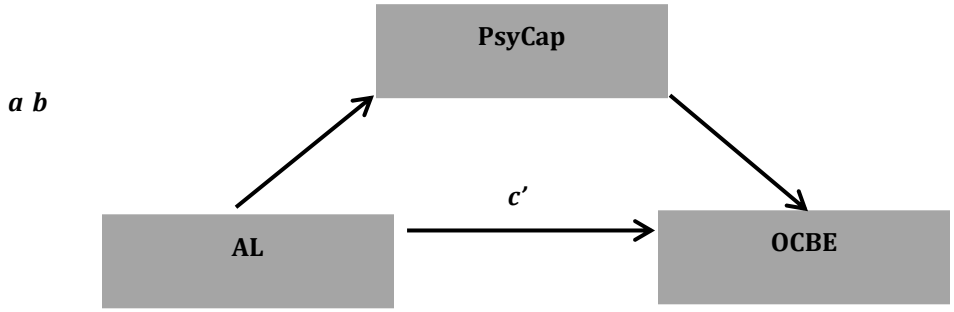
Research Model: Figure 1 illustrates the proposed model for this study, which examines the direct associations specified in Hypotheses 1-3 as well as the mediating role of psychological capital in the link between authentic leadership and organizational citizenship behaviour toward the environment (OCBE) proposed in Hypothesis 4. To evaluate the mediation effect, the bootstrapping approach was applied (Preacher & Hayes, 2004; Preacher, Rucker & Hayes, 2007). This procedure involves generating a large number of resamples by randomly drawing observations with replacement from the original dataset and estimating the target statistic for each resample (Preacher & Hayes, 2004; Preacher et al., 2007). Mediation analysis is based on the premise that the influence of predictor variables on an outcome variable may occur both indirectly through a mediating variable and directly without passing through the mediator. The indirect effect represents the portion of the predictor's influence that operates via the mediator. Bootstrapping is widely regarded as a robust technique for mediation testing because it accommodates non-normality in the sampling distribution of indirect effects. As such, it has been recommended as a superior alternative to traditional mediation tests, including the Sobel test (MacKinnon, Warsi & Dwyer, 1995).

Figure 1: Direct and Indirect Model

Direct Relationship



Indirect Relationship



Note: AL=Authentic Leadership, PsyCap=Psychological Capital, OCBE=Organizational Citizenship Behaviour toward the Environment

3. Methodology

Data were obtained from the front-line employees in six large publicly-owned utility organizations under the commercial category in Sri Lanka using a self-administered questionnaire sent by mail. The operations of these six organizations, i.e., Transport Board, Ceylon Electricity Board, Road Development Authority, Lanka Electricity Company, National Transport Commission, and Water Resource Board, affect society and the environment. The population of the study consists of 10,163 front-line workers. A total of 569 questionnaires were distributed using the formula suggested by Bartlett, Kotrlik and Higgins (2001), taking into consideration the poor response rate which is expected in survey research. A disproportionate stratified random sampling method was used to draw the sample from the six public sector organizations. The mailing address was obtained from the Human Resource Department of each organization, and the questionnaires were mailed to the selected participants. The data collection process lasted for four months from April 2018 to July 2018.

Measurement and Scales: The study used the Organizational Citizenship Behaviour toward the Environment Scale (Boiral & Paillè, 2012) to measure OCBE. The scale is a 10-item self-report instrument. A five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to measure the construct. The internal consistency values (Cronbach's Alpha) of the dimensions range from 0.81 to 0.92 (Boiral, 2009; Boiral & Paillè, 2012).

The 16-item follower-rated Authentic Leadership Questionnaire (ALQ) by Avolio, Gardner and Walumbwa (2007) was used to assess authentic leadership. Respondents were asked to indicate the frequency of authentic leadership traits displayed by their respective superior using a five-point Likert-type scale, ranging from 1 (not at all) to 5 (frequently). Cronbach's alpha values of the dimensions range from 0.70 to 0.77 (Walumbwa et al., 2008).

The study used the 24-item Psychological Capital Questionnaire (PCQ) by Luthans et al. (2007) to measure psychological capital items on a five-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The internal consistency estimates (Cronbach's alpha) for the dimensions range from .88 to .89 (Luthans et al., 2007).

4. Results

Demographic Profile: In total, 569 survey instruments were administered, of which 417 were completed and returned. Thirteen responses were excluded from further analysis because they contained incomplete information. As a result, 404 questionnaires were initially deemed suitable for analysis, representing a usable response rate of 71.0%. Following preliminary data screening, an additional eight cases were removed due to the presence of univariate and multivariate outliers. Consequently, the final sample comprised 396 valid responses. The sample consisted of 56.6% female and 43.4% male participants. Most respondents were aged between 29 and 45 years (43.9%) and held Diploma or Certificate-level qualifications (40.9%). With respect to tenure, 38.9% of participants reported having between one and five years of experience in their current roles.

Descriptive Statistics, Reliability Coefficients, and Correlations: The descriptive statistics and the correlation matrix values for all variables are presented in Table 1. The mean values and standard deviation of the variables are as follows: OCBE (*M=3.502*, *SD*=.758, psychological capital (*M*=4.116, *SD*=.394), and authentic leadership (*M*=3.957, *SD*=.523), which are all higher than the midpoint of their respective scales. Overall, the results suggest that respondents perceived themselves as frequently engaging in organizational citizenship behaviour toward the environment (OCBE) and reported relatively high levels of psychological capital. In addition, supervisors were generally perceived as exhibiting authentic leadership behaviours. The internal consistency of the measurement instruments was satisfactory, with Cronbach's alpha values of 0.940 for OCBE, 0.911 for authentic leadership, and 0.896 for psychological capital. As shown in Table 1, Pearson correlation analysis reveals that all associations align with the proposed hypotheses. Authentic leadership demonstrates a significant positive correlation with OCBE ($r = .357$, $p < 0.01$) and with psychological capital ($r = .630$, $p < 0.01$). Similarly, psychological capital is significantly and positively associated with OCBE ($r = .302$, $p < 0.01$). These results indicate that stronger perceptions of authentic leadership are linked to higher levels of psychological

capital and OCBE among employees in Sri Lanka's public utility sector. Furthermore, higher psychological capital appears to be associated with increased engagement in OCBE.

Table 1: Descriptive Statistics, Reliability, and Correlations among Variables (N=396)

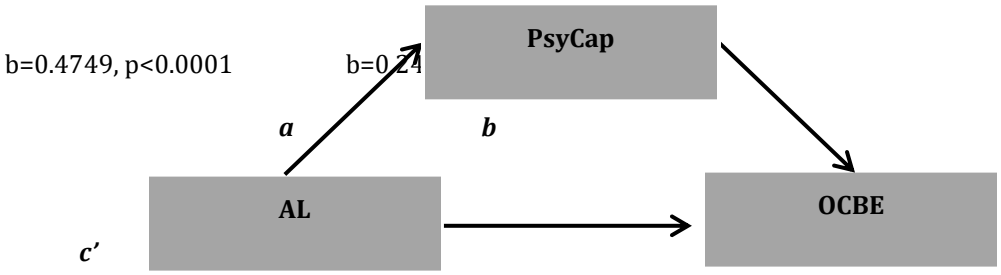
Variable	Mean	SD	1	2	3
1. OCBE	3.502	0.758	(0.940)		
2. AL	3.957	0.523	.357**	(0.911)	
3. PsyCap	4.116	0.394	.302**	.630**	(0.896)

Notes: Coefficient alphas are presented along the diagonal
**Correlation is significant at the 0.01 level (2-tailed)
AL=Authentic Leadership, PsyCap=Psychological Capital, OCBE=Organizational Citizenship Behaviour towards Environment

Hypothesis Testing: The hypotheses were tested via multiple regressions and mediation analysis using PROCESS Macro (Hayes, 2013) and SPSS 23. PROCESS is a conditional process modelling program developed by Preacher and Hayes (2004) that utilizes an ordinary least squares-based path analytical framework to test for both direct and indirect effects (Hayes, 2013). In Table 2, Model 1 shows the direct relationship between authentic leadership and psychological capital. Model 2 shows the direct relationships between authentic leadership and psychological capital, and OCBE.

Table 2 also presents the multiple regressions and mediation analysis results. H1 posits a positive relationship between authentic leadership and psychological capital. Model 1 of Table 2 shows that authentic leadership is significantly and positively related to authentic leadership (β=.4749, p< .0001), thus supporting H1. H2 states that authentic leadership is positively associated with OCBE. Model 2 of Table 2 shows that authentic leadership is significantly and positively related to OCBE (β=.4007, p< .0001), hence providing support for H2. H3 posits a positive relationship between psychological capital and OCBE. Model 2 of Table 2 shows that psychological capital is significantly and positively related to OCBE (β=.2470, p< .05), thereby supporting H3. Figure 2 illustrates that all the paths are statistically significant. Using the bootstrapping method through the bias-corrected confidence estimates, this study obtained a 95% confidence interval (CI) of indirect effects with 5,000 bootstrap resamples (Preacher & Hayes, 2008). Results of the mediation analyses, as depicted in Table 2, confirm the mediating role of psychological capital in the relationship between authentic leadership and OCBE (β=.1173, CI=0.0123-0.2283), providing support for H4. From the bootstrap percentile of CI shown in Table 2, the entire path is 95% of the bootstrap estimates, not including 0, evincing that the indirect effect of authentic leadership on OCBE is significantly different from 0.

Figure 2: Model of authentic leadership as a predictor of OCBE mediated by psychological capital



Direct effect, b=0.4007, p<0.0001
Indirect effect, b=0.1173, 95%, CI (0.0123, 0.2283)

Note: AL=Authentic Leadership, PsyCap=Psychological Capital, OCBE=Organizational Citizenship Behaviour toward the Environment

However, it was necessary to statistically test whether or not the relationship between the independent and dependent variables decreases or disappears when the effect of the mediator variable is controlled. The Sobel test was used to look at the significance of the z-value calculated through this test. The results are significant (S = 2.050, A = 2.035, G = 2.067, $p < .05$) (see Table 2), showing that psychological capital has a partial mediating effect on the relationship between authentic leadership and OCBE. Thus, authentic leadership affects OCBE both directly and indirectly through psychological capital.

Table 2: The mediation analysis (N= 396)

Predictors	**Model 1 PsyCap ß (SE)**	**Model 2 OCBE ß (SE)[a]**	
Independent Variables			
AL	.4749(.0295)**	.4007(.0875)**	
PsyCap	-	.2470 (.1161)*	
R^2	.3970	.1374	
Bootstrap indirect effects on OCBE (through PsyCap)[b]	**ß (SE)**	**LL 95% CI**	**UL 95% CI**
AL	0.1173(.0554)**	.0123	.2283

Test statistics	**SE**	**p-value**
Sobel test	2.050	0.062 0.040
Aroian test	2.035	0.063 0.042
Goodman test	2.067	0.062 0.039

Note: LL = Lower limit; UL = Upper Limit; CI = Confidence Interval. Unstandardized regression coefficients are reported with standard error in parentheses.
[a] Direct and total effect. [b]Bootstrap sample size = 5000.
Note: AL=Authentic Leadership, PsyCap=Psychological Capital, OCBE=Organizational Citizenship Behaviour towards Environment
*p < .05; ** p < .01

Discussion

The significant positive association identified between authentic leadership and psychological capital indicates that stronger perceptions of leader authenticity are linked to higher levels of psychological capital among public sector employees in Sri Lanka. This outcome reinforces earlier scholarly arguments that authentic leadership fosters positive emotional experiences and enhances followers' psychological well-being through the establishment of genuine and trust-based leader–follower relationships (Ilies et al., 2005; Macik-Frey et al., 2009; Coxen et al., 2016; Atwijuka & Caldwell, 2017). From the perspective of the Conservation of Resources (COR) theory, authentic leadership can be viewed as a critical job-related resource that facilitates the accumulation and strengthening of employees' psychological capital (Avolio & Gardner, 2005). Overall, the results align with prior empirical evidence demonstrating that authentic leadership plays an important role in promoting positive psychological resources among employees (Ilies et al., 2005; Walumbwa et al., 2008; Clapp-Smith et al., 2009; Rego et al., 2012; Amunkete & Rothmann, 2015).

The observed positive relationship between authentic leadership and OCBE among public sector employees in Sri Lanka indicates that leaders who act authentically can encourage employees to voluntarily adopt environmentally responsible behaviors that extend beyond formal job requirements (Avolio, Gardner et al., 2004; Walumbwa et al., 2008). When supervisors are viewed as genuine and consistent advocates of environmental initiatives, employees tend to experience higher levels of satisfaction and organizational commitment, which in turn strengthens their readiness to engage in discretionary behaviors such as OCBE (Ilies et al., 2005; Clapp-Smith et al., 2009). Through ethical conduct, role modeling, and the reinforcement of social and moral responsibility, authentic leaders can heighten employees' awareness of environmental issues and motivate pro-environmental actions (Ilies et al., 2005; Walumbwa et al., 2008). These findings are consistent with prior research showing that employees are more likely to mirror environmentally responsible behaviors when leaders actively demonstrate and clearly communicate expectations regarding pro-

environmental practices in the workplace (Ramus & Steger, 2000; Boiral, 2009; Daily et al., 2009; Paillé & Boiral, 2013).

The results of this study indicate that employees with higher levels of psychological capital are more inclined to engage in favorable environmental citizenship behaviors. Psychological capital supports adaptive change and promotes constructive workplace outcomes, including behaviors that go beyond prescribed job roles. As an internal personal resource, psychological capital enables individuals to accumulate and mobilize further resources, thereby increasing their willingness to perform discretionary behaviors such as OCBE (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2007). Consistent with earlier empirical evidence (Norman et al., 2010), the present findings suggest that psychological capital functions as an important antecedent of voluntary extra-role behaviors in organizational settings. Overall, the analysis underscores that employees who experience stronger positive psychological states at work are more likely to demonstrate elevated levels of OCBE than those with comparatively lower psychological capital.

The presence of partial mediation identified in this study indicates that authentic leadership contributes to the cultivation of employees' positive psychological states (Luthans & Youssef, 2007), which function as critical personal resources for encouraging discretionary behaviors beyond formal job requirements, including OCBE (Youssef-Morgan & Luthans, 2015). At the same time, the results reveal that authentic leadership also exerts a direct influence on OCBE. These findings align with spillover theory (Wilensky, 1960), which posits that affective experiences such as psychological capital developed through authentic leadership extend beyond their immediate domain and are reflected in favorable workplace behaviors like OCBE. Moreover, by serving as a key job-related resource, authentic leadership facilitates the enhancement of employees' psychological capital, a vital personal resource that equips individuals with the capacity to mobilize additional resources necessary for engaging in extra-role behaviors, including OCBE (Avey et al., 2009; Rego et al., 2012).

5. Implications

Theoretical implications: This study makes several theoretical contributions. First, this study overcomes the lack of research on the influence of authentic leadership on OCBE in a non-Western context by providing new insights into the significance of authentic leadership in predicting psychological capital and OCBE in emerging economies, like Sri Lanka. The findings of this study, therefore, add to the body of knowledge on the authentic leadership style in a non-Western context (Zhang, Everett, Elkin & Cone, 2012).

Secondly, the findings of this study address the gaps in existing leadership studies on the element of authentic leadership and its influence on the behaviour of employees toward the environment. This study enriches our understanding of both authentic leadership and employees' pro-environmental behaviour. This is one of the main contributions of the current study, casting authentic leadership as an antecedent of OCBE (Walumbwa et al., 2008).

Thirdly, by testing the model in a public sector setting, the findings of this study augment knowledge on concepts, like authentic leadership, psychological capital, and OCBE, which are still lacking in the public sector compared to the private sector (Christensen & Whiting, 2009). Our research evinces that authentic leadership and psychological capital are important antecedents of OCBE behaviour among public sector employees.

Fourthly, by including a mediator in the leadership-pro-environmental relationship, the present study suggests that through the development of psychological capital, authentic leaders can motivate employees to display OCBE toward sustainable development. It appears that psychological capital can serve as an important mechanism to explain the association between authentic leadership and positive workplace behaviour, such as OCBE. Hence, psychological capital should be considered as one of the enablers in future studies involving leader-member relationships toward ensuring environmental sustainability.

Finally, our research extends the COR theory by indicating that job resources (authentic leadership) may be helpful for generating other personal resources (psychological capital), which in turn, can motivate employees to engage in pro-environmental behaviour beyond the call of duty. To date, the application of the COR theory, which forms part of the Job Demands-Resources Model (Bakker & Demerouti, 2007), has been limited to

studies on traditional workplace outcomes, such as stress, work burnout, voice behaviour, well-being, work engagement, and job performance (e.g., De Cuyper, Mäkikangas, Kinnunen, Mauno & Witte, 2012). The use of the COR theory to study pro-environmental behaviour among public sector employees not only uncovers its potential in predicting employee outcomes in other domains, but also distinguishes our study from other studies that have focused on traditional theories, like the social exchange theory (Blau, 1964); social identity theory (Tajfel & Turner, 1985); and the Theory of Planned Behaviour (Ajzen, 1991).

Practical Implications: In practical terms, since authentic leadership is found to be a crucial component in promoting public sector employees' OCBE at the workplace, it is important for public sector organizations to promote an authentic leadership style among leaders in the public sector in Sri Lanka. This is because employees who receive proper guidance and direction from authentic leaders who display strong internal moral values, including being responsible towards the environment, will emulate such behaviour. Accordingly, this study suggests that managers must understand their role as role models. Since employees tend to learn from and imitate their leaders' behaviour, managers should set examples of pro-environmental behaviour to protect the environment. Efforts must be taken to implement green policies to demonstrate that such leaders really "walk their talk" (Luu, 2019; Maqsoom et al., 2025).

Secondly, managers should attend training and development courses to develop authentic leadership qualities, specifically relating to their organization's green initiatives. They should share with employees pro-environmental values and support and stimulate them to engage in OCBE. They should also encourage employees to become "authentic leaders" themselves (Walumbwa et al., 2008; Luthans & Avolio, 2003), who then can help their colleagues develop green values and behave pro-environmentally. Therefore, training interventions should be considered by the organizations. Likewise, coaching employees in pro-environmental values and skills, encouraging them to share, and engaging employees in collective green activities, will promote their social responsibility performance and sustainability of the organization (Akisik & Gal, 2017; Luu, 2019).

Thirdly, although OCBE is a voluntary pro-environmental employee behaviour in the workplace, such behaviours should be encouraged further through proper recognition and reward, which can be in the form of monetary or non-monetary rewards. Public sector organizations can include an assessment of employees' concerns with and awareness of environmental performance in their annual performance appraisal. Employees should be rewarded accordingly if they demonstrate an acceptable level of OCBE. Such recognition will raise greater awareness of the importance of OCBE.

Finally, it is also important to find the fit between the person and the organization in terms of pro-environmental values and skills. The recruitment and selection process in the public sector organizations should be revisited for this purpose. From the perspective of employees, organizations should attach importance to the assessment of candidates' environmental values and skills in the recruitment and selection process, like self-assessment and 360-degree feedback. Individuals with high environmental values are more likely to be motivated to engage in OCBE in the workplace than those with low environmental values. Similar assessments can be considered for managerial positions in the organization.

Limitations and Future Research Recommendations: This study has a number of limitations, which pave the way for future research. First, the cross-sectional data used in the current study preclude any causal inferences. Future research should go beyond cross-sectional data and include longitudinal or time-lagged data to allow for causal inferences. Second, although the results of Harman's single-factor test show that there are no serious CMV biases in the current study, it cannot be completely excluded. Subsequent studies may collect data from multiple sources. Third, the current study only focused on a mediating mechanism to link authentic leadership to employees' OCBE, ignoring its boundary conditions. According to the contingency theory of leadership, the effectiveness of leadership is constrained by specific situational conditions (Thompson & Vecchio, 2009). Future research should incorporate these situational factors as moderators into the research framework. Finally, the concept of authentic leadership should not just focus on motivating employees to display OCBE, but should go beyond this to improve the organization's environmental and financial performance. Future research can add organizational environmental performance, green innovation, and even

financial performance as outcomes into the research framework (Boiral, 2009) to have an in-depth understanding of OCBE.

Conclusion

The current research examines the direct and indirect effects of authentic leadership on OCBE with psychological capital as a mediator. The findings suggest that psychological capital partially mediates the relationship between authentic leadership and OCBE. In other words, the direction of the relationship between authentic leadership and OCBE is both direct and indirect, mediated through psychological capital. The evidence of the indirect influence of psychological capital on the relationship between authentic leadership and OCBE suggests that psychological capital, as an important personal resource, contributes significantly to the promotion of positive workplace behaviour, like OCBE. Our research sets the stage for further research toward understanding how authentic leadership and psychological capital can increase pro-environmental outcomes in organizations.

