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Unleashing the potential: Enhancing technology adoption and innovation for micro, small and medium-sized enterprises (MSMEs)

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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

Unleashing the potential: Enhancing technology adoption and innovation for micro, small and medium-sized enterprises (MSMEs)

Mei Kay Loo¹, Sridar Ramachandran^{1*} and Raja Nerina Raja Yusof¹

Abstract: This study conducts a comprehensive systematic review to gain insights into the challenges of technology adoption and innovation for Malaysian Micro, Small and Medium-sized Enterprises (MSMEs), which play a crucial role in the country's economy. These MSMEs face obstacles, including challenges in adopting technology and a lack of technical efficiency. To address these issues, the study explores prominent technology adoption theories (e.g. TAM, DOI) and organizational theories (e.g. RBV, ST). By addressing these challenges, policymakers can enhance MSMEs' competitiveness through targeted strategies, fostering innovation and effective technology adoption, thus contributing to their growth and resilience in the Malaysian economy.

Subjects: Information & Communication Technology (ICT); Communication Theory; ICT; Sustainable Development; Business, Management and Accounting

Keywords: Msmes performance; technology adoption; innovation, theories and models

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PUBLIC INTEREST STATEMENT

This study delves into the challenges encountered by Malaysian micro, small, and medium enterprises (MSMEs) in adopting technology and fostering innovation. As crucial contributors to Malaysia's economy, MSMEs drive employment and economic growth. However, they face hindrances such as challenges of adoption and lack of technical efficiency. By exploring theories of technology adoption and organizational management, this study offers valuable insights for policymakers to enhance MSMEs' competitiveness. Emphasizing innovation and effective technology adoption can bolster these businesses, making them more resilient in the Malaysian economy. The study presents recommendations for future research and implications to support MSMEs in embracing technology and nurturing a culture of innovation. By implementing these measures, policymakers can pave the way for MSMEs' success and advancement in the global market, benefiting the entire society.



1. Introduction

Malaysian MSMEs are a vital contributor to the national economy, playing a crucial role in employment creation, strengthen innovations, and driving economic growth (Abd Aziz et al., 2019, 2021, 2021). In recent years, there has been a noticeable trend of emerging Malaysian MSMEs, with their numbers increasing from 1,151,339 in 2020 to 1,204,987 in 2022 (Department of Statistic Malaysia, 2022). Malaysian MSMEs contributed significantly to the country's economy in 2021, accounting for 37.4% of the Gross Domestic Product (GDP) and generating a value added of RM518.1 billion. They also played a crucial role in driving business growth, being responsible for 97.4% of the total growth and the share of employment in MSMEs was 47.8% in 2021 (DOSM, 2021). MSMEs in Malaysia also made a notable contribution to the country's exports in 2021, accounting for 11.7% of the share export, the main export destinations were China, Singapore and Hong Kong (DOSM, 2021). Despite their hugely growing contribution to Malaysia's economy, MSMEs have been severely affected by the COVID-19 health crisis (DOSM, 2021). In particular, the implementation of the nationwide Mobility Control Order (MCO) led to a decline in the performance of all sectors of the economy. Moreover, the insufficient emphasis on innovation among MSMEs in Malaysia has led to a lower rate of technology adoption than expected (Abdul Halim et al., 2018). Compared to other Asian countries, ranked 35th in the Global Innovation Index (GII) clearly shows that Malaysia's innovation performance is growing very slowly (MASTIC, 2019).

One of the main reasons organizations fail to drive technology is the difficulty leaders have in considering the ideas of others (Hanifah et al., 2019). Therefore, developing a culture of innovation over the long term is crucial for leaders to achieve success. To be successful, leaders must cultivate a sustainable culture of innovation that encourages collaboration, autonomy, research initiatives, thoughtfulness, trust, and employee recognition (Kaasa, 2016). Combining a culture of innovation approach with advanced technology can have a greater impact on a company's performance (Camisón & Villar-López, 2014).

Despite the recognition of innovation as a long-term success factor, many MSMEs managers are unsuccessful in bringing new goods or services to market (Terziovski, 2010). Lee et al. (2016) suggests that the reason behind the inability of many SME managers to bring new products or services to the market is their lack of understanding of the management practices required for leading innovation. Exploring and utilizing the characteristics of creativity, risk-taking, and idea generation can lead to the improvement and modification of existing systems and processes (Tian et al., 2020). Furthermore, most research on innovation and technology tends to focus on large firms and developed countries (Hanifah et al., 2019). In the current circumstances, the sustainability of the MSME sector and developing countries depends heavily on the adoption of technology.

Moreover, technology adoption theories and models are commonly used in various fields to comprehend and forecast user behaviour. However, the application of theories and models of technology adoption in the contexts of MSMEs is relatively limited. Therefore, the research objectives are:

- (1) To provide a comprehensive overview of the performance of MSMEs in Malaysia.
- (2) To explore the theories related to technology adoption.
- (3) To explore the theories related to organizational.
- (4) To explore the challenges encountered by micro and small businesses in adopting different types of technology.
- (5) To provide recommendations and future research for enhancing technology adoption and improving the performance of MSMEs in Malaysia.

This research paper represents a systematic review-domain based review, aiming to provide a comprehensive understanding of the challenges and opportunities faced by Malaysian MSMEs

in technology adoption and innovation. The significance and usefulness of this research lie in its potential to promote the growth and development of MSMEs in Malaysia and other countries. By addressing the unique contextual issues faced by micro and small businesses, this study can offer valuable insights and policy recommendations to enhance technology adoption and foster a culture of innovation among MSMEs, contributing to the resilience and success of these businesses in the Malaysian economy. The research delves into exploring theories related to technology adoption and organizational management in the specific context of Malaysian MSMEs. By linking theoretical discussions to the realities and challenges faced by MSMEs, this study bridges the gap between theory and practice, providing practical implications for MSME owners and managers to lead innovation and successfully adopt technology to drive their businesses forward.

2. Literature review

2.1. Definition of MSMEs in Malaysia

MSMEs in Malaysia are classified according to the total annual turnover and number of employees and generated in two sectors: manufacturing sector and services and other sectors (SME Corp Malaysia, 2021). A detailed classification is shown in Figure 1.

2.2. Overview the Malaysian MSMEs performance

In order to sustain competitiveness in the business world, performance is the major objective of any MSME (Efrat et al., 2018). Performance is defined as the ability of a unit, organization, group or individual to achieve a specific goal through a set of activities (Kumar, 2018; Laitinen, 2002). Performance is also conceptualized as an organization's ability to attain its objectives through work behaviour and performance in executing tasks (Gomez-Mejia et al., 2021). In particular, business performance can be measured both financially and non-financially. According to Chen et al. (2009), financial performance measures are more effective in indicating a competitive advantage compared to other performance measures.

With Malaysian MSMEs constituting a significant proportion of the country's business landscape, it becomes vital to understand and enhance their performance as Figure 2. Accounting for 97.4% of total businesses in 2021, these MSMEs play a critical role in the nation's economy. The service sector emerges as the dominant player, representing 83.8% of the total MSMEs, while the construction and manufacturing sectors contribute 8% and 5.8%, respectively. This diverse distribution underscores the importance of addressing the unique challenges faced by MSMEs in different industries. By evaluating and improving their performance, these businesses can secure their competitiveness and contribute to the overall economic growth of Malaysia.

In Malaysia, it is worth emphasizing that local MSMEs made a significant contribution to Malaysia's economy in 2021. They accounted for 37.4% of the country's GDP, 11.7% of its total exports, 47.8% of the job opportunities and 0.1% of its total productivity as Figure 3.

Figure 1. Definition of MSMEs by category "SME Corp Malaysia (2021)".

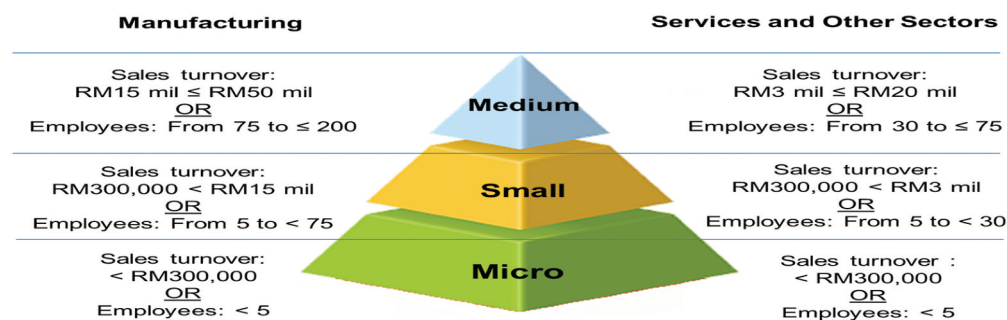


Figure 2. Msmes performance in 2021 “SME Corp Malaysia (2021)”.

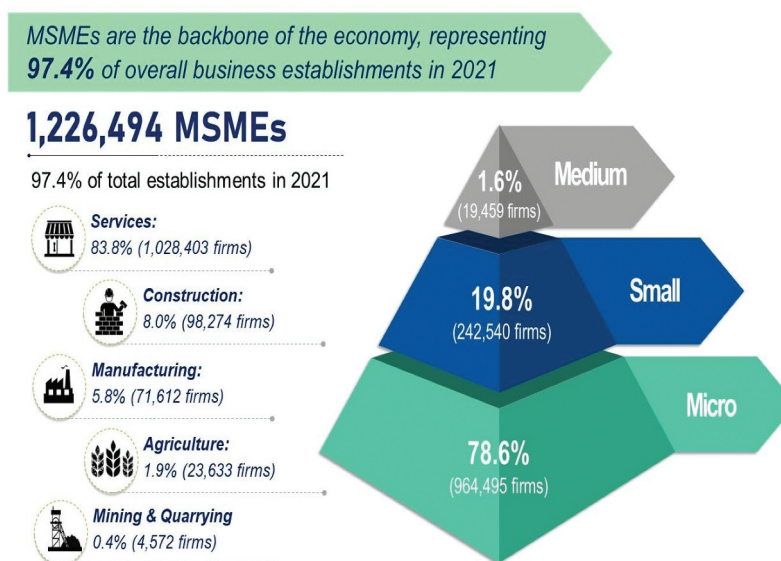
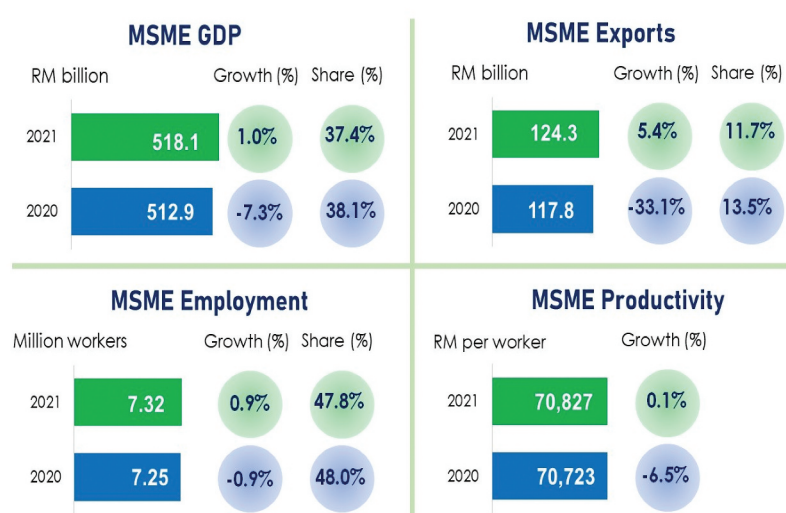


Figure 3. Contribution of MSMEs Malaysia 2021 “DOSM (2021)”.