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Cultivating Desire: Malaysian Urban Citizens' Perspectives on Urban Farming for a Sustainable Future

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Abstract: Malaysia's growing dependence on food imports amidst rising domestic demand highlights the urgent need for sustainable interventions such as urban farming. This study explores the desire for urban farming among Malaysian urban citizens as a strategic response to food security and socio-economic challenges. A qualitative hybrid analytic approach, combining inductive and deductive thematic analysis, was employed to interpret primary data collected through semi-structured, open-ended interviews, guided by a pre-developed interview protocol. A total of 50 participants, aged above 20 years and representing diverse backgrounds including urban farmers, policymakers, researchers, entrepreneurs, environmental activists, and community members from major cities in Peninsular Malaysia, were interviewed. Secondary data sources were utilized for triangulation to enhance the validity of the findings. Theory-driven and data-driven codes were integrated using NVivo 14 software for comprehensive thematic analysis. Results indicate a strong underlying interest in urban farming, motivated by concerns over food security, environmental sustainability, and personal well-being. Nonetheless, barriers such as high start-up costs, space limitations, and low public awareness continue to hinder its widespread adoption. Participants identified government support, structured training programs, and technological advancements as key enablers for the successful mainstreaming of urban farming practices. The study concludes that with strategic collaboration among stakeholders, investment in public education, and the deployment of advanced technologies, urban farming can evolve into a vital component of Malaysia's urban development strategy, contributing significantly to food system resilience, economic diversification, and sustainable urban living.

Keywords: *Urban Farming and Food Security, Sustainable Development, Qualitative Approach (NVivo 14), Thematic Analysis*

1. Introduction

Malaysia, situated in Southeast Asia near the equator, experiences a predominantly tropical and subtropical climate, resulting in consistently warm temperatures throughout the year except during the monsoon season. This climate is well-suited for agriculture and the cultivation of a variety of crops. Despite this advantage, Malaysia is unable to achieve self-sufficiency in food production, as domestic output does not fully satisfy local demand. With steadily increasing consumption, the nation's food supply remains under pressure. While local producers contribute a range of products, these efforts are insufficient to close the gap between supply and demand. Consequently, Malaysia relies heavily on food imports from multiple countries, positioning itself as a net importer. In 2023, Malaysia spent RM 78.79 billion on imported food and beverages, up from RM 75.62 billion in the previous year (Dardak, 2020; DOSM 1, 2025; Siddharta, 2025; Faghiri, Zulkornain, Mohdshahwahid, & Krauss, 2019). Malaysia has the potential for urban agriculture, which can support sustainability in cities by enhancing food production, adding greenery, and helping to reduce pollution (Rezai, Shamsudin, & Mohamed, 2016; Tang, Slimani, Al-Ghazal, Talukdar, & Maharjan, 2023). Providing communities with management skills, knowledge, and tools about urban farming will let them cultivate and sustain crop production independently.

This allows a low-income household to access and satisfy its nutritional needs while being a stable food source. As a result, household expenditures on food sources may be reduced, leaving them with extra expenses to spend elsewhere, such as education and household needs (Poulsen, McNab, Clayton, & Neff, 2015; Knößlsdorfer, Sellare, & Qaim, 2021; Salim, Hamid, Mahomed, & Hassan, 2024). Therefore, excess harvest can be utilized as a source of passive income in the community, potentially addressing the cycle of poverty to some extent. However, urban farming has limitations and cannot fully meet the consumption needs of Malaysian citizens. Conventional farming and industrial farming continue to play an essential role in food production and food security. Therefore, this study aims to investigate Malaysian urban citizens' perspectives on urban farming to provide data-driven insights that inform development policies and stakeholder planning.

Background of Study

The agricultural sector is essential for food security, economic development, and poverty reduction. Despite decades of policy support, challenges such as ineffective management and overreliance on foreign technology persist, contributing to food insecurity even among middle-income households (Stewart, et al., 2013; Dardak, 2022; Albab, 2022). Urban farming has become a global solution to address urban challenges such as food security, environmental sustainability, and the rising cost of living. In Malaysia, the concept of urban farming has yet to achieve widespread popularity and practical adoption despite its recognized benefits (Yapp, Jamil, Lee, Chooi, & Chen, 2025; Suhaidi & Adi Maimun, 2023). The success of urban farming initiatives depends on public support and active participation, since urban citizens are both potential farmers and primary consumers of the produce (Rabu & Muhammad, 2015; Albab, 2022). Public involvement is essential for urban farming projects to sustain and meet their objectives.

Despite growing awareness, participation rates among Malaysian urban residents remain low due to factors such as limited knowledge about urban farming techniques, lack of resources, space constraints, and insufficient institutional support (Ali & Vaiappuri, 2022; Khan, 2023). While many studies have evaluated technical aspects of urban agriculture, such as hydroponics and vertical farming, few have explored the motivational drivers and psychological barriers that influence urban dwellers' willingness to engage in these practices (Tiraieyari & Krauss, 2018; Yusuf, et al., 2024). Understanding the community's motivations, perceived benefits, and deterrents is crucial for crafting effective strategies and interventions to foster greater adoption of urban farming.

Another key consideration for sustainable urban farming management in Malaysia is aligning crop selection with the public's dietary preferences. National dietary studies indicate that the ten most consumed foods in Malaysia include white rice, sugar, green leafy vegetables, marine fish, sweetened condensed milk, powdered milk, bread, biscuits, traditional delicacies, and hen eggs (Institute for Public Health, 2014; Kasim, et al., 2018; Worldbank, 2025; Data Commons, 2025). Among these, green leafy vegetables, herbs, and summer crops suit urban farming and modern agricultural technologies like hydroponics and vertical farming (Melegrito, 2022; Science Daily, 2022). Identifying which agricultural products Malaysians prefer to produce and consume through urban farming initiatives ensures market relevance and economic viability. As Malaysia continues to urbanize rapidly, concerns over food supply sufficiency, reliance on imported foods, and environmental degradation have intensified. Urban agriculture offers a way to localize food production, reduce carbon emissions associated with food transportation, and promote healthier, self-sufficient urban communities (Suhaidi & Adi Maimun, 2023; Yapp, Jamil, Lee, Chooi, & Chen, 2025).

Based on the aforementioned information, there is a gap in understanding the actual desires of Malaysian urban citizens regarding urban agriculture. Therefore. This study aims to explore the aspirations of Malaysian urban residents regarding urban farming initiatives. It seeks to understand their perspectives on how these activities can contribute to enhancing food security, creating employment opportunities, promoting sustainable lifestyles, and fostering community development. By analyzing these desires, the study intends to offer comprehensive guidance and establish clear objectives for stakeholders. These insights will help stakeholders formulate effective strategies and development plans, ensuring that urban farming practices are aligned with the needs and expectations of urban communities in Malaysia. Such targeted planning and implementation have the potential to make urban agriculture a vital component of food security and socio-economic resilience in the country.

2. Research Methodology

This study uses a qualitative approach, analyzing non-numerical data from semi-structured interviews through thematic analysis and triangulation. These methods help identify patterns in participant responses by repeatedly reviewing the data and categorizing them into themes (Fereday & Cochrane, 2006). In this analysis, the latent variables are considered as the manifest variables to categorize the data. (Vaismoradi, Jones, Turunen, & Snelgrove, 2016). Therefore, the main results of the analysis are the eventually accepted themes (Green, 2007; Krauss, 2005; Vaismoradi, Jones, Turunen, & Snelgrove, 2016; Faghiri, Zulkornain, Mohdshahwahid, & Krauss, 2019).

Snowball purposive sampling is implemented for this qualitative approach. (Bryman, 2001; Latham, 2013). The sampling procedure started with the researcher arranging a meeting with the selected convenient participants and getting an appointment with them for the interview sessions in each city. Since snowball sampling applies in this study, the participants could introduce other interviewees in their area for further data collection. The sampling and data collection (interviews) were continued until achieving the mentioned three conditions (1- resource exhaustion; 2- regularities emergency; and 3- overextension) for stopping sampling in the qualitative study (Faghiri, Zulkornain, Mohdshahwahid, & Krauss, 2019). The 50 participants living in major cities in Peninsular Malaysia were chosen for the semi-structured open-ended interviews. A novel interview guide was developed based on the literature and observations, and it was continuously improved during the data collection based on participant responses. The final version of the qualitative interview guide for this study is in the appendix.

Thematic analysis is a common and widely used qualitative method for identifying, analyzing, and reporting themes (patterns) in a data set. Braun and Clarke's (2006), suggested a framework with 6 major phases for the thematic analysis: Familiarization with the data: all audio and video files were transferred into transcripts, and the secondary data, such as news and past studies' findings, were uploaded to the NVivo 14 software (64-bit software for Windows) on the same day of each data collection. Then the collected data was reviewed a few times by researchers to get familiar with it before creating the start list of the potential codes (Ritchie & Spencer, 2002). Next, the learning patterns theory was implemented to identify the relevant codes, and deductive prior templates of codes were created based on the research objective and design thinking approach (Abu Bakar & Ali, 2017; Fereday & Cochrane, 2006). Then, the reflexivity journal was prepared and fitted into the prior template, and the open coding methodology was implemented to generate the themes from the prior template (Gentles, Charles, Ploeg, & McKibbon, 2015). The interviews were conducted continuously until a clear pattern emerged that aligned with the research objective (Braun & Clarke, 2006).

The second phase involved data reduction and complication. There are three ways of data reduction being used in this part, namely: 1- Noticing the significant phenomena, 2- Gathering the examples for each phenomenon, and 3- Evaluating the phenomena to find and refine the differences, similarities, underlying structure, and patterns. (Seidel & Klaus, 1995). Following data reduction, decontextualizing and again contextualizing of the data was undertaken to simplify the data (Coffey & Paul, 1996). After finalizing the codes, the third phase is searching for themes. Hence, the initial theme lists among the codes were generated by using the data-driven inductive approach (Boyatzis, 1998). In the fourth phase, the initial themes generated from both deductive and inductive approaches were then reviewed for clarity and relevancy (Braun & Clarke, 2006). In the next phase, each theme was defined, named, and explained in a few sentences. The definition of the theme went beyond the surface meaning of the data, and the real meaning of the data was explained (Braun & Clarke, 2006). The researcher in the last phase again reviewed the themes and the most validated and relevant to the topic of the study, and the questions were chosen (Guest, MacQueen, & Namey, 2012).

The above procedure is also called the peer debriefing technique, whereby at each step of the study, rational decisions were carried out to provide a more reliable and valid final result (Abu Bakar & Ali, 2017). The peer debriefing technique has been implemented in research design, interview guidelines, sampling, data collection, and analysis. The peers checked and controlled the techniques, methods, and progress of the research step by step.

The NVivo 14 (64-bit software for Windows) and open coding methodology were implemented to create the themes. This software can handle both rich text and multimedia data, and it is suitable for both small and large types of data. It is very user-friendly and helps researchers to categorize and evaluate unstructured and non-numeric data. It is capable of sorting, arranging, and classifying the information. It can also test the relationship between the data and combine the evaluation with searching, relating, modeling, and sharing (Edhlund & McDougall, 2019). The different types of data are coded and categorized as free nodes by the software. Then, they are organized and assessed by a specific analytical model based on the free nodes and form the accident causes framework (tree). Therefore, the keywords of data inside the framework are considered as the categorization elements that are used on the tree nodes. Finally, they can be coded and classified for analysis (An, 2012; Hovden, Størseth, & Tinmannsvik, 2011).

3. Data Collection and Analysis

Data Collection Process

Semi-structured open-ended interviews with verbatim notes taken and voice recording were applied in this research. Additionally, the other data collections, such as literature review, observation, and so on, are used for validation of the results of the interview part. Initially, the researcher scheduled a meeting with the eligible participant, provided a brief overview of the study, and obtained consent to record the interview. Then he asked the participant to fill out the form and provide their profile and then started to ask the questions based on the interview guidelines. The information collected is analyzed on the same day to improve the guidelines for the next interview.

Profile of Participants

A total of 50 participants were interviewed for this study. The researcher aimed to gather a highly diverse group. The table below shows a snapshot of the participants involved in the qualitative approach and highlights their gender, race, age, education level, and city. In terms of gender distribution, the table reveals a balanced representation with 22 males (44%) and 28 females (56%) participants. Among the 50 participants, there were 33 Malay Bumi Putra, 11 Malaysian Chinese, and 6 Malaysian Indian, reflecting the actual race distribution in Malaysia. This representation is crucial to the robustness and inclusivity of our analysis.

Out of the 50 participants, we observe a diverse range of educational qualifications. There are 9 participants with High School certificates, 3 participants with Certificates in various skills, 4 with Diplomas, 33 with bachelor's degrees, and 1 participant with a master's degree. Additionally, the participants reside in various cities: 8 in Kuala Lumpur, 7 in Petaling Jaya, 7 in Johor Bahru, 6 in Shah Alam, 6 in Seremban, 6 in Ipoh, 5 in Subang Jaya, and 5 in Klang (Table 1).

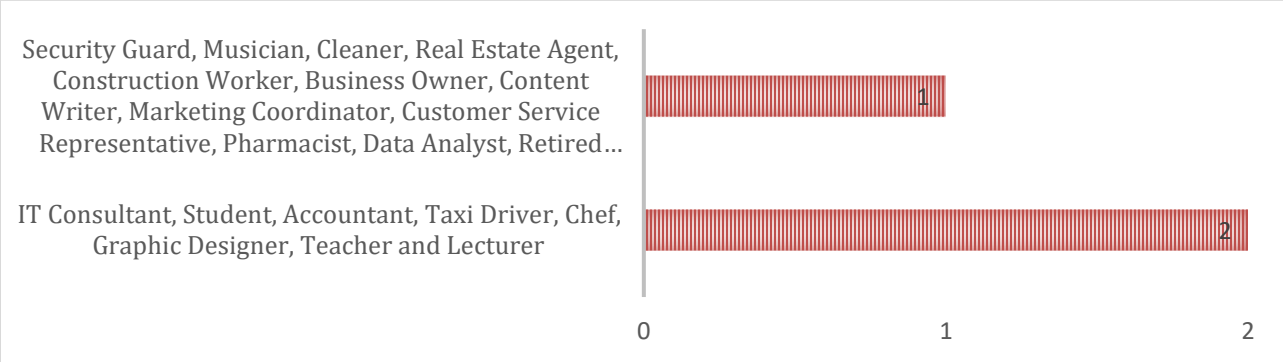
The participants' occupations were equally diverse, ranging from IT consultants, teachers, accountants, engineers, marketing executives, students, taxi drivers, and commercial farm operators (Figure 1). The participant profiles indicate that the study's participants come from various backgrounds, which contributes to the accuracy of the research results.

Table 1: The Qualitative Approach, Participants' Profile

VARIABLES	DESCRIPTIONS	FREQUENCIES	PERCENTAGES
Gender	Male	22	44
	Female	28	56
	Total	50	100
Race	Malay Bumi Putra	33	66
	Malaysian Chinese	11	22
	Malaysian Indian	6	12
	Total	50	100
Age	20-30	18	36
	30-40	16	32
	40-50	10	20
	>50	6	12
	Total	50	100
Education Level	High School	9	18
	Certificate	3	6
	Diploma	4	8
	Bachelor	33	66
	Master	1	2
	Total	50	100
City	Kuala Lumpur	8	16
	Petaling Jaya	7	14
	Johor Bahru	7	14
	Shah Alam	6	12
	Seremban	6	12

Ipoh	6	12
Subang Jaya	5	10
Klang	5	10
Total	50	100

Figure 1: The Qualitative Approach, Participants' Occupation



Participants Narratives

Understanding the perspectives of key stakeholders is essential in examining the development and sustainability of urban farming in Malaysia. This part presents the insights gathered from 50 participants who contributed to this qualitative study. These individuals, representing urban farmers, policymakers, researchers, entrepreneurs, environmental activists, and community members, provided valuable perspectives on the challenges, opportunities, and future potential of urban farming. To understand the participants' narratives and ideas over the interview questions, we categorized the answers based on the group of questions. Awareness and Interest in Urban Farming: Urban farmers are defined as any farming activities in the city, such as home growers, rooftop gardeners, commercial farm operators, and anyone who has some growing activities and hobbies. The participants provided their experiences with urban farming activities during the interview. A teacher (Siti, 30 years old) shared: "Urban farming means using small spaces in cities to grow food, like on rooftops or in community gardens. I helped plant vegetables in a community garden. I think it's a great way to get fresh produce, and it is a great way to save money on groceries."

Preferred Types of Plants and Vegetables: Regardless of the various benefits of urban farming and community farming in the residential areas, the main output should be the agricultural products, unless the activities are considered somehow meaningless. Therefore, we have asked the participants to recommend valuable insights regarding the types of plants they are interested in cultivating on urban farms, which can provide proper guidance for those who want to start the urban farming process in the future. An IT consultant (Ravi, 42 years old) explained: " I'd prefer to grow leafy greens like spinach and kale. Spinach and kale are very nutritious and easy to grow. "

Expected Benefits from Urban Farming (Non-monetary Benefits): Urban farming offers various benefits that are beyond producing agricultural products. Therefore, we asked the participants to share their points of view on the non-monetary benefits of urban farming. A Marketing executive (Aina, 25 years old) explained: "I expect to gain a sense of accomplishment and relaxation. Access to fresh and high-quality food is very important for me. I would value the constant supply because it ensures food security. Gaining knowledge and skills (about urban farming) is very important to me. I think urban farming can help in community gathering and building relationships."

Expected Benefits from Urban Farming (Monetary Benefits): However, urban farming provides plenty of benefits, such as producing agricultural products and different non-monetary benefits; it is still a financial activity and business, and it is important to know about the expected monetary benefits of urban farming from the participants. A Homemaker (Farah, 40 years old) explained: "I hope to save on food costs and sell excess

produce. I want to keep it (urban farm size) manageable and small-scale. I expect significant savings and modest earnings. (It is) Very important, keeping expenses low is key to success."

Desired Benefits at Different Levels: The expected benefits from urban farming can vary based on the level of farming size, technology, and type, such as commercial, community, or hobby farming. Therefore, we asked the participants to share their thoughts and ideas about this matter. An Entrepreneur (Faizal, 29 years old) explained: "I seek to foster a sense of accomplishment and self-sufficiency. Urban farming could reduce stormwater runoff and improve local water quality. Potential benefits include reducing food waste, promoting biodiversity, and mitigating food insecurity. Urban farming at scale could attract investment in sustainable infrastructure and green technologies."

Barriers and Challenges: Of course, there are various challenges and barriers to any activities, specifically urban farming, which is considered a new way of farming and involves many stakeholders, technical matters, and finance. The participants shared their points of view on the barriers and challenges of urban farming activities in Malaysia with us. A taxi driver (Ibrahim, 45 years old) explained: "Limited availability of skilled labor for urban agriculture, vocational training programs, and internship opportunities."

Factors Promoting Sustainable Urban Farming: Urban farming should be promoted like any other activity. There are various methods to promote urban farming, and identifying which ones are acceptable to citizens and encouraging them to engage in urban farming can be challenging. Participants shared their preferences for promotional methods for urban farming during the interviews. A Police Officer (Kumar, 39 years old) explained: "Government Support: Creating urban farming zones within cities with reduced regulations could facilitate easier entry into urban farming. Community Engagement: Organizing urban farming festivals where participants can showcase their produce could create excitement and interest in the community. Technological Innovations: The development of compact composting systems for urban farms could improve soil fertility and sustainability. Public Awareness: Partnering with local schools to incorporate urban farming into the curriculum could educate and inspire the younger generation. Economic Incentives: Offering financial incentives for businesses that source from urban farms could promote a sustainable local economy. Environmental Considerations: Highlighting urban farming's potential to reduce food deserts in cities could be a compelling environmental argument."

Future Prospects and Suggestions: The final part of the interview was to ask about their Future Prospects and Suggestions about urban farming in Malaysia. The participants provided plenty of valuable information in this part. A Civil Servant (Hadi, 31 years old) explained: "Urban farming in Malaysia is set for growth, particularly as cities seek innovative solutions to food security and environmental challenges. It could become a significant aspect of urban planning and community life. Developing urban farming cooperatives could facilitate knowledge sharing and resource pooling among local growers. Additionally, offering incentives for urban farms that focus on educational outreach could further boost participation."

4. Findings and Discussion

The findings reveal that while there is a moderate but growing desire for urban farming among Malaysian urban citizens, several barriers, such as high costs, space limitations, and lack of awareness, hinder its widespread adoption. However, participants acknowledge the benefits urban farming can bring to individuals, communities, and the broader economy. Government support, training programs, and technological advancements are seen as key enablers for making urban farming a viable and sustainable solution for Malaysian cities. Table 2 lists the summary of the thematic analysis findings. The summary of the participants' answers to the qualitative interviews is illustrated in Table 3.

Table 2: The list of thematic analysis themes and sub-themes

THEMS	
Theme 1	Awareness and Perception of Urban Farming
Sub-Themes 1	General vs. advanced understanding of urban farming The role of media and community exposure in shaping perceptions Differentiation between home gardening and commercial urban farming
Theme 2	**Motivations and Perceived Benefits of Urban Farming**
Sub-Themes 2	Personal Benefits: Health, stress reduction, and food accessibility Community-Level Benefits: Social cohesion and urban beautification Economic & Industrial Benefits: Reducing grocery costs, increasing job opportunities
Theme 3	**Barriers and Challenges Limiting Adoption**
Sub-Themes 3	Spatial Limitations: Lack of available land in urban centers Financial Constraints: High initial investment in farming infrastructure Regulatory Issues: Lack of policies supporting urban farming expansion Knowledge Gaps: Limited training programs and accessibility to technical know-how
Theme 4	**Factors Promoting Sustainable Urban Farming**
Sub-Themes 4	Government Support: Grants, tax incentives, and policy integration Education & Training: Workshops and technical assistance for beginners Community Engagement: Encouraging urban farming in residential areas
Theme 5	**Prospects and Expectations for Urban Farming**
Sub-Themes 5	Integration with Smart Cities: IoT and AI-driven urban farms Economic Growth Potential: Agritech startups and investment opportunities Sustainability & Food Security: Reducing reliance on food imports

Table 3: Summary of the qualitative approach interviews

QUESTION	ANSWER	COMMENTS
Awareness of Urban Farming	Basic Knowledge	Important: the majority had the basic knowledge.
	Participation	Important: the majority had some participation.
Interest and Desire for Urban Farming	Interested in participation	Yes, almost all were interested in participation.
	Willing to learn	Yes, almost all are interested to learn more about it.
	Personal value	Yes, almost all agreed on it.
Preferred Types of Plants and Vegetables	Plant type	Tomatoes, Basil, Spinach, kale, chilies, lemongrass, cucumber, bell peppers, mint, rosemary, carrots, radishes, lettuce, strawberries, green beans, cherry tomatoes, coriander, cabbage, parsley, Swiss chard, oregano, leafy greens, arugula, zucchini, herbs, thyme,
	Reason for plant type	Healthy source of food, and it reduces costs.
Expected Benefits from Urban Farming (Nonmonetary Benefits)	Nonmonetary benefits	Mental health, reduce stress, reduce environmental impact, enjoyable outdoor activity.
	Access to fresh	It is highly important for all participants.
	Constant food supply	Yes, because it ensures food security, reliable sources of food, and consistent access to nutritious and fresh food.
	Important to gain knowledge	Yes, learning new skills and gaining knowledge are important for the participants.
	Community gathering	Yes, almost all agree about it.
Expected Benefits from Urban Farming (Monetary Benefits)	Financial benefits	Only a few of the participants expected significant profit from urban farming, and the majority expected to have some cost reduction and a small side income.

	Business scale	Only a few of them were interested in urban farming on a business scale, and most of them preferred individual, family, community, and small scales only.
	Return on investment	Just a few of the participants considered the high return on investment, and the majority did not look at it as a serious business with a significant return on investment.
	Low cost	Low operation costs were important for all participants.
Desired Benefits at Different Levels	Individual Level	Stress relief, mental well-being, and mindfulness, Physical health improvement, learning new skills, Access to fresh, organic produce, environmental conservation, and enjoying physical activity through gardening.
	Neighborhood Level	Access to fresh, organic products promotes environmental sustainability, enhances local food security, encourages healthy lifestyles, improves green spaces, reduces grocery expenses, supports mental well-being, and promotes eco-friendly practices.
	Community Level	Strengthening community bonds through shared activities, improving access to fresh, local food for everyone, promoting environmental awareness and conservation, encouraging shared learning in sustainable agriculture, enhancing public health and well-being, supporting local food systems and reducing reliance on imports, fostering community self-sufficiency and resilience, and creating green spaces that benefit the entire community.

Table 3: Summary of the qualitative approach interviews (Continue)

QUESTION	ANSWER	COMMENTS
	Industrial Level	Reducing food transportation, increasing local food production, promoting sustainable agricultural practices, encouraging innovation in agricultural technology, supporting circular economies and waste reduction, creating green jobs and economic opportunities in urban areas.
Barriers and Challenges	Main challenges or barriers	Limited land and space, lack of knowledge and expertise, and high initial costs and investment
	Solution for the challenges	Using unused spaces such as rooftops, workshops, and training programs, financial support from the government, technical and technological support from experts, and government.
Factors Promoting Sustainable Urban Farming	Factors that can promote	Government Support, Community Engagement, Technological Innovations, Economic Incentives, Environmental Considerations.
	Future of it in Malaysia	Very promising and bright future
	Suggestions to promote	Integrate urban farming into schools and community projects, organize competitions, provide starter kits, and offer financial incentives, promote through media, public-private partnerships, and educational resources, create urban farming zones, community gardens, and public spaces, Support with grants, subsidies, and tax breaks, increase awareness through social media and public campaigns.

	Add on discussion	Urban farming is a vital component of sustainable urban development, offering significant benefits for food security, environmental sustainability, and community resilience. It should be integrated into urban planning, supported by government policies, and promoted through education and public awareness. By fostering collaboration between governments, businesses, and citizens, urban farming can transform urban spaces, enhance food systems, and contribute to greener, more self-sufficient cities. Its potential to address global challenges and improve local environments makes it an essential focus for future initiatives.

As mentioned in Table 3, the qualitative part identified a range of benefits that urban citizens desire from urban farming activities in Malaysia. Primary benefits include access to a healthy, high-quality source of food, which is particularly highlighted by the rising concerns about food safety in Malaysia. For example, Abdullah et al. (2021), highlighted that Malaysians valued urban farming because of providing fresh, high-quality, quality and healthy food sources. Additionally, Tay et al. (2024) studied sustainable agriculture and localized food systems through community-supported farming and found that Community engagement was one of the key benefits, and learning new skills was a significant motivator for farmers. According to Zhou et al. (2022), Urban farming promotes social connections, aligning with its focus on community building; however, the financial benefits, such as potential savings on grocery bills, were noted but generally considered secondary, which is consistent with the study's findings.

The insights from the qualitative approach are well-supported by recent research and highlight various primary desired benefits from urban farming, such as healthy sources of food, gaining knowledge and skills, community engagement, and secondary benefits such as financial benefits. However, the moderate interest displays a gap between awareness and action, possibly due to urbanization challenges and limited exposure to farming practices in Malaysia's large cities like Kuala Lumpur. The first three steps of the Design Thinking approach identified a need for customized urban farming solutions by focusing on a practical, integrated urban farming management module.

5. Research limitations and Conclusion

While this study offers important insights, it has several limitations, such as Sample Representativeness and Data Collection Challenges, which provide direction for future research.

The geographic scope of the study, which focuses solely on Peninsular Malaysia, may limit its representativeness. The qualitative component involved 50 urban citizens, all from Peninsular Malaysia. This focus likely excludes East Malaysia, such as Sabah and Sarawak, which have distinct urban dynamics and cultural contexts, potentially skewing the findings. The evidence suggests a need for larger samples to ensure that the findings accurately reflect the experiences of all urban dwellers, particularly considering Malaysia's diverse ethnic and socioeconomic landscape. For example, the study may not capture the perspectives of rural-urban migrants or urban populations in less developed areas, thereby limiting generalizability. Future studies should consider employing stratified sampling techniques to include East Malaysia and ensure representation from various urban areas and demographic segments, thereby enhancing the robustness of the findings.

The study mainly used self-reported data, risking social desirability bias. Participants may have inflated their interest in urban farming due to social expectations, especially in Malaysia's collectivist culture. This could overstate the actual demand for urban farming. Objective measures like behavioral observations or participation rates are needed to complement self-reported data. The cross-sectional design limits establish causality or tracking changes over time. Longitudinal studies could offer better insights into factors affecting urban farming adoption, such as economic conditions, policy changes, and seasonal variations.

Conclusion

This study likely confirms or extends existing theories and research around urban farming activities in

Malaysia. The findings were matched with the theory of Planned Behavior in the context of urban farming in Malaysia. Tiraieyari & Krauss (2018), predicted the youth participation in urban agriculture in Malaysia with the insights from the theory of planned behavior, and they showed that the attitude toward urban agriculture, subjective norms, career motives, and perceived barriers are the key factors for the students to step into urban farming activities in Malaysia. Moreover, the community urban farming offers healthy, high-quality, nutritious, and low-cost fresh source of food. It is considered a mechanism to generate extra income or reduce the living costs of households. However, one of the challenges is to encourage this activity among communities. Muhammad et al. (2021), studied the behavioral factors of farmers' intention to participate in community urban farming activities by using the theory of planned behavior and found that norm and publicity are the strongest factors, followed by farming facilities and costs, and attitude towards community urban farming.

The findings of this study offer actionable insights for stakeholders, focusing on public awareness and community programs, Government policies, technology and innovation, economic incentives, environmental benefits, and food security support. For example, local communities can organize workshops and training sessions to increase awareness and provide practical training in urban farming techniques, focusing on hydroponics and other space-efficient methods. Collaboration between NGOs, educational institutions, and local authorities can assist in spreading awareness and providing resources. Establishing community gardens or shared farming spaces can support social interaction and mutual assistance, which aligns with findings that emphasize community engagement as a key benefit. Schools and educational institutions can include urban farming in their curricula to educate younger generations, promoting long-term adoption. Additionally, the Malaysian government can devise policies to promote urban farming by relaxing zoning regulations to permit agricultural activities within urban areas and offering financial assistance or incentives to individuals or groups pursuing urban farming initiatives. For example, incorporating urban farming into national food security and sustainability strategies can maximize its potential benefits, thereby ensuring a conducive regulatory framework.

Moreover, it is essential to promote the advancement of space-efficient and resource-minimal technologies, such as hydroponics and vertical farming. Facilitating research through grants and collaborations with academic institutions and private enterprises can foster innovation. Showcasing successful implementations, such as community-operated hydroponic systems, can serve as an inspiration for others. Additionally, providing tax breaks, subsidies, or low-interest loans can help make urban farming financially feasible by addressing challenges such as high initial costs. Establishing markets or platforms for urban farmers to sell their produce ensures a stable income stream, improving economic feasibility.

Urban farming can reduce the urban heat island effect, improve air quality, and promote biodiversity. Integrating urban farming into environmental sustainability plans can enhance urban livability, especially in densely populated cities such as Kuala Lumpur. Furthermore, urban farming can increase local food production and reduce dependency on imports in Malaysia, which imports a significant portion of its food. It can contribute to food security by ensuring a stable local food supply during crises. Establishing targets for urban farming's contribution to national food production and monitoring progress can provide a measurable impact.

In conclusion, the study's implications are extensive, presenting a framework for stakeholders to establish a conducive environment for urban farming in Malaysia. By addressing theoretical gaps and offering practical solutions, it sets the foundation for a more sustainable and resilient urban future, improving food security, environmental health, and community cohesion.

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Beyond Adoption: Drivers, Challenges and Farmer-Led Recommendations for Sustained "Internet of Things" (IoT) Use in Malaysian Smallholder Farming

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Abstract: Smart farming technologies are essential for enhancing food security and the welfare of the farmers. The Internet of Things (IoT) facilitates real-time monitoring and administration of agricultural activities. In Malaysia, IoT is vigorously endorsed through the National Agrofood Policy 2.0 and Agriculture 4.0, yet its implementation and sustained utilization are inconsistent. Previous research has mostly emphasized quantitative determinants of adoption, leaving farmers' lived experiences largely unexplored. This study examines the factors, obstacles, and farmers' generated suggestions for the adoption of IoT among farmers in Selangor and Negeri Sembilan. In these two central region states, smart farming efforts are vigorously encouraged. A semi-structured interview was performed with 10 farmers who had utilized IoT for over one year, and the data were thematically analyzed to discern factors affecting acceptance, obstacles faced, and farmers' suggestions. The results indicated that adoption is influenced by perceived utility, user friendliness, institutional and external assistance, elevated expenses, technological apprehension, and operational challenges. To strengthen the adoption, they recommended strengthening system usability, augmenting technical support and accountability, securing ongoing government backing, broadening training options, offering financial aid, and presenting solutions that demonstrate the real value.

Keywords: *Adoption, Challenges, Internet of Things, Recommendation, Thematic Analysis*

1. Introduction

The smallholder farmers are responsible for up to 80 percent of the food supply in Asia and Sub-Saharan Africa (Food and Agriculture Organization, 2021). It portrays a substantial contribution to agricultural production that occurs on a global scale. Smallholder farmers in Malaysia supported the rural agricultural economy by cultivating key commodities such as rice, fruits, vegetables, and palm oil. They are all regarded as the backbone of the rural agriculture industry through supplying a vast production of fruits and vegetables, which enables the country to reduce the need for imports, guarantee the availability of fresh food, and support the rural livelihoods through agricultural employment. The agrifood sector constitutes around 7.4 percent of Malaysia's GDP, with the smallholders serving as significant contributors and supporting nearly 10% of the national workforce. Despite their significant role, they face several challenges and obstacles, including limited land, insufficient market access, inconsistent policy support, and increasing vulnerability to climate change.

The use of technology has been more essential to curb these problems. The use of technology, particularly digital and the Internet of Things (IoT), can provide farmers with the opportunity to make informed decisions, industrialize and automate operations, use scarce resources, and enhance productivity in agricultural enterprises (Kumar et al., 2024). Technology is a significant resource to achieve the sustainability and competitiveness of the Malaysian agriculture sector, to eliminate inefficiencies, and enhance resilience. Moreover, there is a high use of chemical fertilizers and pesticides in Malaysia, which must be considered, as they have a harmful impact on the environment and the health of farmers (Adnan et al., 2020). As a matter of fact, even overutilization can lower the productivity and the fertility of the soil. Consequently, there is an urgent need to use technology to determine the nutrients in the soil, ensuring that fertilizers and other nutrients are

applied according to the specific needs of plants. This approach will help in minimizing the use of inefficient inputs and agricultural costs.

The implementation and application of IoT technology among smallholder farmers in Malaysia is an important step towards the attainment of the Twelfth Malaysian Plan (12MP) of promoting smart farming in the agro-food sector, in line with the Industrial Revolution 4.0 (4IR). This program aims at modernizing and ensuring efficiency in small-scale agricultural methods. This closely aligns with the National Agrofood Policy of Malaysia (NAP2.0) that sees modernization and smart agriculture as reasons that must be included in the agrifood transformation to make it a resilient and high-technology industry (Ministry of Agriculture and Food Industry, 2021). This is echoed by En and Hui (2023), who stated that the deployment of smart agriculture systems, especially IoT, offers multiple benefits across crop and plantation operations, including input optimization, yield enhancement, and real-time monitoring. Further, the entire agro-food system is transformed to be more efficient operations, improved economic returns, strong environmental outcomes, and better working conditions in the field (Azlan et al., 2023).

In Malaysia, the application of smart farming in the agricultural industry is still in its initial development phase and has not been thoroughly applied (Wei et al, 2020). For instance, the most common uses of IoT in Malaysia's agriculture industry are IoT-based fertigation and IoT-based hydroponic systems, which enable farmers to monitor and control their farm operations through an application installed on their smartphone or computer. Additionally, the E-Satellite Farm program, which was introduced by Malaysia Development Corporation Berhad (MDEC), also helps modern and data-driven farming practices by combining IoT technologies, information and communication technology (ICT) applications, and drone solutions through a matching grant scheme (MDEC, 2022). The programs use smart systems for fertigation and farming, radio frequency identification (RFID), and drones. These IoT-based smart systems enable farmers to monitor and evaluate crop performance by collecting real-time data, such as fertilizer status in tanks, fertilizer mixture levels and concentration, irrigation settings, and timely pesticide spraying. The Ministry of Agriculture and Food Industry (MAFI) allocated RM10 million in the Malaysia Budget 2021 to the Farmers' Organization Authority (LPP) for the execution of this program. This project resulted in a 20% increase in production and a 30% decrease in operating costs among the chili producers. The programs facilitate farmers by providing information through digital laboratories and intensive training for the newbie. Meanwhile, in the paddy sector, the SMARTSBB/SMART Paddy Field in Sekinchan, Selangor, is also another project aimed at incorporating the use of IoT throughout extensive paddy fields. This program is being expanded to thousands of hectares, engaging several thousand farmers, and successfully increasing production exceeding 50% (Malay Mail, 2023). In vegetable farming, the researchers were actively using IoT-powered irrigation, fertigation, and environment-controlled systems to increase the supply of vegetables, especially the temperate crops that grow better in cooler climates. For instance, a recent study on Malaysian greenhouse vegetable systems illustrates how sensors and automation enhance the optimization of water and nutrient utilization (Ahmad, Nik Omar, & Engku Ariff, 2024).

Nevertheless, while these programs demonstrate the efficacy of smart agriculture, their efficacy has largely been limited to only well-resourced or commercial-scale farms. On the other hand, the smallholders who are the backbone of Malaysia's agro-food sector have not yet reaped these advantages to a similar extent. Ahmad et al. (2024) reported that the smallholders frequently encounter enduring obstacles, including high implementation costs, insufficient technical support, and unstable infrastructure, which hinder their capacity to adopt and maintain the use of IoT technologies. Therefore, it is important to focus on smallholder farmers to attain an inclusive agricultural change. They are the most significant players in the food security of Malaysia, yet they remain outsiders in the use of the technology. It is important not only to understand their problems and lived experience to increase initial acceptance of the IoT but also to ensure continuity and sustained use, which will eventually determine the sustainability of Malaysian digital agricultural transformation.

Therefore, this research seeks to explore the key aspects that drive smallholder farmers in two central region states in Malaysia, namely Selangor and Negeri Sembilan, which are central to Malaysia's agro-food production and have been early adopters of smart farming initiatives to keep on using IoT. It also discusses the challenges that hinder implementation and highlights the concepts farmers have proposed to enhance long-term adoption results. The current research goes further than previous studies that mainly focused on the initial adoption intention for smart farming technologies by farmers by focusing on continuity and sustainability of IoT

adoption, which have not been adequately explored in the Malaysian agricultural setting. It uses the qualitative method based on the real experiences of the farmers who have been analyzed, identified the perceived barriers, and made suggestions on how to continue using IoT.

2. Conceptual Underpinning

The implementation and further utilization of smart technology in farming, like IoT, are affected not only by the initial acceptance but also by the constant evaluation of performance, benefits, and usability by the farmer. This paper highlights the relevance of learning the behavioral commitment towards the further use of IoT in agriculture beyond the initial use of technology adoption beyond the initial diffusion phase, as much as the diffusion-based school of thought seems to dominate research on technology adoption. To direct this investigation, the inquiry is conceptually informed by the Unified Theory of Acceptance and Use of Technology (UTAUT) components suggested by Venkatesh et al. (2003) and the Expectation-Confirmation Theory (ECT) proposed by Bhattacherjee (2001). The UTAUT theory assumes that the behavior of using technology is determined by performance expectancy, effort expectancy, social influence, and facilitating conditions. Though the theory is first intended to be applied to organizations, these constructs are becoming more and more applicable to the agriculture sector, where the decision of farmers is conditioned by the expected yield of the activity, the ease of operation of instruments, experience, and the support systems of the institutions (Cimino et al., 2024; Ronaghi & Forouharfar, 2020; Michels et al., 2020). This research uses UTAUT to explain the psychological and social factors that motivate farmers to adopt and integrate IoT technologies in their daily farm management.

Nonetheless, the availability of driving forces does not ensure a long-term interaction. In order to overcome this drawback, this research incorporates the Expectation Confirmation Theory, which states that the continuing intention depends on whether the user is satisfied with the product, and this satisfaction depends on whether their initial expectations were fulfilled or not met after the actual use of the product (Bhattacherjee, 2001). As IoT technologies provide good performance results, financial benefits, and work comfort, farmers are sure of their initial expectations and are more willing to maintain the system. On the other hand, dissatisfaction and diminished continuance occur when customer expectations are not met due to reasons of failure, a lack of after-sales service, and vague financial gain (Al-Emran et al., 2018). This is especially crucial among smallholder farmers whose technological decisions are largely affected by perceived risk, learning requirements, and financial constraints.

Moreover, the choice made by farmers is usually affected by the national digitalization agenda, market forms, institutional interventions, and training and infrastructure accessibility (Klerkx et al., 2019). Confidence and trust in the IoT system gradually improve as farmers are assisted by policy incentives, accountability of the vendor, and the availability of digital knowledge networks. Taken together, these theoretical perspectives give a unified perspective on evaluating the interplay between individual perceptions, social cues, institutional structures, and technological performance in influencing the further usage of IoT. The continuance intentions do not merely represent the continuation of initial adoption but rather a process influenced by confirmation of expectations, trust development, and perceived value.