In 2021, Malaysia’s MSMEs’ GDP witnessed a growth of 1.0%, which was lower compared to the overall GDP growth rate. This trend was consistent with the previous year, as indicated by the time-series data of GDP Malaysia and MSMEs, as illustrated in Figure 4. Specifically, in 2020, MSMEs experienced a decline in GDP of 7.3%, highlighting the challenges faced by this sector in the face of economic uncertainties.

In 2021, the performance of MSMEs in contributing to Malaysia’s GDP decreased by 37.4%, amounting to RM518.1 billion in value added. This decline was observed compared to the previous year when MSMEs contributed 38.1%, as illustrated in Figure 5. The manufacturing and services sectors continued to play a significant role in MSMEs’ GDP activities, collectively accounting for over 80.0% of total MSMEs’ GDP. Moreover, MSMEs’ GDP in nominal terms reached RM572.6 billion in 2020, indicating growth from the previous year’s value of RM547.3 billion.

The MSMEs manufacturing sector experienced a notable rebound in value added, recording a growth rate of 8.5%. This rebound followed a decline of 2.9% in 2020, as indicated in Figure 6.

Figure 4. GDP, Malaysia, MSMEs and non-MSMEs 2001–2021 at constant prices- Annual percentage change “DOSM (2021)”.

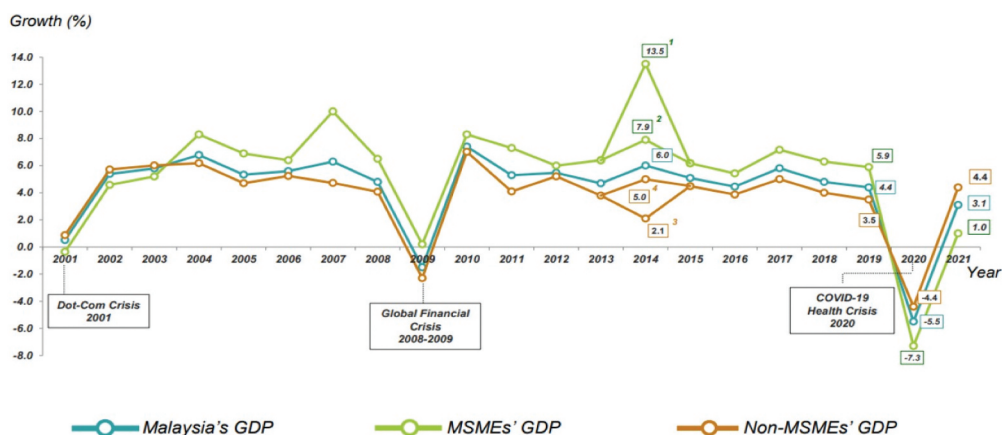


Figure 5. Value added and contribution of MSMEs' GDP to Malaysia GDP 2015–2021 at constant 2015 prices “DOSM (2021)”.

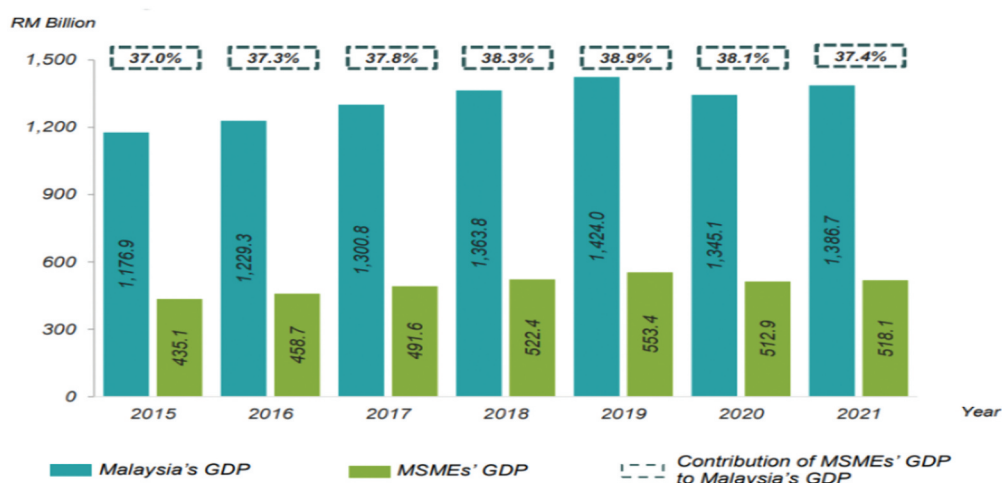


Figure 6. Annual percentage change of MSMEs' GDP by kind of economic activity for 2019–2021 at constant 2015 prices “Department of Statistics Malaysia (2021)”.