Therefore, in this study, UTAUT explains the initial drivers that encourage farmers to adopt and experiment with IoT technologies, including perceived usefulness (performance expectancy), ease of use (effort expectancy), social influence, and facilitating conditions. However, adoption alone does not guarantee long-term use. Therefore, Expectation Confirmation Theory (ECT) is integrated to explain how post-adoption evaluation shapes continuance behavior. When farmers experience actual benefits such as improved productivity, reduced labor, and better monitoring capabilities, their expectations are confirmed, which leads to satisfaction and reinforces their intention to continue using IoT. Conversely, when system failures, high costs, or weak technical support contradict initial expectations, dissatisfaction emerges and discourages continued usage. Thus, continuance of IoT among smallholder farmers is conceptualized as the interaction between adoption drivers (UTAUT) and post-adoption evaluation (ECT).

3. Methodology

This study uses a qualitative approach. The data required to meet the objectives of the study were obtained and collected through interviews with fruit and vegetable farmers who have used IoT for more than one year. An in-depth interview of about 1-2 hours with farmers was conducted after receiving a list of potential farmers as respondents suggested by the Selangor State Department of Agriculture, while those in Negeri Sembilan were identified through random and convenience sampling among local smallholder farmers. Selangor and Negeri Sembilan were selected as study areas because both states are in the central region where smart farming initiatives are actively promoted, and they provide a relevant and practical context to this study, while their proximity ensures accessibility and feasibility for data collection. A total of 10 farmers were involved as respondents for this study. A purposive sampling strategy was employed to select participants who had direct experience using IoT technologies in their farming activities. Farmers who had utilized IoT systems for at least one year were specifically targeted, as they were considered information-rich cases capable of providing meaningful insights into both adoption and continued usage experiences. This criterion ensured that respondents had sufficient exposure to the technology to reflect on its benefits, limitations, and sustainability in daily farming operations. Qualitative studies commonly rely on purposive sampling to capture in-depth perspectives from participants with relevant knowledge and experience (Palinkas et al., 2015).

The interviews were conducted either on the participants' farms or at locations convenient for them. Every session was audio recorded and later transcribed to enable data analysis. Demographic information of the respondents was collected after the interviews. The preliminary portion of the interview sought to document participants' experience as fruit and vegetable cultivators and their views on the utilization of IoT in their agricultural practices. The next section discusses the internal and external factors that impact their readiness to adopt, the barriers to the use of IoT, and the recommendations needed to enhance long-term adoption outcomes. Data collection continued until thematic saturation was achieved. Saturation was determined when additional interviews no longer produced new themes or meaningful insights related to IoT adoption and continuity. After approximately the eighth interview, similar patterns and experiences began to be repeated across respondents. Two additional interviews were conducted to confirm the stability of the identified themes, resulting in a total of ten participants (Bryman, 2016). Although the number of participants in this study was relatively small (n = 10), such sample sizes are common in qualitative research that aims to obtain rich, in-depth insights from participants with relevant experience. The emphasis of qualitative research is not statistical generalization but analytical depth and contextual understanding (Miles & Huberman, 1994). In this study, the interviews generated detailed narratives regarding farmers' experiences with IoT usage, and thematic saturation was reached when additional interviews no longer produced new insights. Therefore, the sample size was considered sufficient to capture the key themes relevant to the research objectives while ensuring depth of analysis.

The interviews were analyzed using thematic analysis, which entailed the extraction of common themes in the data collected. The analytical questions guide the thematic analysis. The identified themes, codes, and patterns accurately displayed the content of the entire data set of the interview. It was conducted following several systematic stages. First, all interview recordings were transcribed verbatim and reviewed multiple times to ensure familiarity with the data. Second, initial open coding was conducted to identify meaningful statements related to farmers' experiences with IoT adoption and continuance. Third, similar codes were grouped into broader categories to develop preliminary themes. These themes were then reviewed, refined, and compared across interviews to ensure consistency and relevance. Finally, the themes were interpreted at a latent level to identify underlying patterns that explain drivers, challenges, and recommendations regarding IoT use among smallholder farmers (Levitt et al., 2017; Corbin & Strauss, 2008).

To enhance the trustworthiness of the analysis, several strategies were employed. The coding process involved repeated review and refinement of the transcripts to ensure consistency in theme identification. Codes and emerging themes were continuously compared across interviews to confirm their relevance and accuracy. In addition, representative quotations from respondents were included to support the interpretation of themes and maintain transparency between the data and the findings. In addition, ethical considerations were carefully observed throughout the research process. Participation in the study was entirely voluntary, and all respondents were informed about the purpose of the research before the interviews were conducted. Verbal

consent was obtained from each participant before recording the interview sessions. To protect confidentiality, respondents' identities were anonymized and are represented using respondent numbers in the findings section. All collected data were used strictly for academic purposes.

4. Results

Overview of IoT Practice Among Smallholder Farmers

The findings of the interview showed that every respondent was an active user of smart farming technologies using IoT, primarily smart fertigation and hydroponic systems. Agro-technology companies and government programs like the Program Pembangunan Pertanian Jabatan Pertanian Negeri Selangor and Negeri Sembilan have been introduced as the most prevalent sources of information about IoT for most farmers. Throughout the interview, the respondents became aware of various advantages of the application of IoT in farming as per their experience and intuition. These advantages include less use of labor, effective fertigation, and real-time monitoring of pH, EC, temperature, and humidity. In general, IoT was seen to make the operations of the farm more efficient, accurate, and trustworthy.

Drivers of IoT Adoption among Smallholder Farmers

The following themes have been identified in the adoption of IoT smart farming based on interviews and analysis: (1) perceived usefulness, (2) ease of use, (3) institutional and external support, (4) personal innovativeness, (5) social influence, and (6) awareness. In the first theme, perceived usefulness is portrayed by how the system helps increase efficiency and accuracy in managing the farming jobs. The farmers observed that with the help of IoT-based fertigation systems, fertilizer and water can be supplied in appropriate amounts and evenly distributed across the crops. Moreover, the implementation of automated monitoring systems enables farmers to sustain appropriate pH, EC, temperature, and humidity levels, resulting in healthier and more consistent yields. Farmers also recognized that IoT technologies reduce manual labor, save time, and minimize physical exposure to chemicals, especially during the application of fertilizer and nutrients. In summary, IoT is regarded as an efficient instrument that simplifies work processes and enhances productivity in daily farm operations.

With IoT, fertilizer mixing and water control are faster and more accurate. It saves us time, reduces labor, cuts costs, and helps produce better-quality crops with almost zero defects (Respondents 1 and 4).
IoT can give direct feedback about farm conditions such as soil moisture, salinity, and environmental temperature. It helps me make faster decisions without having to manually check every day (Respondent 3).
My vegetable production increased about 30% after using IoT (Respondent 5).

The second theme is ease of use. During the interview, farmers constantly highlighted that IoT-based smart farming devices are user-friendly and facilitate daily farm operations. Numerous respondents indicated that they could effortlessly track the crops' growth, pH, EC meter, temperature, and humidity using their smartphones, which enables them to make quick and informed decisions.
I can easily check and monitor my plant growth, such as EC, pH, and temperature, just using my phone (Respondents 1, 4, and 7).
The application interface is simple, and I can easily understand and use it without any problem (Respondent 5).
Because of my disability, IoT really helps me. I can monitor the plants just using my smartphone, without moving around too much or doing heavy work (Respondent 2).

Next is the institutional and external support. It has become a significant issue affecting farmers' motivation to adopt and continue the use of IoT. Several respondents recognized that government agencies and programs, including the Department of Agriculture and MDEC, significantly contributed by offering financial aid, subsidies, or IoT equipment to the farmers. Instead, farmers emphasized that they should have more precise guidelines for implementation and regular technical assistance. This implies that institutional assistance reduces financial barriers, but constant technical support, supervision, and follow-ups are also critical to get farmers to be able to use the IoT systems as effectively and sustainably as possible.
I managed to get an incentive from Jabatan Pertanian Selangor to get IoT units worth RM25,000 each, and the IoT is from RedTone Company (Respondent 3).

One of the motivating factors is that the IoT system was given for free by the Department of Agriculture (Respondent 4).
We support it, but the way it's implemented should be clearer… Don't just give the equipment and then expect us to figure it out (Respondent 6).
In addition to this, there is personal innovativeness that encourages farmers to employ IoT in their farms. It centers on the willingness of the farmers to implement and test IoT smart farming. Many of the respondents report that they are highly curious and open to learning new approaches to farming and investigating digital solutions in farming.
I enjoy trying new things, seeing it as a chance to gain knowledge, networking, and skills to share with others (Respondent 1).
I was excited when given the chance to try this new technology (Respondent 3).
We could not overlook agricultural innovation... we just needed to test it, as IoT was trending at that moment (Respondent 6).

In addition, social influence affects the uptake of IoT by the farmers. The views and experiences shared by farmers' social networks, their peers, friends, and fellow farmers made a great difference in their willingness to adopt new technologies. There is also a high level of peer influence and demonstration in motivating adoption. Seeing other farmers succeed builds trust and reduces uncertainty about new technologies.
I was very interested in using IoT after seeing the impressive yields and quality of produce from my friend's farm (Respondent 10).
Some friends said, 'try using it, it's good'… others said, 'don't use it, I had problems with it (Respondent 6).

Lastly, there is the awareness. Awareness of IoT is influenced by direct experience, government policy, training initiatives, and social media exposure. The interview revealed that farmers are more inclined to adopt IoT when they possess prior knowledge and understand the potential benefits that they might gain from the technology. According to Akpojotor (2016), awareness encompasses comprehension or observation of a circumstance, facts, awareness, identification, realization, grasp, and acknowledgment. This shows the role of information dissemination and policy signals in shaping farmers' readiness for IoT.
I came to know about IoT from reading the newspaper, government policy, and social media (Respondent 4).
I got to know more about IoT because I often join programs and projects with MARDI, UPM, and other government agencies. Through these events and presentations, I was exposed to the latest technology (Respondent 5).
If the government hadn't highlighted IoT, maybe I wouldn't know much about it. The policy really made me start paying attention (Respondent 8).
I got exposed to IoT when I attended a course organized by the agriculture office. Before that, I had no idea this kind of technology even existed (Respondent 9).

Challenges of IoT Adoption among Smallholder Farmers

Interviews with smallholder farmers revealed that the issues they faced can be grouped into five main areas, which are (1) knowledge and learning, (2) inadequate technical support, (3) high cost, (4) technology anxiety, and (5) operational difficulties.
First, there are knowledge and learning issues. Farmers reported that they only have minimal exposure to digital technologies, which hinders their capacity to understand and effectively use IoT devices and applications during the first implementation stages. The lack of structured training and clear instructional materials further compounded this challenge, forcing farmers to rely on self-learning or external support from vendors. This limited technical knowledge not only hindered their confidence but also increased dependence on suppliers whenever system issues occurred.
I was unfamiliar with IoT at first. I had to learn step by step on my own until I got used to it (Respondent 1).
I take the chance to learn from the manufacturer whenever there is a problem that occurs. So that I can solve it myself after the warranty ends (Respondents 2 and 4).
Every time something goes wrong, I will call the supplier. I don't have enough knowledge to solve it myself. We rely too much on the vendor; if they don't answer, we are stuck (Respondents 7 and 8).

Besides that, the farmers also indicated that the technical support issues are another obstacle to the adoption of IoT. This is when they always experience frequent delays and inadequate responsiveness from the supplier

or service provider during system failures. The lack of timely and reliable after-sales support not only hindered their agricultural operations but also resulted in financial losses, especially when crops suffered due to the prolonged downtime. This situation diminished farmers' confidence in the long-term sustainability of IoT technologies, as many felt abandoned once the system was installed.

The supplier's responses were very slow, and I had to face losses while waiting for repairs (Respondent 3).

Backup service is very poor, and complaint calls are not resolved promptly, which incurs financial losses to me (Respondent 10).

If there were a technician nearby, it would be easier. Currently, they come from far away, so it takes too long. There should be someone in the district who can handle IoT issues quickly (Respondent 7).

Additionally, the results also emphasize that high cost represents a major challenge to IoT adoption among farmers. Many participants indicate that even though the technology offers great potential for long-term benefits, the initial investment, maintenance fees, and infrastructure equipment are financially burdensome. For a small-scale farmer who operated with a small cash flow, IoT was perceived as a risky and slow-return investment by them. Even when government grants or departmental assistance are available, farmers still face expenses related to system upkeep, repairs, and subscription renewals once the support period ends.

I am worried about the maintenance cost of using IoT once the warranty ends. We also need extra money to be spent on training and face difficulties in getting financing (Respondent 1).

Even though the IoT systems are free, given by the department, the cost of basic infrastructure remains high. For example, it costs about RM30,000 for the IoT system plus RM5,000–6,000 for the basic infrastructure, such as pump houses and pipes. Profitability takes a long time, about five years before you really see the return (Respondent 3).

The subscription is still covered under the grant for these three years, and after that, I need to pay about RM400 per year (Respondents 4 and 6).

Another challenge identified from the interview is the technology anxiety, which refers to nervousness, uncertainty, and fear farmers experience when using unfamiliar digital tools such as IoT systems. Certain farmers express a lack of confidence during the first stage of using IoT on their farms. This is when they feel worried that incorrect settings or system errors could harm their crops. This anxiety was especially affecting farmers who had been using the conventional farming approach for many years. Even though some of them were able to overcome their fear after self-education, training, and peer-to-peer support, the mental resistance at the outset underscores how mental barriers may hinder the seamless integration of IoT.

At the initial stage of using IoT, I had to acquire knowledge independently with the help of the manual. Initially, I felt nervous because I had little idea about it, and I had to take time to learn. I also enrolled in courses and inquired with friends who already had IoT (Respondent 2).

At the beginning, I was worried about using IoT because I was afraid of making mistakes with the application. If I pressed the wrong setting, it could cause damage to the crops and lead to losses (Respondents 3 and 6).

I really felt very afraid. Because we've been manual for more than 14 years (Respondent 5).

Lastly, the findings also reveal persistent technical and operational issues that hinder farmers' confidence in the reliability of IoT systems. Although automation is meant to streamline farm management, farmers reported that they experience the problem of technical failures in their devices, including blocked pipes, biased distribution of nutrients, sensor breakages, and unreliable internet access. Not only do these issues interfere with normal operations, but they also influence the crop growth and quality of yield. Consequently, there are still numerous farmers who observe their farms manually despite the presence of IoT systems.

Even though I can control my farm using a smartphone, I still need to go to the farm and check whether there is any blockage because sometimes the cocopeat floats and blocks the channels, causing plants to turn yellow and not grow evenly because nutrients aren't delivered properly (Respondent 2).

The IoT interface is outdated, not user-friendly, and often fails to function. Sometimes the system only pumps fertilizer solution A but not B, or vice versa, leaving the crops without sufficient nutrients and causing damage (Respondent 3).

Sometimes water-soluble fertilizer doesn't dissolve fully, creating crystals that block the drippers and increase pressure until the pipe bursts (Respondent 6).

Sometimes it depends on the internet… if the internet has problems, it's difficult for us to control and monitor (Respondents 8 and 4).

Insights and Suggestions from Farmers for Better IoT Utilization

The farmers not only display the impediments to using the IoT but also offer various recommendations and suggestions to make its implementation a better process with long-term sustainability. All these recommendations reflect first-hand experience in dealing with daily operational challenges and show that there is a real desire to adopt digital technology, as long as sufficient supportive systems are available. The recommendations emphasized (1) improving system usability and reliability, (2) improving technical support and accountability, (3) sustaining government support and policy improvements, (4) increasing exposure and training opportunities, and (5) making it economically viable and sustaining financial support.

To begin with, the farmers emphasized the need to make the IoT more usable and reliable to promote its broader implementation. Most of them said that the existing systems are overly complicated, volatile, and liable to crashes, which restrains their usefulness in the daily running of their farms. They require IoT systems that are easier to use, deliver precise, detailed data, and are stable without repeated technical failures. They also emphasized the need to possess an elaborate manual in the local language and for active maintenance capabilities, like clog detection sensors and scheduled maintenance, to avoid repetitive operational inconveniences.

The system interface needs to be more user-friendly and up to date. It should be improved to provide more comprehensive and accurate data, not just basic controls (Respondent 3).

Should provide manuals and tutorials on IoT in Malay and include more detailed guidelines to facilitate comprehension (Respondent 2).

Establish a working maintenance process to inspect and clean systems to avoid problems of clogging, such as those that come with floating cocopeat. Maintaining a system proactively is able to guarantee smooth running of the system (Respondent 6).

Secondly, farmers always insisted on the necessity of improving the technical assistance and responsibility of the service provider. They suggested that every district would assign a special officer or technician to provide immediate on-site assistance in the event of system failures. Others recommended that close monitoring and active participation by the providers should be done to help farmers after installation to ensure the technology meets its intended performance.

The service provider must be accountable for any complaints or reports made and ensure prompt responses (Respondent 3).

Each district should have a special officer who oversees the IoT system and takes immediate action in case of any failure or interruption. It is not merely about system installation. Once it is installed, we require constant support so that the system will not be working properly and the workers will not be guided properly (Respondent 5).

They should send technical officers to the farm… to teach us… because every IoT system is different, with different sensors (Respondent 6).

Furthermore, farmers also emphasize the significance of continuous government support and improved policy frameworks in promoting sustainable use of IoT in the agriculture sector. Though most farmers appreciated the existing initiatives, subsidies, and training programs as good moves, they pointed out that there was a need to have consistency of policy in the long term and equal support to all classes of farmers. The change in policy direction was witnessed too often and was considered a hindrance to the confidence of farmers in their investment in IoT systems. Some respondents were also worried that government aid targets bigger farms, and thus, smallholders have little access to technological resources and financial support.

Perhaps the government might continue to fund us to use this type of technology. It actually assists farmers like us and, therefore, should not be halved (Respondent 4).

The policies must not be revised regularly; every few years, farmers require stability to invest in IoT (Respondent 6).

Support should reach all farmers, not just those in certain projects or areas. Sometimes big farmers get more help… we want policies that also focus on small-scale farmers (Respondent 10).

More than that, more formal training and exposure are also proposed by farmers who need to know more about it, as it is crucial for farmers to help them make more of IoT. Despite the clear benefits of technology, a lack of digital fluency and more experience continues to be a hindrance to uptake, particularly in older farmers or

those with less formal education. They proposed that regular and practical courses that are accessible and free of charge should be offered by government agencies, training centers, and project managers. Moreover, respondents suggested that there should be the establishment of farmer-farmer support networks and knowledge-sharing systems, like the Internet forums, field visits, or experience exchange programs, to reinforce group learning and eliminate technology anxiety.

IoT classes should be increased; however, in pay-related cases, small farmers may not be able to attend (Respondents 4 and 6).

That would be nice to have a community or online group of farmers using IoT only. We get to discuss our issues and their solutions... sometimes a fellow farmer already had the same issue and knows what to do (Respondent 2).

Maybe the department can organize farm visits or exchange programs. When we see how other farmers use the technology, we can learn faster and get new ideas to improve our own system (Respondent 7).

Finally, farmers underscored that the sustained success of IoT adoption depends on its economic sustainability, encompassing both the technology cost and its capacity to generate meaningful returns for farmers. Most participants also reported that they are not able to use IoT without sufficient financial assistance, especially among small-scale operators who have little to no capital at hand. They proposed other forms of subsidies, such as monthly payments and government-subsidized grants, to reduce the high initial investment. Farmers, however, also emphasized that monetary assistance will not suffice. IoT should provide tangible value of enhanced returns, fewer losses, or increased market revenue. In the absence of direct financial rewards, technology implementation will be perceived as an unnecessary cost and not an investment to consider.

The government should introduce cheaper purchase options or allow instalment payments or subsidies to encourage the use of IoT (Respondent 8).

With a subsidy, at least we can try. Otherwise, the technology is just applicable to large farmers. With the government still providing grants, they will have more farmers willing to embrace the use of IoT (Respondent 9).

Now we're using IoT technology… but fruit prices are still the same… so the ROI isn't worth it. If the cost of using IoT is higher than what we earn, then it becomes a burden, not a help (Respondent 6).