The excellent performance in the manufacturing sector can be attributed to positive growth across all sub-sectors. Particularly, the petroleum, chemical, rubber, and plastic products sub-sector demonstrated significant increases, surging by 14.4%. Additionally, the food, beverages, and tobacco sub-sector also experienced stronger growth, reaching 4.6%, an increase from 2020 growth rate of 1.9%.

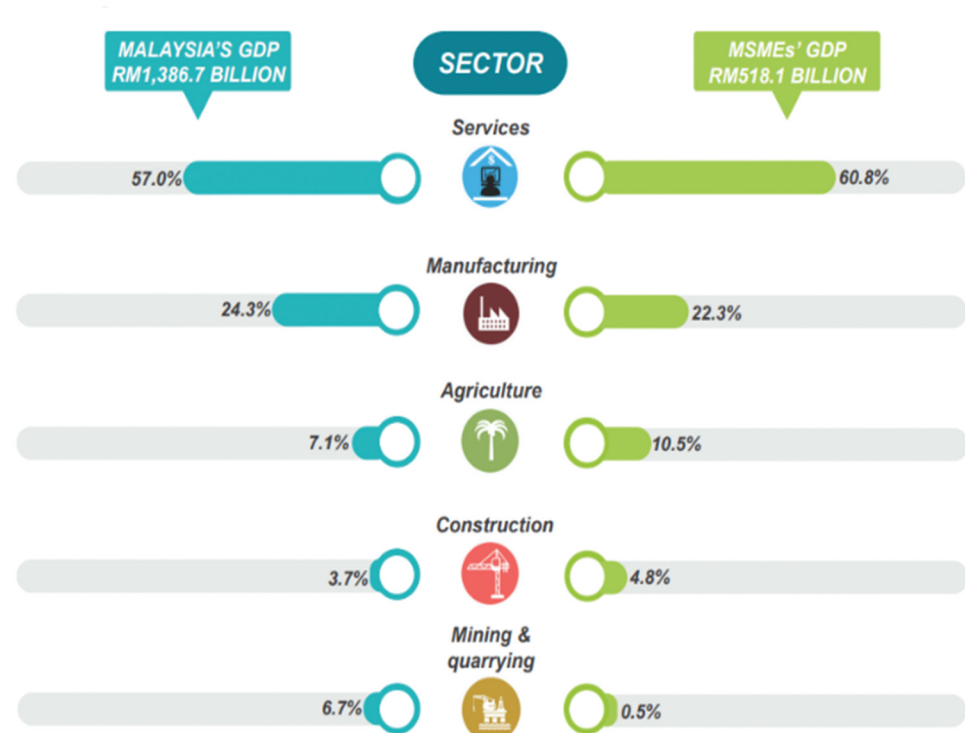
In the agriculture sector, MSMEs experienced an expansion in value added, with a growth rate of 1.9% compared to a negative growth rate of 0.7% in 2020. This positive growth was primarily driven by the livestock, rubber, oil palm and other agriculture sub-sector, which flourished with a growth rate of 2.5% in 2021. However, the fishing sub-sector remained negative this year.

On the other hand, the mining & quarrying sector witnessed a contraction in value added for MSMEs, with a decline of 3.1%. Similarly, the construction sector narrowed its decline to 4.6% from a negative growth rate of 15.4% in 2020.

The MSMEs services sector reported a lower decline of 1.2% in 2021. The decrease was affected by a 5.8% decline in the real estate, insurance, finance and business services sub-sector. However, this was offset by the rebound in performance of the food and beverages, accommodation, wholesale and retail trade sub-sector, which grew by 0.5%. Additionally, the information and communication and transportation and storage sub-sector grew by 2.9%.

The services sector remained the dominant contributor to MSMEs activities, accounting for 60.8%, followed by manufacturing at 22.3% as illustrated in Figure 7. Agriculture sector contributed 10.5% to MSME GDP. While construction sector and mining and quarrying sector contributed 4.8% and 0.5% respectively.

Figure 7. Percentage share of Malaysia and MSMEs' GDP for 2021 at constant 2015 prices "DOSM (2021)".



2.3. National entrepreneurship policy

On 11 July 2019, the Prime Minister of Malaysia, YAB Tun Dr. Mahathir Mohamad, launched National Entrepreneurship Policy (DKN 2030). The purpose of DKN 2030 is to develop policies that foster the growth of an entrepreneurial community that is inclusive and competitive, with a particular focus on the SME sector. The aim is to enable these enterprises to compete effectively in global markets and contribute towards the sustainable development of the social entrepreneurs and B40 group.

DKN 2030 is specifically designed to cultivate an entrepreneurial ecosystem in Malaysia, with the goal of enhancing the country's competitiveness in the global economy. This initiative recognizes the increasing competition and challenges posed by Industry 4.0 and aims to address them effectively. Furthermore, DKN 2030 seeks to foster an entrepreneurial culture within Malaysian society.

The policy document outlines five key objectives:

- (1) Fostering a conducive environment for entrepreneurship: DKN 2030 aims to create a supportive environment that encourages entrepreneurship by implementing policies and initiatives that facilitate business growth, reduce regulatory burdens, and promote innovation and creativity.
- (2) Enhancing the competitiveness of MSMEs: The policy places a strong emphasis on improving the competitiveness of MSMEs by providing them with access to financing, markets, technology, and capacity-building programs. This objective aims to empower MSMEs to thrive in the global marketplace.
- (3) Developing high-growth and innovative enterprises: DKN 2030 recognizes the importance of nurturing high-growth and innovative enterprises to drive economic growth. The policy aims to provide these enterprises with the necessary support, including funding, mentorship, and access to research and development facilities, to accelerate their growth and success.
- (4) Empowering the B40 group and social entrepreneurs: The policy places a strong emphasis on inclusivity, aiming to empower the B40 group (bottom 40% income group) and social entrepreneurs. DKN 2030 seeks to create opportunities for these marginalized groups by providing them with access to financing, capacity-building programs, and market access, enabling them to participate actively in economic activities.
- (5) Strengthening entrepreneurship education and research: Recognizing the importance of education and research in fostering entrepreneurship, DKN 2030 aims to enhance entrepreneurship education at all levels and promote research and development activities related to entrepreneurship. This objective seeks to build a knowledgeable and skilled workforce that is equipped to contribute to the entrepreneurial ecosystem in Malaysia.

Overall, DKN 2030 sets out a comprehensive framework to develop Malaysia's entrepreneurial ecosystem, enhance the competitiveness of MSMEs, empower marginalized groups and social entrepreneurs, and promote entrepreneurship education and research.

Therefore, it is crucial to continue striving towards the target of achieving a 25% contribution by MSMEs to Malaysia's overall exports by 2025, as outlined in the 12th Malaysia Plan and the DKN (Malaysian Green Technology and Climate Change Corporation, 2023). With the advancement of technology, it is crucial for Malaysian MSMEs to adopt digital technologies in order to enhance their global competitiveness (MGTC, 2023). In 2021, the MGTC reported that the gross value added of technology reached RM201.1 billion, indicating a significant increase of RM37.2 billion compared to the previous year, with a growth rate of 22.7%. The next section will elaborate on the models and theories of technology adoption.

3. The models and theories of technology adoption

Technology adoption is critical to the success and competitiveness of organizations in today's rapidly evolving digital landscape. Several theories and models have been created to understand and describe the process of technology adoption.

3.1. Theory of Reasoned Action (TRA)

The TRA was designed to understand the association in human behaviour between behaviours and attitudes by Fishbein and Ajzen (1975) in Figure 8. Basically, it is used to predict the way an individual with pre-existing behavioural and attitudes intentions will behave. The choices individuals make regarding their behaviours are influenced by the anticipated outcomes they expect to achieve from engaging in those behaviours. Moreover, the TRA has also been used to understand communicative discourse (Rogers et al., 2002). The TRA was later modified and extended, leading to the development of the Reasoned Action Approach (RAA) and Theory of Planned Behaviour (TPB). The primary objective of the TRA is to gain insight into individuals' voluntary behaviour by examining the underlying motivations that drive their actions (Doswell et al., 2011). TRA suggests that a person's intention to engage in a behaviour is the primary predictor of whether or not they will actually engage in that behaviour (Glanz et al., 2015). In addition, the normative component also has an influence on whether the person actually performs the behaviour, as the theory suggests. According to Ajzen and Madden (1986), the TRA proposes that the intention to engage in a behaviour precedes the actual behaviour. The formation of behavioural intention in the TRA is based on the belief that performing a behaviour will result in a specific outcome (Colman, 2015). This belief is a crucial factor in shaping the individual's intention to engage in the behaviour. Stronger intentions result in greater effort to perform the behaviour, thereby increasing the probability of actually performing the behaviour. To test and evaluate the TRA theory, 3 constraints are defined: intention stability over time, the measurement of intention, and volitional control regarding goal, context, specificity, time and action. The main drawbacks of TRA are the failure to account for the influence of habit and cognitive deliberation, the possibility of misinterpretation through survey questions and the exclusion of moral factors. Furthermore, the voluntary nature of technology usage is a critical aspect that must be considered for TRA validation.

3.2. Theory of Planned Behaviour (TPB)

The TPB is based on an extension of the TRA, first introduced by Ajzen and Madden (1985) in Figure 9. The TPB extends the TRA by adding a new variable known as Perceived Behavioural Control (PBC). Essentially, PBC depends on the availability of opportunities, skills and resources and the perceived importance of these opportunities, skills and resources in achieving the outcome (White et al., 2015). While both TPB and TRA assume that the person's behavioural intention influences the person's behaviour, TPB uses PBC to deal with the person's behaviour that is not controlled by will. With the addition of PBC, not only are realistic limitations taken into account, but also a factor similar to self-efficacy is included (Taherdoost & Masrom, 2009; Taherdoost et al., 2012). The TPB includes three main factors that influence behavioural intention: perceived

Figure 8. Theory of Reasoned Action (TRA) "Fishbein and Ajzen (1980)".

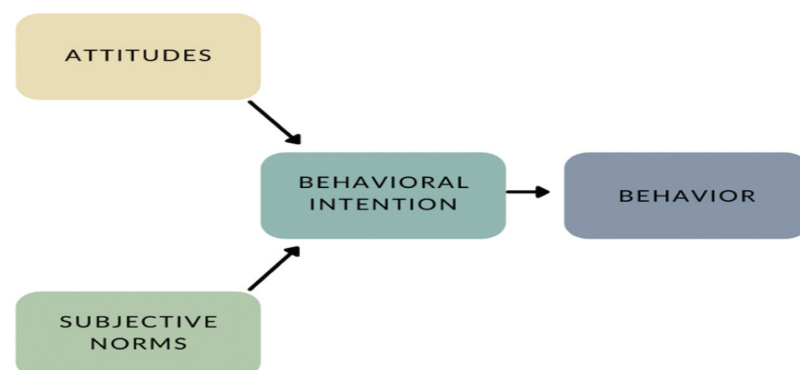
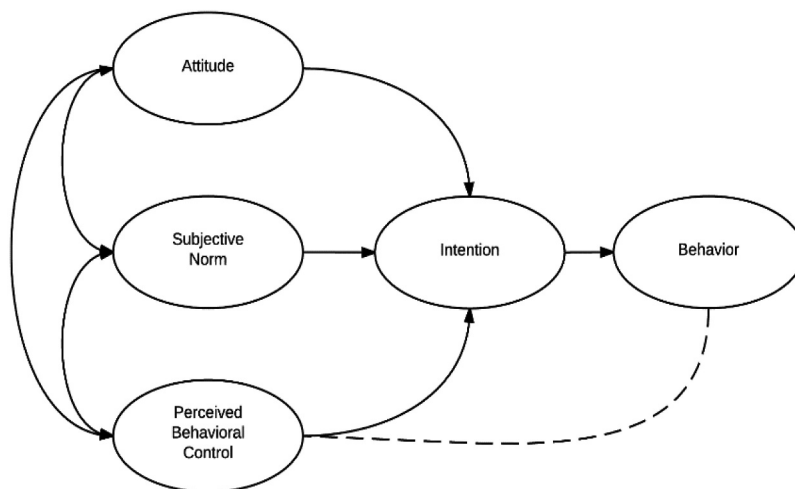