Discussion

This paper clarifies the long-term use of IoT technology by Malaysian smallholder farmers by examining the determinants, challenges, and recommendations of the farmers, which affect continued use. It is important to distinguish between the factors influencing the initial adoption of IoT technologies and those shaping their continued use. Initial adoption typically occurs when farmers perceive potential benefits, such as improved productivity, automation, or efficiency in farm management. These motivations often relate to expectations about the technology's usefulness and the influence of peers, government programs, or technology providers. However, the findings of this study suggest that the decision to continue using IoT is influenced by a different set of considerations that emerge after farmers gain practical experience with the system. Continuance behavior is shaped largely by farmers' post-adoption evaluation of the technology. Once the system is implemented, farmers assess whether the expected benefits are realized in practice. When IoT technologies demonstrate tangible improvements in farm operations, such as reduced labor requirements and more efficient monitoring of environmental conditions, farmers are more inclined to maintain their usage.

Conversely, operational challenges, unreliable technical support, and financial burdens may undermine farmers' willingness to depend on the technology in the long term. The findings indicate that IoT persistence is influenced by perceived usefulness, convenience of use, and supportive systems but hindered by financial constraints, inadequate knowledge, unreliable technical support, technology-related anxiety, and operational difficulties. These findings align with the theoretical perspectives of UTAUT and Expectation Confirmation Theory (ECT), suggesting that continuance of IoT usage is influenced not only by initial adoption drivers but also by farmers' post-adoption evaluation of technology.

Furthermore, the perceived compatibility of IoT with existing farming routines plays a critical role in sustained usage. Smallholder farmers tend to adopt technologies that integrate seamlessly into their daily operations without requiring complex technical skills or significant changes to established practices. Additionally, social influence emerges as a significant factor, as farmers frequently relied on peer recommendations,

demonstrations and informal networks before committing to sustained usage. This is indicative of the UTAUT propositions that farmers trust a technology more when it is socially approved by means of trusting relationships (Yeo and Keske, 2024). Moreover, institutional support in the form of incentives, subsidies, and training increased adoption and sustained participation (Ansari et al., 2024). Nonetheless, the results point out that enabling circumstances should extend beyond the initial setup. Farmers need guidance on a constant basis, clear implementation procedures, and responsive technical support to make sure that IoT can be viable and useful in the long term.

Despite the perceived benefits of IoT technologies, farmers encountered several barriers that limit their willingness to rely on the systems in the long term, such as a lack of knowledge and learning capacity, insufficient technical assistance, the expensive nature, anxiety toward technology, and challenges in using the technology. These challenges highlight the fragile nature of technology continuance in smallholder farming systems, where operational disruptions can directly affect crop productivity and financial stability. Unlike conventional technologies that allow manual intervention, failures in automated IoT systems may expose farmers to higher perceived risks, which explains their hesitation to rely fully on digital farming solutions. Reliance on suppliers was also a significant issue, as support after sales was either delayed or unreliable, which resulted in possible losses of crops. Large investment and maintenance costs, such as subscription payments at the end of the grant period, also reduced farmers' confidence in their long-term affordability. In the meantime, technology anxiety further restricted the use of IoT, particularly among farmers switching to non-mechanized systems, and technical problems such as system clogging, sensor failures, and unreliable internet shut down operations daily. These issues show that adoption does not necessarily lead to continuance, particularly in situations where system failures pose direct risks to production.

From the perspective of Expectation Confirmation Theory (ECT), continuance behavior depends on whether farmers' expectations are confirmed through actual outcomes such as improved yields, easier farm management, and reduced labor. When IoT performance meets these expectations, satisfaction increases, and continuance becomes more likely. In contrast, repeated malfunctions, weak support systems, and unclear return on investment create dissatisfaction and reduce farmers' willingness to depend fully on the technology (Jaroenwanit et al., 2022). However, this study shows that satisfaction is influenced not only by system performance but also by vendor accountability and the consistency of institutional support. Based on farmers' recommendations, there is a need for more reliable and user-friendly systems, improved technical support and accountability, stable government support, wider training and exposure opportunities, and financial mechanisms that reduce the financial burden on smallholders.

Taken together, the findings indicate that continuance of IoT usage among smallholder farmers is shaped by the interaction between the motivational drivers identified in the Unified Theory of Acceptance and Use of Technology (UTAUT) and the post-adoption evaluation mechanisms proposed in ECT. While UTAUT explains the factors that motivate farmers to initially adopt IoT technologies, ECT explains how farmers evaluate the technology after practical use and decide whether to continue using it. When farmers observe tangible improvements in crop management and productivity, their expectations are confirmed, generating satisfaction and reinforcing continuance intention. Conversely, system failures, high maintenance costs, and weak technical support undermine expectation confirmation, leading to dissatisfaction and reduced reliance on IoT systems. This suggests that continuance behavior among farmers is not merely a continuation of adoption but rather a post-adoption evaluation process shaped by perceived value and system reliability.

This study contributes to the literature by shifting from a traditional adoption lens toward a continuance perspective grounded in farmers' lived experiences. The results validate the important UTAUT constructs in the agribusiness environment and complement ECT by demonstrating that expectation confirmation among the smallholders is strongly contingent on the reliability of the service, responsiveness of the vendors, and economic sustainability. Sustainability in IoT adoption in the Malaysian context is not only based on equipment provision but also long-term provision, consistent implementation strategies, and accessibility for small-scale farmers, since policy-led programs often spearhead technology introduction. Overall, the findings suggest that the sustainability of digital agriculture initiatives depends not only on the availability of advanced technologies but also on the alignment between technological performance, institutional support, and farmers' everyday operational realities.

5. Conclusion and Recommendations

The overall results showed that smallholder farmers have a reason to use the IoT due to its apparent help in the farmers' farm management more efficiently, ease of use, institutional reinforcement, innovativeness of individuals, social influence, and the rising awareness created by governmental efforts and educational programs. However, based on the experience of farmers with the use of the IoT, there are numerous barriers that have to be addressed to ensure that they keep using the IoT. The barriers included a lack of digital literacy, unreliable technical support, the prohibitive cost of original investment, technology fear, and constant operation challenges that render the system unreliable. Farmers, through their experience, provided viable ideas to enhance the long-term effectiveness of IoT projects. These involve making IoT systems easier to use and more reliable, providing accountable and responsive after-sales services, enhancing government support and the continuity of policies, creating more practical training opportunities, and increasing finance so that IoT can be affordable to the smallholders. Combined, these observations highlight that effective IoT implementation must go beyond hardware installation. It relies on the unremitting capacity building, reliable support networks, and empowering policies that appreciate the limitations of small-scale farmers. The research is relevant to the existing literature on digital agriculture because it does not focus on the first adoption but rather on the realities of continuance and sustainability, which have not been well studied in Malaysia.

The findings of this study offer several practical implications for policymakers, agricultural agencies, and technology providers aiming to promote the sustainable use of IoT in smallholder farming. First, policymakers should design long-term support mechanisms rather than short-term technology distribution programs. While many farmers initially adopt IoT through government grants or subsidies, the sustainability of these technologies depends on continuous technical assistance, maintenance support, and stable policy commitments. Establishing district-level technical support units or digital agriculture service centers could help farmers obtain timely assistance when technical failures occur. Second, training and capacity-building programs should be strengthened to improve farmers' digital literacy and confidence in using IoT technologies. Rather than relying solely on one-off training sessions, agricultural agencies could implement continuous learning programs such as hands-on workshops and peer learning networks that allow farmers to exchange knowledge and practical experiences in using smart farming technologies. Third, technology providers should prioritize user-centered design when developing IoT systems for smallholder farmers. The study indicates that complicated interfaces and system failures discourage long-term use. Therefore, IoT solutions should be designed with simpler interfaces, clear manuals in the local language, and automated maintenance features like clog detection or system alerts to assist farmers in managing technical issues.

Finally, financial accessibility remains a critical factor affecting long-term adoption. Policymakers could consider introducing flexible financing mechanisms such as subsidized leasing schemes, instalment payment options, or shared digital infrastructure programs to reduce the financial burden on small-scale farmers. Ensuring that IoT technologies demonstrate clear economic value, such as increased productivity or reduced operational costs, will also be essential in encouraging farmers to sustain their use of digital farming systems. The results provide practical guidance to policymakers, providers of technology, and agricultural agencies that aim to accelerate the uptake of smart farming by smallholders. The economic effects of IoT in the long run, policy loopholes, cross-state analysis, or longitudinal research could offer additional insights into the continuance behavior of farmers in the long term and could serve as future studies. Strengthening these areas will be essential to ensuring that IoT becomes an accessible, reliable, and valuable tool that truly supports Malaysia's agricultural transformation and smallholder resilience.

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Corruption and Public Spending as Predictors of Tax Evasion in Libya: Political Instability as a Moderator

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Abstract: Taxation remains a vital and dependable source of revenue for governments, playing a key role in promoting social and economic development. In Libya, despite ongoing efforts to strengthen tax collection mechanisms, compliance among self-employed individuals remains persistently low, leading to substantial revenue shortfalls. The impact of public expenditure and perceived corruption on tax evasion, particularly within the context of Libya's ongoing political instability, remains insufficiently explored in the existing literature. These factors may be important in molding the compliance of the taxpayer. This research sought to explore the effect of perceived corruption and public spending on tax evasion, while political instability was considered as a moderating variable. Questionnaires were distributed to 369 self-employed taxpayers in Libya which were analyzed by Smart-PLS version 4. Findings show that there is a positive and statistically significant relationship between perceived corruption and tax evasion while the relationship between public spending and tax evasion is negative and statistically significant. Though political instability does not significantly moderate the relationship between corruption and tax evasion, it does moderate the relationship between public spending and tax evasion. The results provide important policy implications that would benefit tax authorities aimed at increasing revenue collection and minimizing evasion in Libya's independent sector.

Keywords: *Perceived corruption,* Public Spending*, Political instability, Tax evasion, Libya*

1. Introduction and Background

Tax evasion is a common problem all over the world because of its dangerous threats to economic stability and attracting remarkable academic attention (Abodher et al., 2020; Anggareni & Mujiyati, 2024). It refers to willful behavior on the part of taxpayers (individuals or corporations) whereby income is underreported, and deductions are exaggerated to pay lower taxes (Ben Othman et al., 2023). It refers to willful behavior on the part of taxpayers (individuals or corporations) whereby income is underreported, and deductions are exaggerated to pay lower taxes (Aca & Dick, 2018) This situation is even worse in developing countries, where decreasing revenues make it difficult for the government to finance essential public services (Al-Asfour & Mcgee, 2024) Libya, for instance, released significantly loss in tax revenue of $254 million IN 2019, $667 million IN 2020, and above $501 million in 2021 (Libyan Audit Bureau, 2018).

Tax compliance among taxpayers, particularly the self-employed is reported as low in Libya as one of the main factors influencing the low tax revenue (LAB, 2018). It emphasizes the urgency of sorting out issues related to tax compliance for effective domestic resource mobilization and national budgeting. A study by (Sidik et al., 2019) highlighted that low levels of tax compliance are a primary factor affecting the tax revenues and it is also a serious challenge for the Libyan tax administration. Tax evasion has increased in Libya since the revolution (LAB, 2018). It is therefore necessary to explore the causes of tax evasion, especially amid prevailing political and economic situations, which may account for the dwindling tax revenues in the country (Abodher et al., 2020). The issue of tax evasion in North Africa and the Middle East. Overall, there is scarce empirical literature on tax evasion for both North African and Middle Eastern nations compared with other regions' writers. This lack of knowledge keeps us from controlling for factors that determine tax evasion in these zones (Senan, 2024).

Tax evasion has been identified as a major problem in many developing countries, with taxpayers admitting to higher rates of tax evasion than in developed countries. This is due to weak enforcement mechanisms, a large informal economy, corruption and people's trust in government (Al-Rahamneh et al., 2023). In this research, the theory of social influence is an informative model for explaining factors that affect tax compliance and

evasion attitudes. Such a theory suggests that social norms and peer behavior have a role in determining individual tax compliance judgments (Bani-Khalid et al., 2022). Researchers have employed this theory to examine which factors determine tax compliance, such as perceived corruption (Torgler, 2011), public spending (Iraman et al., 2021), and political instability (Fagbadebo, 2007). By understanding these determinants from the perspective of social influence theory, researchers can more accurately explain how individual attitudes, societal norms and institutional-level factors interact to influence taxpayers' levels of tax compliance.

The remainder of this paper is divided into the following sections: Section 2 reviews the related literature systematically and makes a detailed discussion on previous research about tax evasion. The theoretical framework is presented in Section 3, and specifically we look at Social Influence Theory. The methodology of the research is presented in Section 4. Section 5 discusses the results and key determinants of tax evasion in Libya, as inspired by the analysis of data. Implications of findings, limitations of the current study and recommendations for future research are discussed in Sections 6&7 respectively. Lastly, Section 8 concludes the paper by presenting the main conclusions and contributions.

2. Literature Review

Tax Evasion Issue

Tax evasion has been defined by various authors from different perspectives. (Al-Rahamneh & Bidin, 2022; Anggareni & Mujiyati, 2024) define tax evasion as the illegal act of eluding financial obligations to the state by hiding or distorting income or wealth that are liable to taxation. According to Ben Othman (et al., 2023) tax fraud is a crime that taxes society and states of similar importance and so are the damages for general public. Nevertheless, McGee et al., (2012) suggest that tax evasion is less serious compared to other offenses like drug-related crimes, violent crimes, commercial crimes, property crimes, and traffic offenses. Rashid et al., (2021) highlight that deterrence, personal and social norms, likelihood of compliance, fairness, and trust are crucial factors influencing taxpayer compliance and recommends that tax policy measures proposed by the government and implemented by tax administrations should aim to reduce tax evasion and encourage compliance.

Corruption Perception

Corruption's perception has been defined as the abuse of public power and authority for personal gains, and can take on various forms of corrupt practices such as bribery, embezzlement and fraud (Carmelo et al., 2023; Hope, 2022). According to Amoh et al., (2023), with the corruption in tax administration possible to have a material reduction on government's revenue as agents might take bribes to close an eye to illegal actions or decrease the taxes. Many studies indicate a positive and significant relationship between perceived corruption and tax evasion. For example, Gebrihet et al., (2024), Irawan & Utama (2021) & Posadnieva & Sidelnykova (2024) argue that higher levels of perceived tax unfairness, especially when the taxing authorities are viewed as corrupt and raise the level of tax evasion. There are caveats, though, and not all studies support this view. For instance, Akdede (2006) reported a negatively significant relationship between bribery and tax evasion, suggesting that when bribes are high enough, some taxpayers may prefer to respect their levies than incur evasion. Similarly, Alkhatib et al., (2019) and Obaid et al., (2020) did not find a robust relationship between corruption and tax evasion. In view of the scarce studies that have investigated this association in Libya, it is important to appeal to Social Influence Theory as a theoretical basis to provide an explanation from an explanatory standpoint on the effect of perceived corruption on tax evasion behavior.
H1: There is a significant relationship between corruption and tax evasion among self-employed taxpayers.

Further, in light of the inconsistent results, Baron and Kenny, (1986) theory suggests adding a moderating variable to enhance the relationship among inconsistent relationships. It is therefore postulated:
H1a: Political instability moderates the relationship between corruption and tax evasion among self-employed taxpayers.

Public Spending

Public spending that is highly visible and efficient in improving public goods and services can also enhance the perceived returns to taxes. If taxpayers observe significant changes in their quality of life as a result of the

government expenditure, they may have a higher level of compliance with tax obligations (Alloza et al., 2019; Kousar et al., 2023; Saddaf et al., 2022). The nature of the relationship between government expenditure and tax evasion is complex, influenced by a variety of economic, social and institutional factors. This relationship has been analyzed in a variety of work and the main result is that the size seems to be negatively related to government spending. There is also a group of researchers, Rashid et al. (2022), Khaltar (2024), Mishi & Tshabalala (2023) and Tawiah et al. (2025), who have added to this knowledge. Their research proposes that the higher the levels of government spending and revenue, the lower tax evasion becomes for taxpayers. On the contrary, works such as that of Mugarura et al. (2021), Novita et al. (2024) & Ogungbade et al. (2021) observed that taxpayers' perception of government spending has no significant relationship with tax evasion behaviour. In view of the existing gaps in the literature—particularly in the Libyan context, where limited evidence is available regarding whether government spending has a moderating effect on tax evasion, this study employs social influence theory as a guiding framework for hypothesis development:

H2: There is a significant relationship between public spending and tax evasion among self-employed taxpayers.

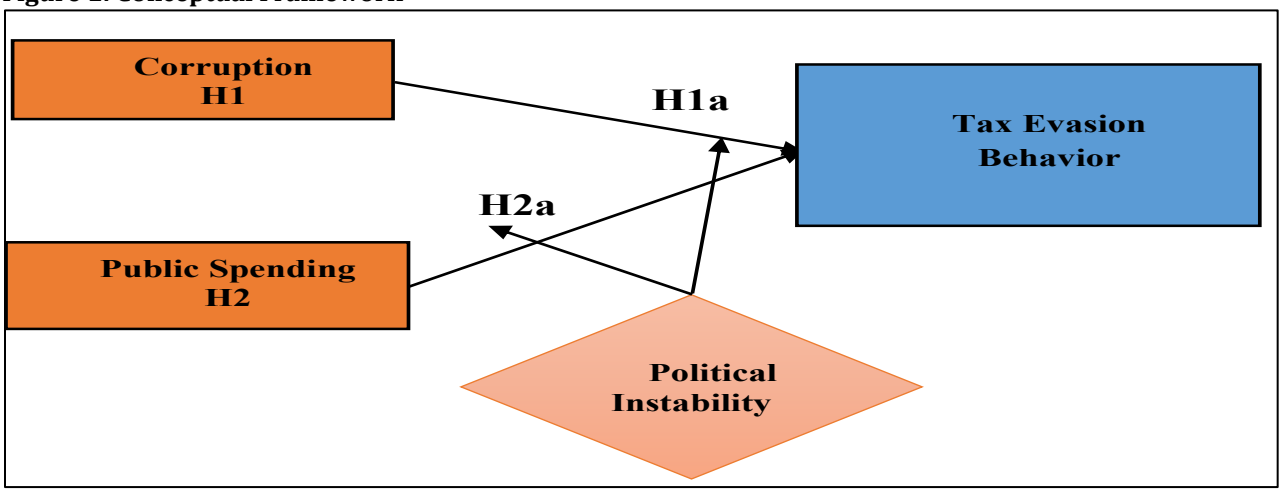
It is also possible that political instability in a country may affect the extent to which public spending reduces tax evasion. Financial instability can hinder the contribution of public service expenditure to tax compliance. The subsequent hypothesis was formulated:

H2a: Political instability moderates the relationship between public spending and tax evasion among self-employed taxpayers.

Moderating Role of Political Instability

In statistical modeling, the concept of moderators is crucial, especially when we seek to understand the complex interplay among variables (Baron & Kenny, 1986b). Although political instability has been researched in the past as a direct variable with respect to tax dodging, its role as a moderating variable was not addressed so much (Abodher et al., 2020). With respect to Libya, the country provides an interesting space for this type of research. Attitudes and behavior in favor of fighting tax evasion may be significantly influenced by the sustained political turmoil that has lasted since 2011. Therefore, the analysis in which factors such as corruption and public spending are considered in the presence of political instability as a moderator (Figure 1 below) might offer valuable new insights into these relationships on tax evasion among Libyan citizens.

Figure 1: Conceptual Framework



3. Research Methodology

Data Collection and Sample

A self-administered questionnaire using simple random sampling was used to obtain 369 responses from self-employed taxpayers in Tripoli, Libya's capital. It is estimated that approximately 18,200 Libyans living in Libya file their own taxes. Data Analysis The data presented were analyzed using the (PLS-SEM version 4.

Measurement of the Variables

To measure the variables in this study, modifications were made based on previous research. Specifically, four items related to corruption were derived from the work of (Obaid & Udin, 2020), while four items concerning the perception of public spending were adapted from (Azmi et al., 2008). Additionally, five items addressing political instabilities were taken from (Abodher et al., 2020), and five items about tax evasion behavior were sourced from (Jeyapalan & Abdul-Jabbar, 2014). A five-point Likert scale was employed for these four constructs, following expert recommendations.

Responded

The study population is individuals who work in various occupations and industries in Tripoli city in Libya. The unit of analysis of this study is individuals. A systematic random sampling procedure was adopted to pick 490 individuals from the population of self-employed taxpayers. This procedure entailed the random selection of an initial point from the list at the outset. The author initiated the selection process with the number 25 and then chose every 37th individual (e.g., 25, 62, 99, etc.) until the target sample size was attained (Zikmund, 2013). Of the 490 issued surveys, 380 replies (78%) were obtained. Nevertheless, 11 questions were identified as inappropriate and eliminated from subsequent analysis. As a result, 369 valid surveys (75%) were incorporated into the final data analysis. As demonstrated in Table 1, the sample composition is dominated by males (76.2%) and respondents are mainly between the ages of 30-50 years old (61.2%). Most participants are married (65.3%) and have a bachelor's degree (62.6%). Based on the sources of income, the major group is professionals (45.5%) followed by traders (21.4%), craftsmen (18.2%) and industrial workers (14.9%).

Table 1: Profile of Respondents

Demographic Variables	Category	Frequency	Percentage
Gender	Male	281	76.2
	Female	88	23.8
Age	Less than 30 years	71	19.2
	Between 30-50 years	226	61.2
	More than 50 years	72	19.5
Marital Status	Single	116	31.4
	Married	241	65.3
	Others	12	3.3
Educational	Before Secondary School	23	6.2
	Secondary School or Diploma	74	20.1
	Bachelor's Degree	231	62.6
	Master's or Doctorate Level	41	11.0
Source of Income			
	Trade	79	21.4
	Industry	55	14.9
	Crafts	67	18.2
	Professions	168	45.5
Total		**369**	**100.0**

4. Results

Convergent Validity

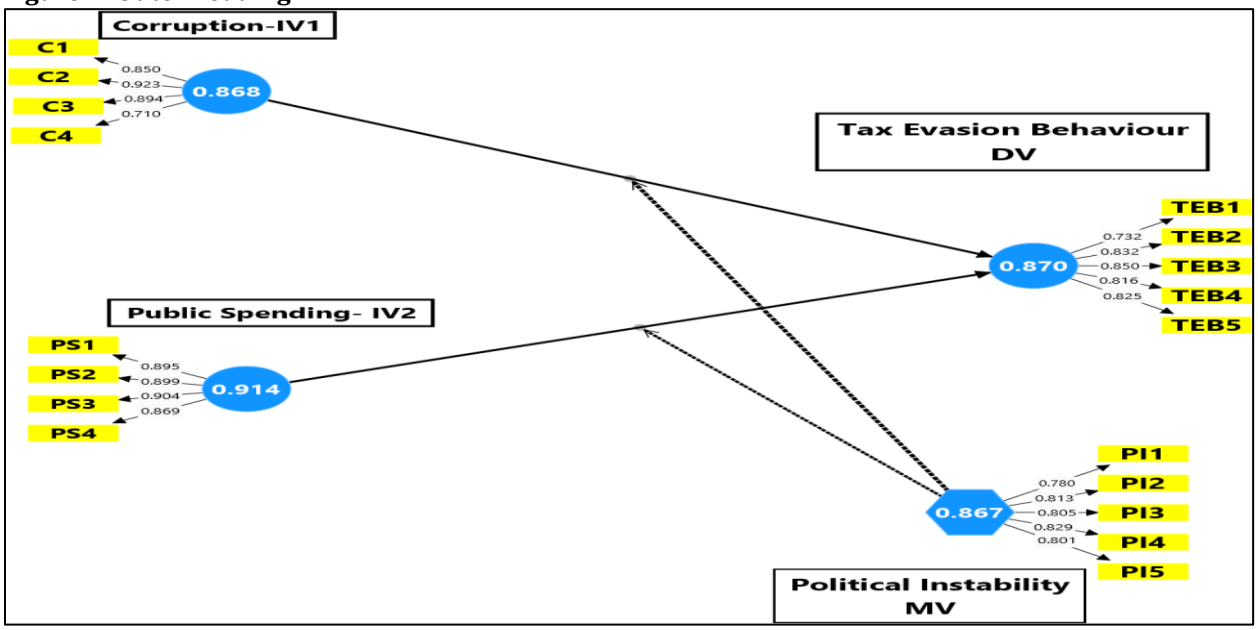
There are two measures of validity which measured based on the quantity of how they averagely measuring items accurately to measure the intended construct, in line with Hair et al. (2024). There are many ways validity can be measured and one of these is convergent validity. This method evaluates whether items related to a construct indeed converge to represent that construct, according to Hair & Alamer (2022). As shown in Table 2 and Figure 2. The composite reliability (CR) and Average Variance Extracted (AVE) values for this study

indicate robust convergent validity, with all constructs exceeding the thresholds of 0.7 for CR and 0.5 for AVE. Moreover, the factor loading values for all items met the acceptable standards suggested by Haji-Othman & Yusuff (2022).

Table 2: Convergent Validity

Latent Variable	Items	Factor loadings	CR	AVE
Corruption	POC1	0.850	0.911	0.720
	POC2	0.923		
	POC3	0.894		
	POC4	0.710		
Public Spending	POGS1	0.895	0.940	0.796
	POGS2	0.899		
	POGS3	0.904		
	POGS4	0.869		
Political Instability	PI1	0.780	0.903	0.649
	PI2	0.813		
	PI3	0.805		
	PI4	0.829		
	PI5	0.801		
Tax Evasion Behavior	TEB1	0.732	0.906	0.659
	TEB2	0.832		
	TEB3	0.850		
	TEB4	0.816		
	TEB5	0.825		

Figure 2: Outer Loading



Discriminant Validity

Discriminant validity evaluates the degree to which the constructs in a model are distinct from one another (Hair et al., 2024). According to Legate et al. (2023) discriminant validity is established when the square root of the Average Variance Extracted (AVE) for each construct is greater than its highest correlation with any other construct. In other words, a construct should share more variance with its own indicators than with other constructs in the model. The results presented in Table 3 confirm that discriminant validity has been achieved, as the square roots of AVE range from 0.806 to 0.892, all exceeding the corresponding inter-construct correlations.

Table 3: Discriminant Validity - Fornell-Larcker Analysis

Latent Variable	PS	PC	PI	TEB
Public Spending	0.892			
Corruption	-0.028	0.848		
Political Instability	0.044	0.324	0.806	
Tax Evasion Behavior	-0.164	0.286	0.432	

Hypotheses Testing

Testing Results (Direct Effect)

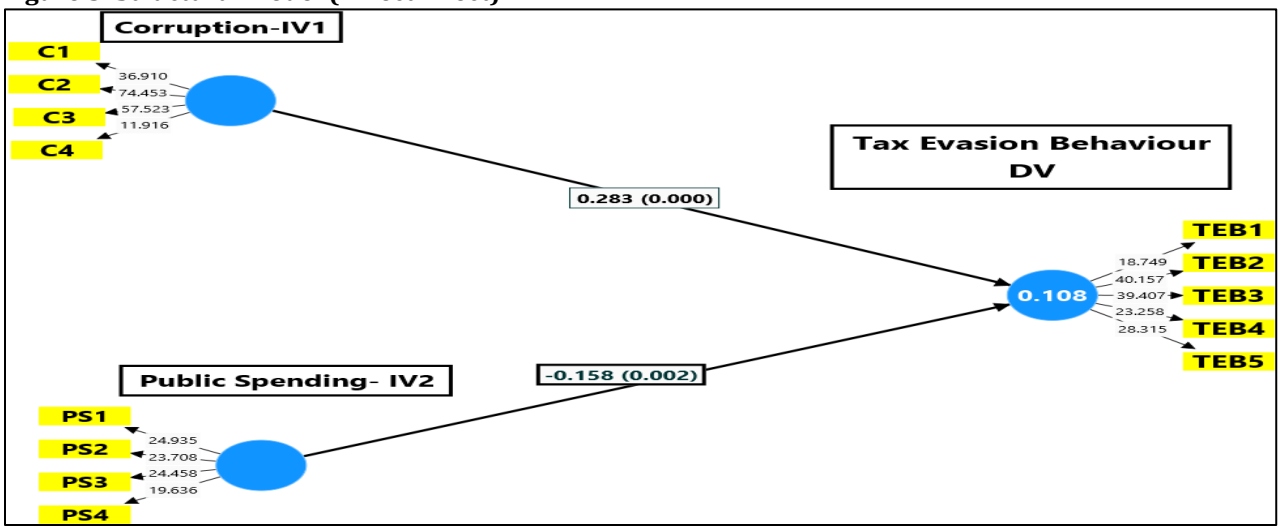
As can be seen in Table 3 and Figure 4, the perception of corruption (β = 0.283, p <.001) and public spending (β = -0.158, p <.001) are significant factors driving tax evasion among self-employed taxpayers within Libya. There is an empirical correlation, in particular, between corruption perception and tax evasion (positive) and public expenditure and tax evasion (negative). Hence, hypotheses H1 and H2 are supported. This evidence indicates the importance of corruption and public spending for tax evasion by self-employed people. The findings underscore the importance of decreasing perceived levels of corruption and improving the efficiency of public expenditure to minimize tax evasion in Libya.

Table 4: Path Coefficient (Direct Effect)

H	Relationship	Path Coefficient	T-Value	P-value	Decision
H1	PC-> TEB	0.283	5.776	0.000***	Accepted
H2	PS -> TEB	-0.158	3.064	0.002***	Accepted

Note: Significant at * p < 0.001

Figure 3: Structural Model (Direct Effect)



Moderating Effects Analysis (Indirect Effect)

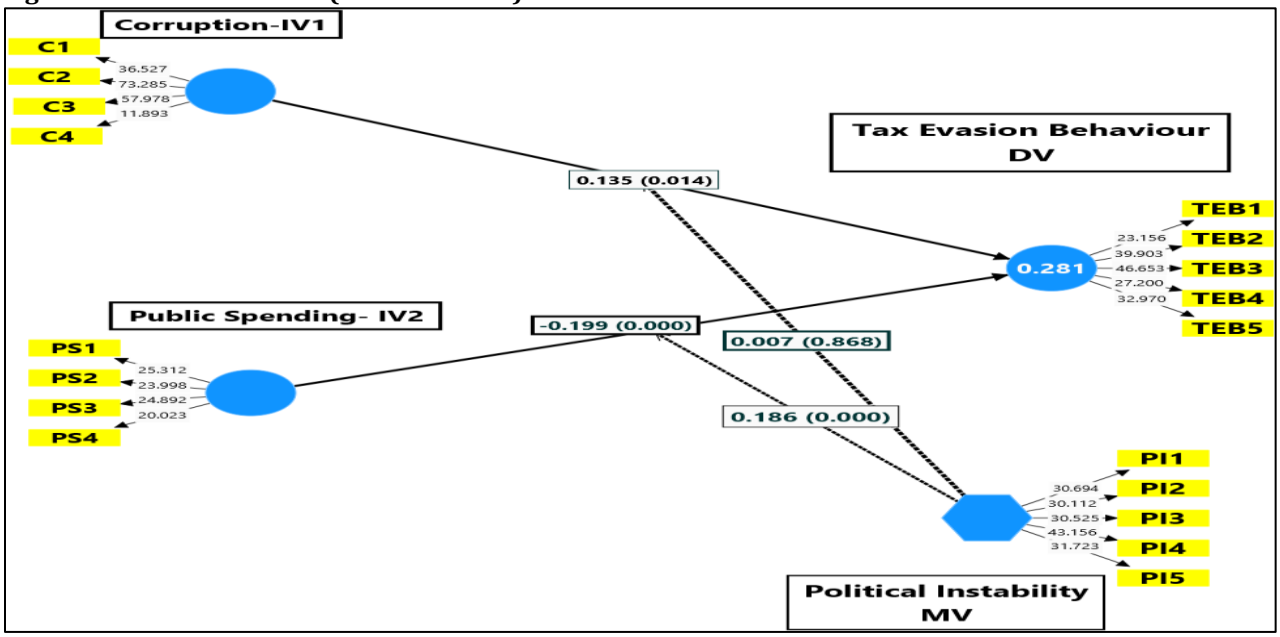
As outlined in Table 5 and Figure 4, the analysis of moderating interactions shows that political instability does not moderate the corruption–tax evasion behavior relationship. However, political instability does moderate the relationship between public spending and tax evasion. To be specific, the moderation effect of political instability and corruption was nonsignificant (β = 0.007, p > 0.05), which does not support H1a. On the contrary, we found a strong and negative interaction effect of political instability and public spending on tax evasion (β = 0.186, p < 0.001), in line with hypothesis H2a.

Table 5: Path Coefficient (Indirect Effect)

H	Relationship	Path Coefficient	T-Value	p-Value	Decision
H1a	PI x PC -> TEB	0.007	0.167	0.868	Not Supported
H2a	PI x PS -> TEB	0.186	4.481	0.000***	Supported

Note: Significant at * p < 0.001

Figure 4: Structural Model (Indirect Effect)



Discussion

This study sought to examine the association between perceived corruption, public spending perception and tax evasion behavior, and specifically focused on the mediating effect of political instability among Libyan self-employed taxpayers. The results show that there is a positive and significant relationship between the perception of corruption on the one hand and tax evasion behaviour in Libya among Libyan taxpayers. This implies that Libyan taxpayers tend to evade higher taxes when they believe the tax authority is corrupt. This outcome is consistent with previous studies, which similarly report that higher levels of perceived corruption are associated with greater tax evasion (Amoh et al., 2023; Litina & Palivos, 2014; Posadnieva & Sidelnykova, 2024). They concluded that when taxpayers believe corruption is widespread, their motivation to fulfil tax obligations declines, leading to increased evasion.

Furthermore, the current study reveals that attitudes toward public spending have a negative and significant effect on tax evasion among self-employed respondents. This suggests that when taxpayers view government spending as fair, transparent, and beneficial, their willingness to evade taxes decreases. This result implies that Libyan self-employed taxpayers, who believe the government is effectively expending money on activities beneficial to society, will see the tax system as morally honest and decline avoiding of taxes. This finding is consistent with other studies that have found an association between tax delinquency and perceptions of the role that public spending fulfills (Khaltar, 2024; Mishi & Tshabalala, 2023; Tawiah et al., 2025).

5. Practical implications, limitations and future work

Theoretical Implications

This study contributes to the literature on tax compliance by examining the influence of trust and power on the tax evasion behavior of self-employed taxpayers in Libya. Although they have traditionally been treated by the literature as independent variables, this paper includes them in a single model (Socio Influence Theory) and highlights their interplay in explaining anti-combining behavior. Perceived corruption substantially raises the probability of tax evasion, and, on the other hand, a higher level of satisfaction with public spending lowers this probability. These findings highlight the need to include socio-political factors in tax compliance models,

especially in fragile and developing countries where both institutional trust and public goods' provision are key determinants of compliance.

Practical Implications

From a policy perspective, the results provide relevant policy implications for tax authorities and public sector parties in Libya and countries with similar backgrounds. The positive effect of perceived corruption on tax evasion implies that fighting corruption in tax administration is a prerequisite for reducing noncompliance. Improved transparency, accountability and integrity in government institutions may provide a way to win voters' trust back again. At the same time, the negative correlation between public spending and tax evasion suggests that transparent and efficient government use of tax revenues can motivate compliance. Governments should prioritize better quality public services and transparent communication on the use of taxpayers' money. By pursuing a dual-pronged strategy of, on the one hand, minimizing corruption and maximizing the use of public funding.

Limitations and Future Work

Every research paper has its limitations, and this study is no exception. Firstly, the sampling technique and data collection methods used in this study have inherent constraints. The survey data collected may not fully capture the complexities of tax compliance behavior among self-employed taxpayers. To overcome this, future research should consider employing alternative data collection methods, such as mixed-method approaches, to gain a more nuanced and in-depth understanding. Moreover, the literature is limited to applying moderating and mediating roles in the tax evasion context as well as in Libya especially post political matter. It is recommended that further studies consider the addition of mediating and moderating factors to investigate their role in tax evasion behaviors toward Libya. To the extent that these limitations can be addressed in further research, we would achieve a fuller and more accurate picture of tax evasion by different taxpayer groups in the country.

Conclusion

This paper investigates the effect of corruption perception and perception of public spending on tax evasion behaviour among Libyan self-employed taxpayers, considering the moderating role of political instability. The study indicated that corruption perception had a significant positive effect on tax evasion behaviour. This means that in Libya self-employed taxpayers are going to evade taxes when they feel that there is a high level of corruption within the tax authority. On the contrary, the perception of public goods positively affected tax evasion behavior. When self-employed taxpayers have the impression of living in a just society, they are less likely to engage in tax evasion. Moreover, the influence of these factors in combination with country instability also produced surprising outcomes. Political instability has no significant effect on the relationship between corruption perception and tax evasion but has a moderating influence on the link between perception of public spending and tax evasion. In other words, the effect of government spending efficiency on tax evasion may vary in politically unstable times.

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Twelve Years of Corruption Perception Index: A Tale of Malaysia and Indonesia

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Abstract: Corruption remains a major challenge to governance, public trust, and institutional legitimacy in Southeast Asia. This study compares trends in the Corruption Perceptions Index (CPI) in Malaysia and Indonesia from 2012 to 2024 using annual data published by Transparency International. It examines how changes in CPI scores and rankings corresponded with major political transitions, institutional reforms, and anti-corruption developments in both countries. Through a qualitative approach, this study interprets CPI trends alongside key political and governance events identified through content analysis. The findings show that Malaysia recorded higher CPI scores than Indonesia throughout the period, although its performance remained unstable post 2020 amid political turnover and governance uncertainty. In Indonesia, CPI data observed pre-2020 were not sustained, with subsequent declines coinciding with reforms widely seen as weakening the autonomy of the Corruption Eradication Commission (KPK). These patterns imply that improvements in corruption perception are difficult to sustain without institutional continuity, credible enforcement, and political commitment to reform. By comparing two neighboring democracies with different reform paths, this study contributes to the broader debate on corruption, governance, and political accountability and offers policy-relevant insights to strengthen anti-corruption institutions in both countries.

Keywords: *Corruption Perception Index, governance, political transition, Malaysia, Indonesia*

1. Introduction

Corruption is a persistent challenge to effective governance, as it weakens public institutions, discourages investment, and undermines public trust. In Southeast Asia, Malaysia and Indonesia have continued to face corruption challenges. Nevertheless, both countries face corruption challenges with different impacts and scopes. Over the last ten years, changes in government, political transitions, and institutional reforms have shifted perceptions of corruption. Thus, the Corruption Perceptions Index (CPI) by Transparency International (2025) It is important for evaluating and comparing corruption perception in countries worldwide. As of March 2025, 180 countries have been analyzed by Transparency International (2025). The CPI scores range from 0 (highly corrupt) to 100 (very clean). These scores are based on many sources, such as expert opinions and public surveys. Nevertheless, they do not measure actual corruption cases, but comparatively assess how corruption in the government sector is viewed. The CPI trends in Malaysia and Indonesia depend on major political events, legal changes, and the changing roles of anti-corruption bodies.

In this study, the changing CPI trends in Indonesia and Malaysia, along with the factors causing such changes, are explored. Although both countries are in the Southeast Asian region, the corruption trend has been inconsistent over the years. In Malaysia, famous corruption scandals (for example, 1MDB), changes in the ruling government in a short time, and institutional reforms affected the CPI. On the other hand, the changes in governance and reduced power of the Corruption Eradication Commission (KPK) have played a role in Indonesia's declining CPI. The effectiveness of anti-corruption efforts and the long-term impact of government reforms in these countries are concerning, given the inconsistent trend in perception toward corruption.

Although the Malaysian government introduced the National Anti-Corruption Plan (NACP) 2019–2023 to improve political integrity, public services, government contracts, and corporate governance, its progress has been limited mainly due to political interference, weak enforcement of laws, and a judiciary that is not fully independent. The plan only succeeded to a limited extent due to the influence of corrupted individuals and institutions. These conditions continue to erode public confidence and constrain progress in Malaysia's CPI performance. As emphasized by the Malaysian Anti-Corruption Commission (2019), effective anti-corruption

reform requires attention to addressing the serious institutional and governance problems that sustain corrupt practices. Based on this notion, this study examines the relationship between changes in government and CPI trends in Malaysia and Indonesia between 2012 and 2024. By relating political events and institutional development to shifts in CPI scores and rankings, this analysis seeks to clarify how anti-corruption efforts have been perceived over time and why longer-term structural reform remains essential.

2. Literature Review

Measurement of Corruption

Corruption remains a serious challenge for governments as it weakens public institutions, constrains economic growth, and erodes public trust. Transparency International defines corruption as the abuse of entrusted power for private gain. (Transparency International, 2025). Johnston (2014) argues that corruption takes multiple forms, including bribery, favoritism, embezzlement, and the use of political office to benefit relatives, friends, or business associates. These practices weaken legal institutions and reduce fairness within democratic systems. Since corruption is often concealed, it is difficult to be directly measured. Hence, scholars and policymakers frequently rely on proxy indicators such as the Corruption Perceptions Index (CPI) to assess perceived levels of corruption across countries.

The CPI is one of the most widely used indicators of perceived public-sector corruption. Published annually by Transparency International, it combines expert assessments and business survey data to assign each country a score from 0, indicating a highly corrupt public sector, to 100, indicating a very clean one. (Transparency International, 2025). Perceptions may be shaped by media coverage, political narratives, and broader economic conditions rather than direct observation of corrupt acts. For this reason, some scholars caution that the CPI captures perceived corruption rather than corruption itself, even though it remains useful for comparative analysis (Heywood, 2016). Despite these limitations, the CPI continues to serve as a valuable tool for examining broad corruption trends over time, particularly in contexts marked by political transitions and governance reform. (Rose-Ackerman, 1999).