Figure 9. Theory of planned behaviour (TPB) “Ajzen and Madden (1985)”.

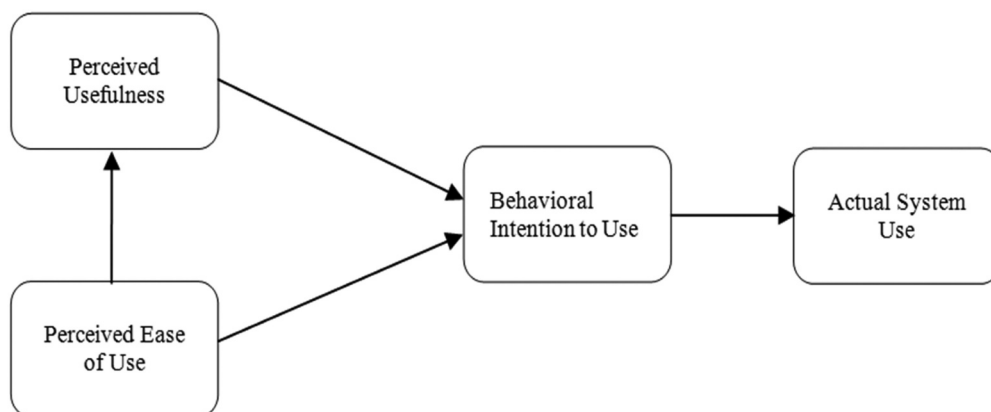


behavioural control, subjective norms, and behavioural attitudes. 2 major issues with the TPB model that have been highlighted in studies Taherdoost et al. (2011) and Taherdoost et al. (2011). First, a person's attitude towards information technology (IT) may be diminished if they do not have access to a computer system (Venkatesh, 2000). Second, the revised TPB may be a more appropriate theoretical framework for studying the degree of voluntariness in an individual's decision to use or not use IT at work.

3.3. Technology Acceptance Model (TAM)

TAM is an information systems (IS) theory that models the use and acceptance of technology by users and developed by Davis (1989). It was derived from the TRA. The TAM model eliminates the user's thematic specification due to the uncertain theoretical and psychometric state of the TRA (Muk & Chung, 2015). Basically, TAM described the motivation of users through three contexts, namely, perceived usefulness (PU), perceived ease of use (PEU) and behaviour intention as Figure 10. In TAM, the two primary beliefs of PU and PEU have a substantial influence on user attitudes, which can be classified as favourable or unfavourable to the system. Occasionally, TAM may include other factors, known as external variables (Lin et al., 2011). Moreover, Taherdoost et al. (2009) also stated that external variables are added to TAM models to improve the accuracy of predicting system usage. TAM has a limitation in that it disregards the social impact of technology adoption, thereby limiting its applicability outside of the workplace. This shortcoming has prompted the development of TAM 2 and TAM 3.

Figure 10. Technology acceptance model (TAM) “Davis (1989)”.



3.4. Extended TAM 2

TAM 2, developed by Venkatesh and Davis (2000), retains the basic determinants of TAM, which are PU and PEU. TAM 2 extends the original TAM model by incorporating the influence of social factors on subjective norms and perceived usefulness, and the instrumental cognitive processes of output quality, job relevance and result demonstrability. TAM 2 proposes that people create mental models to evaluate the link between the use of a specific system and important work goals. These mental models are then used to form judgements about the potential benefits and usefulness of the system, specifically in terms of its impact on performance. In this way, PU is seen as a critical factor in determining technology acceptance and adoption. According to the Matching Mental Processes theory, potential users' judgments of job relevance are typically evaluated through compatibility testing (Venkatesh & Davis, 2000). Thus, job relevance is primarily a person's perception of the extent to which the goals of the system apply to the job. TAM 2 claims that both job relevance and output quality have an impact on PU. Furthermore, Venkatesh and Davis (2000) propose that output quality judgments follow a typical profitability test format, where an individual is presented with a set of options that include various systems and must select the one that offers the highest output quality and is most relevant to their job. Thus, it is clear that PU is seen as the third factor influencing the demonstrability of results. Result demonstrability refers to the degree of tangibility of the results achieved through the use of a particular innovation (Moore & Benbasat, 1991). TAM 2 also suggests that there is a positive relationship between outcome demonstrability and PU, as illustrated in Figure 11.

3.5. Extended TAM 3

Venkatesh and Bala (2008) created an integrated model of technology acceptance, referred to TAM 3, combining TAM 2 with the model of the drivers of PEU (Venkatesh, 2000), as shown in Figure 12. The TAM 3 was developed using four typologies including system characteristics, facilitating conditions, individual differences, and social influence, which affect both PU and PEU. The TAM 3 model includes moderate effects of experience in the relations among PEU and PU, computer anxiety and PEU, and PEU and behavioural intention.

Figure 11. TAM 2 “Venkatesh and Davis (2000)”.

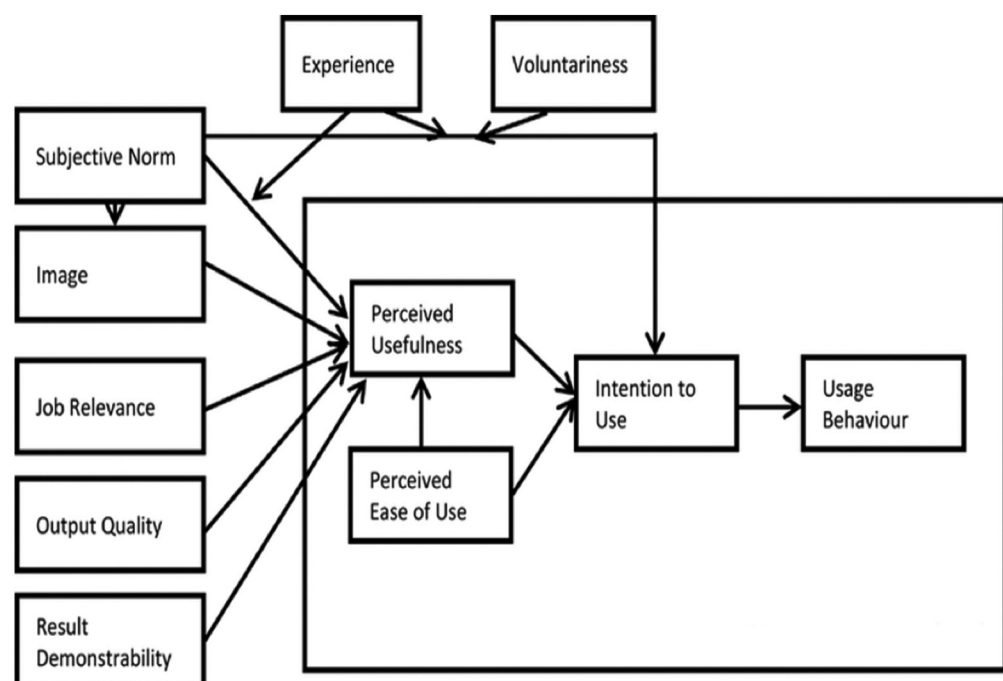
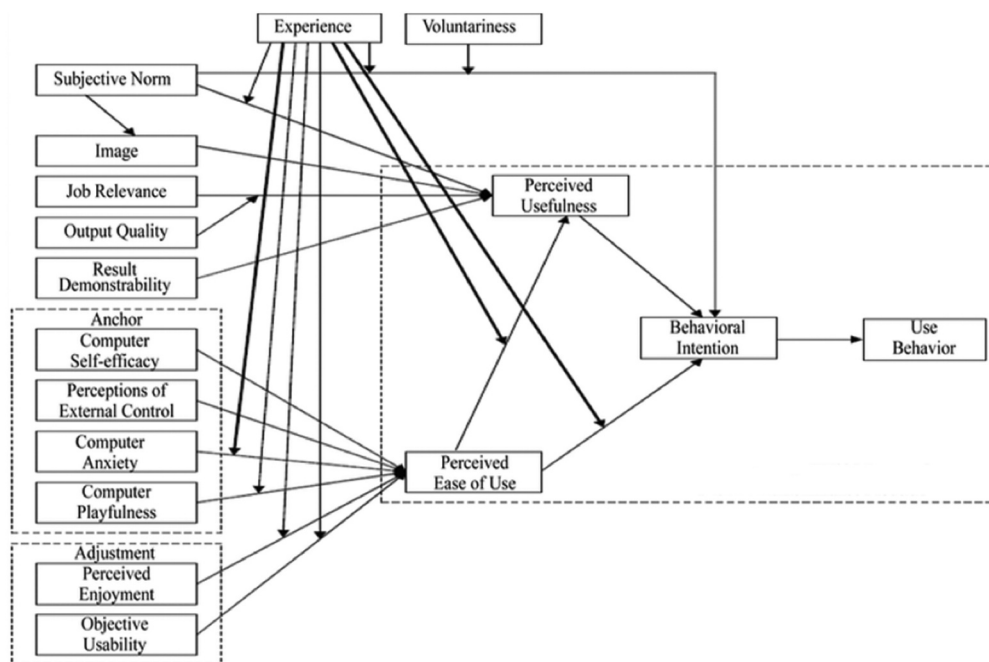