Corruption Trends in Southeast Asia

Corruption remains deeply embedded in the political and economic structures of many Southeast Asian states (Hamilton-Hart, 2001). In Indonesia, corruption has long been associated with bureaucratic inefficiency, weak regulatory enforcement, and fragmented institutional control, all of which have constrained economic development and investor confidence. In contrast, corruption in Malaysia has often been linked to state-business relations and elite political bargaining, where access to state resources may be used to secure personal, fractional, or coalition advantage (Hamilton-Hart, 2001). Such patterns indicate that corruption in both countries should be understood not only as a governance problem but also as a structural constraint on institutional credibility and economic performance.

Corruption Trends in Malaysia and Indonesia

Malaysia and Indonesia have both experienced fluctuations in CPI scores and rankings, although the drivers and implications of these changes differ across the two countries. In Malaysia, CPI performance has been uneven and closely associated with political turnover, institutional credibility, and major corruption scandals. The 1MDB scandal, which unfolded between 2015 and 2018, significantly damaged Malaysia's global reputation and contributed to concerns about the integrity of its governance system (Jones, 2020). Mallow (2018) similarly argues that corruption in Malaysia is sustained by deeper structural weaknesses, including concentrated power, limited transparency, and weak public accountability. He further notes that the existence of anti-corruption laws has not always translated into effective enforcement. This gap suggests the insufficiency of legal measures alone without stronger oversight, institutional independence, and broader public accountability. Following the general election in 2018, Malaysia's CPI score improved due to governance reform under the 'Pakatan Harapan' administration (Jones, 2022). Nonetheless, the CPI has subsequently stagnated in the following years (2020-2022) due to political instability. This situation highlights the importance of political stability in maintaining corruption progress (Siddiquee, Noore Alam, 2022).

Indonesia, on the other hand, has long been struggling with institutionalized corruption. Nevertheless, major anti-corruption reforms between 2012 and 2019 improved CPI scores (Putriyana & Rochaeti, 2021). Under

President Joko Widodo's administration, the weakening of KPK eroded public trust in anti-corruption initiatives. The weakening was further reflected in the decline of CPI scores from 40 in 2019 to 34 in 2023. Unlike Malaysia, the corruption trend in Indonesia is showing gradual as opposed to abrupt changes, implying that institutional stability is crucial for long-term governance progress. On this matter, Butt (2019) critically examined Indonesia's anti-corruption reforms under the KPK. He elaborated on the initial success of KPK, followed by political resistance and weakening of the institution through legislative amendments, besides highlighting the structural and political factors undermining anti-corruption progress. The Indonesian government also introduced an anti-corruption plan that included clear goals and benchmarks (Wibisana & Marbun, 2018).

Social and Political Impact of Corruption

Corruption has serious effects. For instance, Najih and Wiryani (2020) studied how corruption affects Malaysians and Indonesians, further discovering that it makes people lose trust in the government, creates inequality, and makes important institutions weaker. Their study also mentioned that people's view of corruption affects their interest in joining political activities or trusting the legal system. Finally, the authors suggested letting the public take part in fighting it, protecting people who report corruption, and giving the media freedom to report the truth to reduce corruption.

Theoretical Perspective on Corruption and Governance

This study examines the corruption trends in Malaysia and Indonesia using popular ideas and analytical models on good governance. It proceeds from the view that corruption perceptions are not shaped by isolated scandals alone, but are also influenced by the strength of public institutions, the stability of political arrangements, and the credibility of legal enforcement. Hence, changes in CPI scores are examined in relation to institutional performance, political incentives, and the broader governance environment in each country.

Governance Theories

This analysis draws on two broad theoretical perspectives: the good governance framework associated with the World Bank (1992) and Mungiu-Pippidi's (2015) argument on democracy and corruption. The good governance theory holds that corruption is less likely to persist where state institutions are transparent, accountable, and effectively monitored. In this context, a stronger judicial system, clear administrative procedures, and independent anti-corruption bodies create more conducive conditions for corruption control (Kaufman et al., 2011; World Bank, 1992). Mungiu-Pippidi (2015), however, argues that democracy itself does not guarantee lower corruption. Electoral competition may open space for reform, but such reform is unlikely to last unless it is supported by institutions' capability to enforce impartial rules. This character is especially related to Malaysia and Indonesia, where political change has not always translated into sustained improvements in corruption controls.

Analytical Models on Corruption

To reinforce the analysis, this study also draws on Rose-Ackerman's (1999) model of corruption and government model and Khan's (2018) political settlement framework. Rose-Ackerman (1999) depicts that corruption becomes worse when accountability is weak, allowing political actors to interfere in administrative or enforcement processes. Her model is useful for understanding why anti-corruption institutions often underperform when formal rules exist but are not applied consistently.

On the other hand, Khan's framework shifts attention to the distribution of power among political elites (Khan, 2018). It suggests that corruption often persists not simply because of weak institutions, but rather due to influential groups benefiting greatly from weak enforcement and having little incentive to support meaningful reform. This view helps explain why corruption measures lost momentum when they began to threaten established interests.

Collectively, these frameworks suggest that corruption perceptions are shaped less by formal commitments alone than by the actual credibility of institutions and political conditions under which they operate. In the analysis that follows, they are used to interpret whether changes in CPI scores are associated with stronger institutional autonomy or, conversely, with political instability and weakened enforcement.

3. Methodology

Research design

This study adopts a qualitative approach with a comparative case-study design to examine the corruption trends in Malaysia and Indonesia from 2012 to 2024. The analysis focuses on annual changes in the Corruption Perceptions Index (CPI) and interprets those changes in relation to major political developments, institutional reforms, and high-profile corruption-related events in both countries. Rather than treating CPI movement as a direct measure of actual corruption, this study utilizes it as an indicator of perceived public-sector integrity and examines how those perceptions may have shifted over time under different political and institutional conditions.

A structured content analysis was used to interpret CPI trends across the two countries. The unit of analysis was the country-year. For each year, the CPI score, CPI ranking, and relevant political or institutional developments that could shape public and expert perceptions of corruption were considered. These included changes in the government ruling party, major corruption scandals, legal reforms, and developments affecting anti-corruption institutions.

Data sources and scope

The primary dataset consisted of annual CPI published by Transparency International for Malaysia and Indonesia between 2012 and 2024. The period was chosen as it provides a continuous series of comparable annual observations for both countries. CPI scores ranged from 0 to 100, with higher scores indicating lower perceived public-sector corruption. CPI rankings indicate a country's relative position compared with other countries in the same year, with lower numerical rankings reflecting better comparative performance (Transparency International, 2025).

The CPI was selected as it is one of the most widely used cross-national indicators of perceived corruption and provides a standardized basis for longitudinal and comparative analysis. In addition to CPI data, secondary sources were drawn, including academic literature, official reports, and documented political developments, to contextualize shifts in scores and rankings and to reduce overinterpretation of CPI as a standalone measure.

Malaysia and Indonesia were selected as both are important Southeast Asian countries with shared regional context but different political trajectories and institutional dynamics. Comparing the two nations allows one to examine how corruption perceptions may develop under different patterns of political competition, institutional reform, and governance continuity. The comparison is hence aimed at generating analytical insight into the conditions under which anti-corruption efforts appear more or less credible over time.

Content analysis procedure

The content analysis was conducted in three phases. First, annual CPI scores and rankings for both nations were compiled and organized chronologically to identify broad trends, periods of improvement or decline, and notable fluctuations over time. Second, key political and institutional developments during the same period were identified from secondary sources. Third, these developments were grouped into analytical categories to support systematic interpretation of CPI movement.

Limitations

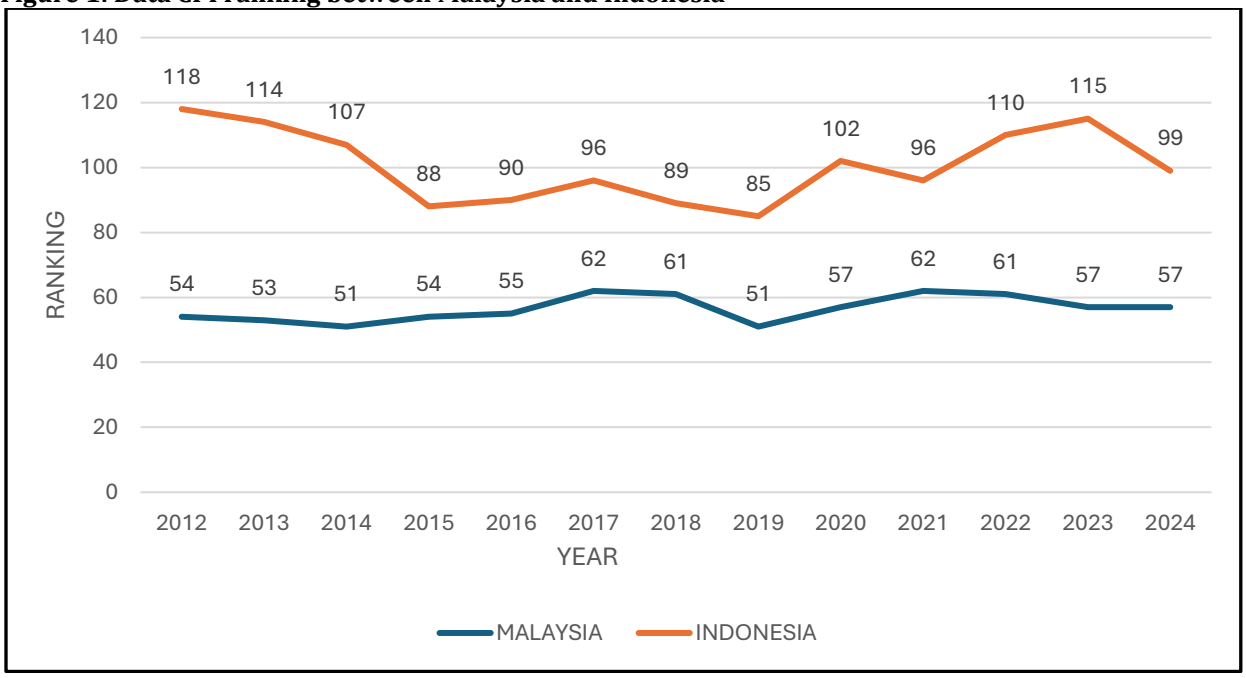
The use of CPI as a perception-based index has some limitations. First, it does not measure actual corruption directly or capture all forms of corruption, particularly those occurring outside the public sector or through informal networks. Moreover, changes in ranking are relative and may reflect improvements in other countries rather than a decline in the country examined. For these reasons, CPI results were interpreted cautiously and used as an indicative rather than standard evidence of corruption trends. Therefore, the analysis focused on changes in perceived corruption in relation to political and institutional developments, rather than claiming to measure corruption itself.

4. Findings

The CPI Index published by Transparency International reports focuses on two related but distinct measures, a score and a ranking. The score ranges from 0 to 100, with a higher score indicating a cleaner perceived public sector. The ranking reflects a country's relative position among countries assessed in a particular year, with a lower numerical rank implying better comparative performance. As depicted in Figure 1, both Malaysia and Indonesia recorded fluctuating CPI rankings over the study period. Malaysia's ranking ranged from 51 to 63 between 2012 and 2024. Its better comparative positions were recorded in years such as 2019, when it was ranked 51st, while weaker relative performance was observed in 2017 and 2021, when it was ranked 62nd. This pattern suggests that Malaysia's standing remained comparatively stronger than Indonesia's throughout the period, although its performance was uneven rather than consistently improving.

In contrast, Indonesia displayed greater volatility over the 12 years. Even though the country started with a low ranking of 118 in 2012, there has been a slight improvement. A temporary setback was recorded in 2023, when Indonesia ranked 115th, before progressing to 99th in 2024. Such an improvement in ranking position, a jump of 16 positions, may indicate better progress in anti-corruption efforts. Overall, while both nations have shown efforts in curbing corruption, Malaysia has maintained a stable position, whereas Indonesia experienced greater fluctuations, suggesting periodic governance challenges or reforms affecting its CPI.

Figure 1: Data CPI ranking between Malaysia and Indonesia

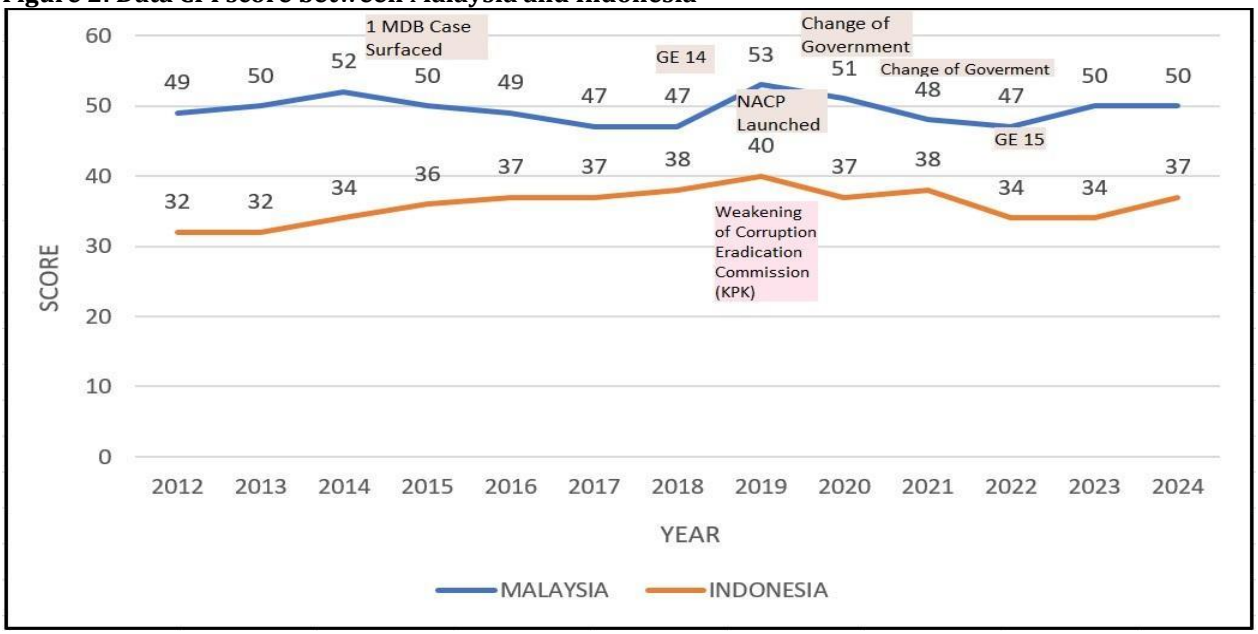


Source: Transparency International (2013 to 2025)

Figure 2 overleaf presents the CPI scores for both nations. Malaysia consistently recorded higher scores than Indonesia throughout the study period, indicating a stronger overall perception of public-sector integrity. Malaysia's highest score was 53 in 2019, while its lowest score of 47 was recorded in 2017, 2018, and 2022. Although the 2019 result suggests a period of improved confidence in governance, the subsequent declines were attributed to the absence of sustained progress.

Meanwhile, Indonesia's CPI score rose from 32 in 2012 to 40 in 2019, implying a gradual improvement in perceived corruption control during the period. However, this trend did not continue. The score declined to 34 in 2022 and 2023 before increasing slightly to 37 in 2024. It indicates that earlier gains in corruption control were not fully established and that institutional progress remained unstable.

Figure 2: Data CPI score between Malaysia and Indonesia



Source: Transparency International (2013 to 2025)

Malaysia outperformed Indonesia in CPI scores throughout the study period, but this should not be read as evidence of steady progress. Its scores improved briefly and then began to lose its momentum after 2019. Comparatively, Indonesia started with a lower score, improved gradually, and then experienced a clear setback before a slight recovery in 2024. In both countries, the overall pattern shows that the real challenge is not in starting anti-corruption reform but rather keeping its progress over time.

Discussion

Malaysia's experience is broadly consistent with Mungiu-Pippidi's (2015) argument that democratization alone does not guarantee sustained corruption control. The 2018 electoral transition was followed by an improvement in CPI performance, suggesting that political turnover may create an opening for reform. However, this motion was not maintained after 2020. The pattern indicates that electoral change, while politically significant, is insufficient on its own unless it is accompanied by sturdy institutional reform and consistent enforcement. In this context, the Malaysian case supports the view that anti-corruption improvement relies less on leadership change than on the stability and credibility of the institutions following it.

This interpretation aligns with the good governance framework. (World Bank, 1992), which emphasizes the role of transparent institutions, accountability, and administrative consistency in reducing corruption. Malaysia's fluctuating CPI trend suggests that political changes did not translate into stable governance gains. Frequent changes in leadership after 2018 may have weakened policy continuity and reduced the consistency of anti-corruption efforts. The findings, therefore, imply that institutional stability matters more than short-term political transition when corruption is assessed over time.

On the other hand, Indonesia's CPI score improved gradually before weakening after 2019, when reforms affecting the Corruption Eradication Commission (KPK) were widely seen as reducing its autonomy. This trail is consistent with the good governance view, since declining institutional independence was accompanied by a deterioration in corruption perception. It also reflects Khan's political settlements framework (2018), which argues that corruption persists where powerful political actors have incentives to weaken enforcement institutions or preserve arrangements protecting the elite interests. In the case of Indonesia, the weakening of KPK suggests that formal commitment to anti-corruption can be undermined when reform compromises established power structures.

Rose-Ackerman's (1999) The model of corruption and government further helps explain this outcome. Her argument emphasizes that anti-corruption laws are unlikely to be effective when enforcement bodies lack independence or when political members can interfere with implementation. The comparison between Malaysia and Indonesia reaches a common conclusion: anti-corruption progress is difficult to sustain when institutions lack autonomy and have inconsistent enforcement, while reform depends too heavily on changing political leadership to strong governance arrangements.

Overall, the findings suggest that improvements in corruption perception require more than legal frameworks or public commitments, as they ultimately depend on credible institutions, political restraint, and the continuity of reform across periods of leadership change.

Policy Recommendations

The findings recommend that Malaysia and Indonesia strengthen their institutional safeguards, legal protections, and governance mechanisms if anti-corruption efforts are to be sustained. First, anti-corruption agencies in both countries must be managed with independence and transparency. In Malaysia, this means reinforcing the autonomy and credibility of the Malaysian Anti-Corruption Commission (MACC), particularly in cases involving senior political members. Meanwhile, Indonesia requires the restoration and protection of the institutional independence of the KPK so that it can function effectively without political interference. Both countries must also empower the broader enforcement environment in which anti-corruption agencies operate. Anti-corruption efforts are unlikely to succeed if prosecution processes, oversight bodies, and judicial institutions remain vulnerable to political pressure. Institutional independence must therefore be matched by consistent legal enforcement and clear accountability mechanisms.

South Korea offers a useful policy reference as its anti-corruption progress has been supported by stricter legal enforcement, stronger oversight, and digital governance reforms. Its experience suggests that transparency, particularly in procurement and public administration systems, can reduce opportunities for discretionary abuse and strengthen accountability (Cahyawati et al., 2023; Public Procurement Service Korea, n.d). Its success lies in the strict enforcement of anti-corruption laws, transparent rules on political funding, and the use of strong digital governance systems. The Korean government established the Korea Independent Commission Against Corruption (KICAC) in 2002 and later integrated it into the Anti-Corruption and Civil Rights Commission (ACRC) in 2008. Later, what became the key factor to South Korea's success in mitigating corruption was the enactment of the Kim Young-ran Act (also known as the Improper Solicitation and Graft Act) in 2016. Its successful implementation was driven by strict compliance and monitoring, as well as clear punishments, which translated to a significant reduction in bribery in the public sector. Additionally, the South Korean government introduced e-government systems, such as digital transparency platforms for public procurement and financial disclosures, reducing opportunities for corruption. (Cahyawati, D., Chandranegara, I., Burhanuddin, N., & Yani, 2023; Ramli, 2001). The Korea Online E-Procurement System (KONEPS) was developed by the Public Procurement Service (PPS). It functions to automate the entire procurement process, reduce human intervention, ensure transparency, and promote equal access to government contracts. (Public Procurement Service (PPS) Korea, n.d.). Furthermore, KONEPS integrates over 130 public organizations and aids in eliminating paper-based bidding, lowering the opportunities for bribery. This digital solution, along with South Korea's fourth position in the United Nations E-Government Development Index (EGDI) in 2024, proved that a digital tool can serve as a powerful tool for anti-corruption globally. (United Nations, 2025).

For Malaysia and Indonesia, the main lesson is not institutional imitation but the value of combining legal independence with credible monitoring and administrative transparency. Malaysia and Indonesia do not need to replicate the South Korean model in totality, but they can draw important lessons from it. Reforms that combine institutional independence, enforceable legal standards, and digital transparency tools are more likely to produce stable gains than those that rely primarily on political promises. Without stronger institutional protection and more consistent enforcement, anti-corruption strategies in both countries are likely to continue making uneven progress and could easily slip backward.

5. Conclusion and Recommendations

This study has compared the CPI scores and rankings in Malaysia and Indonesia from 2012 to 2024 to examine how corruption perceptions changed alongside political transition, governance reform, and institutional development. The findings showed that both countries experienced fluctuating CPI trends, although the patterns differed. In Malaysia, changes in CPI performance were closely associated with political instability, leadership turnover, and the continuing effects of major corruption scandals. In Indonesia, earlier gains were not sustained, and the subsequent decline in CPI scores coincided with concerns over weakened anti-corruption enforcement, particularly in relation to KPK.

Collectively, these findings suggest that political change itself is insufficient to generate lasting improvements in corruption control. Electoral turnover may create opportunities for reform, but progress is difficult to sustain without credible institutions, consistent enforcement, and continuity in governance. Thus, anti-corruption efforts are more likely to succeed when they are supported by institutional independence rather than short-term political force.

From a policy perspective, Malaysia and Indonesia need to strengthen the autonomy, credibility, and effectiveness of their anti-corruption institutions. For Malaysia, this requires greater political stability, stronger judicial independence, and more consistent enforcement in cases involving senior officials. Indonesia, on the other hand, needs to restore confidence and trust in anti-corruption institutions, reinforcing regulatory transparency, and protecting the enforcement agencies from political interference. Both countries would benefit from reforms that combine legal accountability, institutional independence, and administrative transparency. Without these conditions, anti-corruption efforts are likely to remain uneven and vulnerable to reversal.

Limitations

This study is not without limitations. Firstly, it relies primarily on the Corruption Perceptions Index (CPI) as the indicator of corruption trends. Although CPI is widely used for comparative study, it measures perceived public sector corruption rather than actual corruption. Hence, it may not capture the informal, concealed, or private-sector corruption practices. Secondly, this study utilizes structured content analysis and secondary sources to fieldwork, interviews, or stakeholder-based evidence. As a result, the analysis is better suited to identifying patterns and contextual associations than to establishing direct causal relationships. Thirdly, the interpretation of political progress and institutional change inevitably involves some degree of changing corruption perceptions in relation to governance developments rather than as a definitive measure of corruption itself.

Future Research

Future research could strengthen this study by incorporating additional governance indicators, such as interview-based evidence or country-specific institutional data, to triangulate CPI trends and better understand them.

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From Knowledge To Action: Evaluating The Effectiveness of Emerging Technologies in Enhancing Tax Compliance Readiness among University Students

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Abstract: The fast-moving digital revolution in the education sector has transformed how future taxpayers learn and prepare to comply. The conceptual paper is a discussion of the use of emerging technologies like AI-assisted learning, gamification of tax simulations, and digital tax laboratory to increase the readiness of tax compliance among university students in Malaysia and Indonesia. Based on the Technology Acceptance Model (TAM) and Transformative Learning Theory (TLT), the developed framework describes the role of digital learning engagement, perceived usefulness, and reflective learning in developing compliance-oriented behaviour. The paper adds to theory by developing TAM and TLT in a tax education setting and provides implications for the use of technology-based curriculum to produce ethical and digitally skilled taxpayers.

Keywords: *Emerging technologies, digital tax education, tax compliance readiness, Technology Acceptance Model (TAM), Transformative Learning Theory (TLT), higher education*

1. Introduction

The emerging digital technologies have significantly changed the world's tax administration and education systems due to their rapid development. Electronic filing, blockchain verification, and data analytics are becoming more popular with tax authorities to achieve a better level of transparency and compliance efficiency (Ariyibi et al., 2024). The Inland Revenue Board (IRBM) in Malaysia has increased its e-Filing and MyTax (Hasil.gov.my, 2025). Nevertheless, Indonesia, via Direktorat Jenderal Pajak (DJP), encourages digital tax ecosystems in line with its reform of the core tax system (Pajak.go.id, 2025). The changes would entail the future taxpayer developing digital literacy and ethical awareness that would see them meet taxes in the data-driven world. The evolution of learning has taken a new shape in the field of education due to digitalisation in the sector through the creation of artificial intelligence (AI) (Barakina et al., 2021). As a result, virtual simulations and gamification of learning offer learners hands-on and interactive learning. However, there is little research exploring the impacts of digital aid in increasing student intention to pay taxes in reality.

In a study conducted in Malaysia and Indonesia, it has been shown that students are now technologically prepared, but not prepared to act and provide voluntary compliance on a digital platform. The gap is filled in the paper, which conceptualises the use of emerging technologies in the stimulation of readiness to comply with tax. It will be defined as cognitive, behavioural and ethical preparedness to conduct in a responsible fashion with digital tax systems (Okunogbe & Santoro, 2023). It relies on the Technology Acceptance Model (TAM) and the Transformative Learning Theory (TLT), which implies a model of the relationship between engaging in digital learning, literacy, ethical reflection and compliance intention (Alshammari & Alkhwaldi, 2025). It rests on the comparison of contexts between Malaysia and Indonesia, which enables proceeding with the theoretical convergence and offering policy recommendations for the introduction of digital tax education to higher learning programs.

Research Objectives

- To examine how emerging technologies influence tax compliance readiness
- To identify the mediating effects of engagement and digital literacy
- To develop a framework linking digital learning with compliance readiness

Research Questions

- How do emerging technologies shape readiness for tax compliance?
- What is the role of engagement and literacy?
- How can a conceptual framework be developed to explain the pathways through which digital learning engagement and literacy translate into tax compliance readiness among university students?

2. Literature Review

Emerging Technologies in Higher Education

Emerging technologies have transformed how individuals study at higher learning, such as artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and game-based learning tools. These are tools that promote active learning through simulation-based environments and feedback (Komasawa & Yokohira, 2023). According to the study by Avsec (2023), technology-enhanced instruction facilitates a greater degree of conceptual knowledge, especially in the subjects that require problem-solving in an analytical manner, such as accounting and taxation. The gap between theory and practice is addressed with the help of gamification and simulation games that lead to an increase in motivation and interest in the learners (Rivera & Garden, 2021). The synergies between AI-based tutoring and adaptive learning analytics would enable the formation of personalised feedback loops and improve the digital literacy and critical thinking (Strielkowski et al., 2025). However, institutional preparedness and infrastructure remain inequalities that curtail the maximum potential of such innovations, particularly in developing situations, as in the cases of Malaysia and Indonesia.

The higher education sector is changing with emerging technologies that will make education more accessible, engaging, and personalized. Virtual reality, artificial intelligence, and adaptive learning platforms are tools that allow students to study complicated subjects in a complex, interactive, and gradual manner. The digital collaboration tools and cloud computing promote the concept of global connectivity, which enables learners and educators to exchange resources and ideas freely. Data analytics also assists institutions in monitoring student progress and the services to be delivered. Besides, blockchain provides secure credentialing and management of academic records (Ayub Khan et al., 2021). These technologies not only enhance learning but also equip students with a future-ready, inclusive and technologically-oriented workforce, making higher education more dynamic.

Tax Education and Digitalisation

The traditional approach to teaching tax has been focused on theoretical knowledge and hand calculation. Nevertheless, the transition to the digital taxation system requires a pedagogical realignment. Jalgasbaevna et al. (2025) posit that colleges and universities should restructure their tax education curriculum to be more digital competence and applied literate by making sure that graduates can work with e-filing systems, tax analytics apps and cloud-based compliance solutions. Digital tax lab and simulation-based assignments are beginning to be used in Malaysia to develop applied knowledge (Yusvana, 2024). However, Fatmasari et al. (2023) state that in Indonesia, there is a lack of success in integrating technology in tax education because of the limitations of resources. Ratnawati & Darmanto (2023) discovered that perceived usefulness and involvement of core tenets of the Technology Acceptance Model (TAM) have a strong impact on the acceptance of online tax learning by students. This implies that digitalisation of tax education not only increases cognitive knowledge but also determines behavioural intention to act in compliance with tax interaction in the future.

Digitalisation is an important component of contemporary tax training because it makes the learning process accessible, efficient, and interactive. Complex tax concepts can be learned by using simulations, online platforms and e-learning tools, which enable students to use real-world scenarios and automated calculations (Bakar et al., 2023). Electronic materials allow the delivery of more recent content, given the constant changes in taxation and regulations. Online learning and teleconferencing support teamwork between students and practitioners worldwide. Besides, the digital tools will be used to build applicable skills in tax software and data analysis, equipping students with the constantly changing requirements of the industry. Overall, digitalisation helps to improve the quality and topicality of tax education in the rapidly changing financial environment.

Tax Compliance Readiness

The tax compliance readiness is an indicator of the willingness of individuals to handle tax systems voluntarily, correctly, and morally. It is a transition period between learning and civic action by the university students (Taing & Chang, 2021). Research in Indonesia and Malaysia points to the fact that education on taxation raises awareness among students, but they are not always prepared, both practically and ethically, to put this knowledge into practice (Mohamad et al., 2023). This preparation is mediated by digital literacy and engagement that facilitates the translation of the abstract knowledge into compliance behaviour. Moreover, ethical reflection, which is highly emphasized in Transformative Learning Theory (TLT), strengthens

internalized motivation towards responsible tax behaviour. Therefore, the use of the latest technologies in tax education not only enhances the competence of the relevant skills but also the mentality that leads to sustainable compliance.

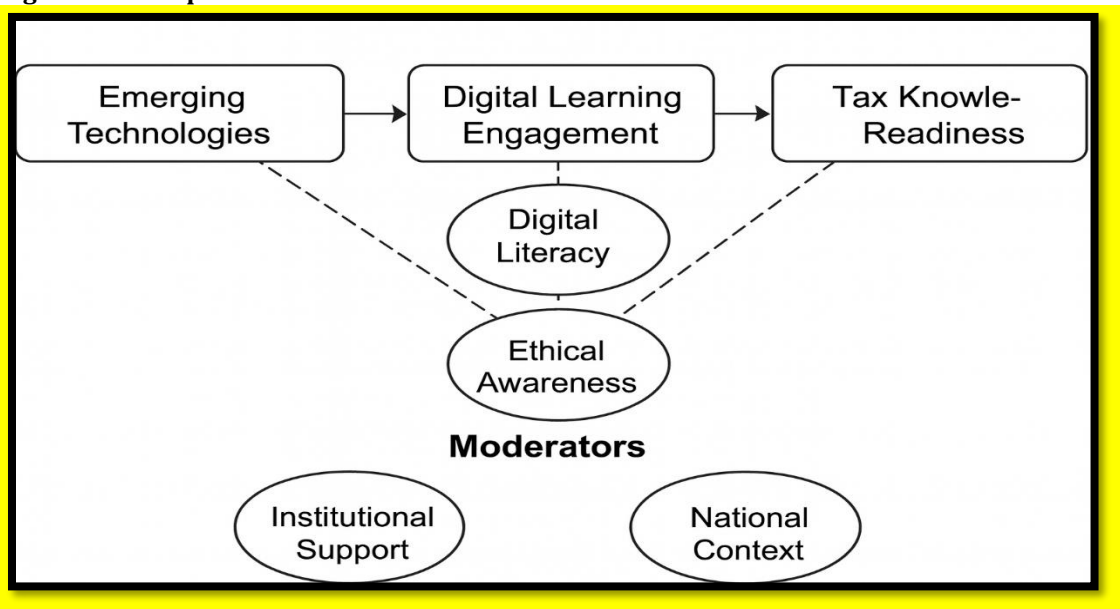
Tax compliance readiness is the ability of an organization or an individual to fulfil the tax liability in the correct manner and on time. It entails the existence of correct systems, processes and knowledge to keep up with the existing tax laws and regulations. This encompasses keeping proper financial records, knowledge of the tax codes, tax software, and acquiring awareness of the change of legislation (Elumilade et al., 2022). Readiness also implies that one is prepared to conduct audits, make returns properly and reduce chances of punishment or litigation. In the current digital age, preparation of tax compliance usually incorporates the use of technology to facilitate reporting, accuracy and transparency in the financial activities.

Theoretical Foundation

The Technology Acceptance Model (TAM), which has been extensively used in educational and behavioural research, determines the acceptance and use of new technologies by individuals based on two major factors, namely perceived usefulness (PU) and perceived ease of use (PEOU). According to recent studies, the interest of students in educational technologies is largely conditioned by their attitude that technology contributes to the effectiveness of the learning process and decreases the cognitive strain (Li et al., 2024). In the field of tax education, TAM offers a model of the process of adoption of digital solutions by learners, including e-filing simulators, AI-based tutorials, and online tax laboratories. An increased level of usefulness and usability translates into increased engagement, which, consequently, forecasts willingness to use the knowledge of taxes in digitalised and practical settings (Opiso et al., 2023). Combining TAM and TLT, therefore, provides a holistic perspective to the technological acceptance process as well as the behavioural change process. Although TAM explains the reason why students use digital tax learning tools, TLT describes how the experiences evolve cognitive, ethical, and willingness to act responsibly in real-life tax situations.

TAM is concerned with adoption and behavioural intention towards technology, whereas Transformative Learning Theory (TLT) is concerned with cognitive and reflective change, which takes place through critical reflection on experience. TLT assumes that the process of learning is transformational as one challenges their assumptions and forms new insights in the process of learning by engaging in activities and dialogues (Bleiler, 2023). In the application to tax education, TLT describes how technology-mediated learning environments, such as virtual simulation or gamified case study, ensure critical reflection, leading to ethical awareness and behavioural readiness to comply (Li, 2022).

Figure 1: Conceptual Framework



Source: Self-Developed

This paper is a proposal of a concept model of how the emerging technologies in the sphere of higher education can make university students more prepared for tax compliance by means of digital involvement and literacy. It is based on the Technology Acceptance Model (TAM) and Transformative Learning Theory (TLT), which involves technology adoption and reflective behavioural change. Digital learning can be triggered through emerging technologies like AI-based learning applications, tax simulations through gamification, and virtual tax labs that promote engagement in learning and active participation, as well as long-term motivation (Celestin et al., 2024). Engagement improves digital literacy, which is the skill to make effective use of technological tools, navigate and interpret them in solving problems (Wei, 2024). By being developed in literacy, the students develop tax knowledge, but this is not just based on conceptual knowledge but also on the practical skills of e-filing, data interpretation, and compliance procedures.

In this model, it is assumed that ethical awareness and digital literacy interfere with digital engagement and readiness to comply. Literacy allows students to operationalize knowledge effectively and ethical understanding that is brought about by reflective and transformative learning promotes responsible behaviour. In the meantime, institutional facilitation, such as the availability of digital tools and pedagogical innovation and the national environment, mediate such associations by influencing the learning conditions and level of digital preparedness (Wang et al., 2024).

3. Methodological Approach

The chosen research design is the conceptual research design, which incorporates the synthesis of theoretical knowledge and logical reasoning to suggest a framework that will be able to connect emerging technologies and tax compliance readiness. Conceptual papers can be useful in promoting theoretical knowledge by bringing together the missing empirical knowledge into a consistent framework, which can subsequently be used to inform future research (Kozlenkova et al., 2025). In this respect, this paper will organise evidence based on the recent literature on digital pedagogy, technology acceptance and tax behaviour to reveal how technological involvement can convert tax knowledge into compliance-related action. The conceptual model had a development that was in three stages, so as to make it possible in the evaluation process.

In order to start with, the literature reviews on the Technology Acceptance Model (TAM) and Transformative Learning Theory (TLT) were conducted to reveal behavioural and reflective learning constructs that applied to tax education. Second, the results of the empirical research in Malaysia and Indonesia were contrasted to ensure the differences in contexts in relation to digital readiness, technology infrastructure, and pedagogical practices (Omar & Mohmad, 2023). Third, the synthesized insights were used to suggest causal relationships among the emerging technologies, digital literacy and compliance preparedness. Although the current paper is theoretical, it forms a basis for empirical validation in the future.

Future research can utilise mixed methods and start with the qualitative approach of interviewing students and teachers, as well as conducting focus groups with these groups, to obtain a better understanding of constructs. Structural Equation Modelling (SEM) is the next method used to verify hypothesised relationships quantitatively (Fauzi, 2022). The comparative ASEAN approach working on Malaysia and Indonesia provides a chance to investigate the role of national digital policies, national cultural perception of taxation, and institutional support to behavioural readiness (Ananda, 2025). This approach creates a solid theoretical generalisability and policy relevance across the emerging economies.

4. Findings and Discussion

The given framework expects an optimistic but indirect impact of emerging technologies on the readiness of students to comply with taxes, with the mediation of digital engagement, literacy, and ethical awareness. According to the Technology Acceptance Model (TAM), the more students consider digital tax learning platforms as helpful and simple to use, the more they will become active users of them (Wulandari & Dasman, 2023). This interaction increases learning motivation and interactivity, which results in better digital literacy and knowledge of tax (Rashid et al., 2023).

Based on the Transformative Learning Theory (TLT), critical reflection can also be provoked by the involvement in the technology-enhanced environment, enabling students to reconsider taxation as not only a technical necessity but a moral and civil duty (Noroozi, 2025). This process of reflection enhances awareness of ethics, which, in combination with literacy, is likely to turn digital knowledge into behaviour with compliance orientation. Therefore, the interplay of the adoption constructs on the adoption side of TAM and the reflective learning aspects on the learning side of TLT offers a two-way channel through which technological and cognitive aspects are integrated into readiness.

Malaysia and Indonesia differ in terms of context and this could affect such relationships. The more advanced digital architecture of Malaysia, as well as its widespread adoption of online learning technologies, will probably produce a better degree of engagement and literacy (Kamaruddin et al., 2023). Conversely, the potential of these impacts depends on the level of uneven technological adoption that is emerging in Indonesia (Wiweko & Anggara, 2025). In both situations, however, institutional support and policy alignment are likely to increase the effect of digital pedagogy on readiness to comply. On the whole, the predicted results indicate that technology use is not enough but the transformational potential can be achieved only in the context of the reflective and ethically driven learning experiences.

Implications

Theoretical Implications

This article is a contribution to theory as this paper takes into consideration the Technology Acceptance Model (TAM) and the Transformative Learning Theory (TLT) to create a combined framework that describes the readiness to comply with taxes. TAM explains the intentions of an individual to adopt technology and TLT explains the thoughtful change that brings about ethical and cognitive transformation. Their synthesis fills the gap between the use of technology and the behavioural outcomes, which provide a multidimensional understanding of the way in which emerging technologies create compliance-oriented learning. Such synthesis broadens the current research on the digital pedagogy and behavioural tax studies by bringing the ethical reflection and digital literacy as mediating variables (Junaedi et al., 2023).

Practical Implications

The framework provides educators with useful guidance on curriculum development. Digital labs, gamified assessments, and AI-based models can all contribute to increasing confidence in digital technology as well as experiential learning (Marengo et al., 2025). Universities are expected to use transformational reflection exercises, such as ethical case assessments, that transform technical expertise into tax-responsible perspectives.

Policy Implications

The study proposes cooperation between universities and tax authorities at the policy level to integrate digital tax education into the agendas of national education. E-learning modules and virtual compliance platforms that are developed by institutions such as the IRBM in Malaysia and the DJP in Indonesia could replicate real tax systems. Such initiatives would produce a generation of digitally literate and ethically responsible taxpayers, and would assist them to make long-term compliance and be economically viable (Abdul Rashid & Ramli, 2024).

5. Conclusion and Future Research

The conceptual paper contributes to the body of knowledge on how university students can be tax compliance ready with the introduction of new technologies in the university to assist them to be digitally literate, engage and reflect on ethical issues. The research is rooted in the Technology Acceptance Model (TAM) and the Transformative Learning Theory (TLT) and suggests a novel integrative model of technology adoption and reflective behavioural change relationship. The framework highlights the fact that effective digital tax education cannot be reduced to technical competence but rather to moral awareness and civic duty that will assist in implementing it sustainably. The comparative focus of Malaysia and Indonesia provides valuable data to determine the way the contextual differences affect the online learning process of the students.

These findings are informative to policy-makers and academic establishments, as well as contributing to the theoretical explanations of digital education and research into tax behaviour. A combination of methods, such

as surveys, interviews, and modelling structural equations, should be tested experimentally in the future in terms of the suggested framework. This makes it possible to examine cross-country differences in ASEAN or other developing countries. Long-term longitudinal research can potentially be conducted to study the long-term implications of digital learning strategies on compliance actions. During the digital era, it is also strengthening the linkage between tax integrity and knowledge development.

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