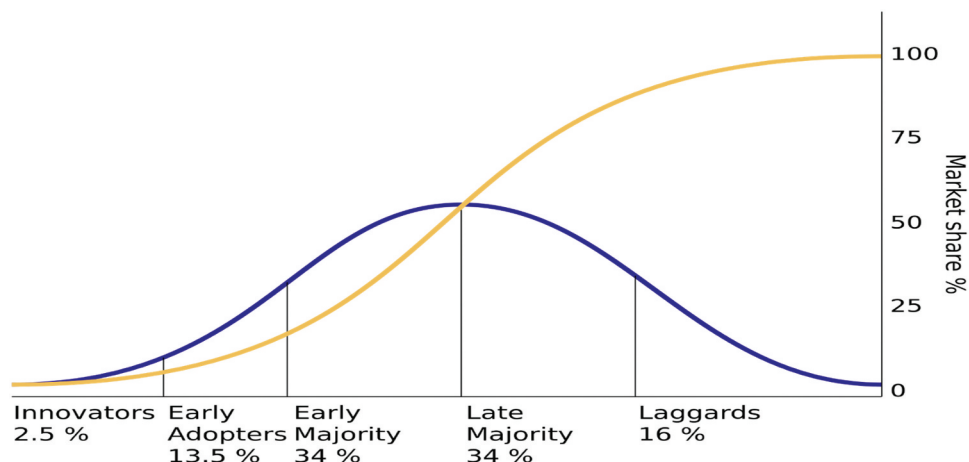
Figure 12. TAM 3 “Venkatesh and Bala (2008)”.



3.6. Diffusion of Innovations (DOI)

The theory of DOI was popularised by Everett Rogers in his book “Diffusion of Innovations”, developed in 1962. It aims to explain the spread, adoption and acceptance of new ideas, products or technologies within a given population over time (Rogers, 2003). The DOI explores the diffusion of different innovations and introduces five factors that influence the spread of a new idea: communication channels, time, innovation, adopters and the social system. DOI has not only been applied at the individual and organizational levels, it also offers a theoretical basis to discuss adoption on a global level. Moreover, the diffusion process consists of five stages: knowledge, persuasion, decision, implementation, and confirmation. The adopter characteristics step categorizes adopters into five groups: innovators, early adopters, early majority, late majority, and laggards as shown in Figure 13 (Rogers, 1962). In conclusion, although the DOI focuses on environmental aspects, organizational attributes and system characteristics, it may have less explanatory power and be less practical for predicting outcomes compared to other adoption theories.

Figure 13. DOI adopter categories “Rogers (1962)”.



3.7. Technology—Organization–Environment Framework (TOE)

The TOE framework, initially proposed by Tornatzky and Fleischer (1990) provides an explanation of technology adoption within organizations, outlines the three key factors that influence the process of implementing and adopting technological innovations, namely, the technological construct, the organizational construct, and the environmental construct as shown in Figure 14. TOE's framework comprehensive structure has led many organizations and companies to use it. It has been summarized numerous applications by Oliveira and Martins (2011). It is used for analysis at the organizational level (Awa et al. (2017). Although the TOE framework has been extensively employed in research, it has experienced limited theoretical advancements since its initial development (Baker, 2012). Additionally, Baker (2012) also suggest that the TOE framework is criticized for its close alignment with other technology adoption models, lacking distinctive explanations and competitive edge. As a result, there is limited impetus to change the framework.

3.8. Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT is a technology acceptance model developed by Venkatesh et al. (2003) to explain users' intentions to use an IS and their subsequent usage behaviour. According to this theory, there are four main contexts that influence technology acceptance: 1) performance expectancy (PE), 2) effort expectancy (EE), 3) social influence (SI), and 4) facilitating conditions (FC) as illustrated in Figure 15. PE, EE and SI have a direct influence on usage intention and behaviour, while FC has a direct influence on user behaviour. In addition, the effects of these four main contexts on usage intention and behaviour can be moderated by factors such as voluntariness of use, experience, age and gender.

3.9. Extended UTAUT 2

Venkatesh et al. (2003) revised the UTAUT model and introduced UTAUT 2 in an effort to improve the theoretical framework. This modified version included three new contexts: hedonic motivation (HM), price value (PV) and habit (H). The effect of these constructs on behavioural intention and technology use was hypothesised to be moderated by individual differences such as age, experience and gender. The UTAUT 2 model was then validated through empirical research. The expansions proposed in UTAUT 2 resulted in a significant improved amount of variance explained in behavioural intention (from 56% to 74%) and technology use (from 40% to 52%) compared to UTAUT. This suggests that the inclusion of the additional constructs in UTAUT2 contributed to a more comprehensive understanding of user behaviour and intentions towards technology adoption (Figure 16).

Figure 14. TOE framework “Tornatzky and Fleischer (1990)”.

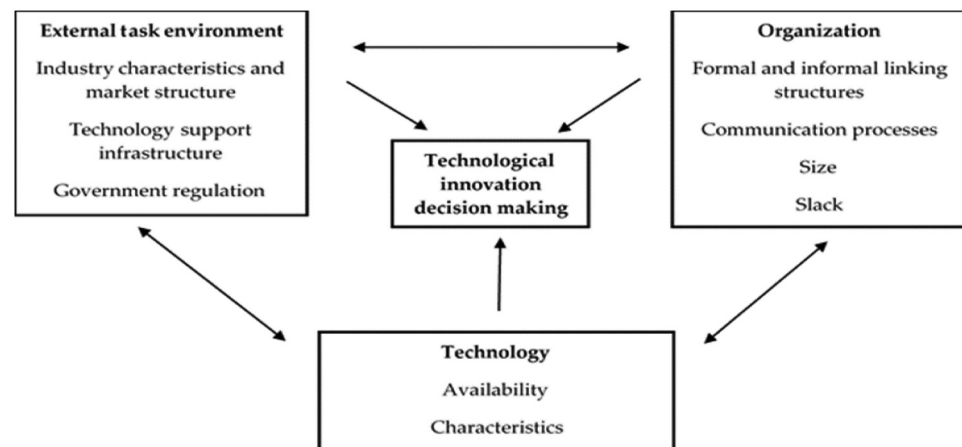


Figure 15. UTAUT “Venkatesh et al. (2003)”.

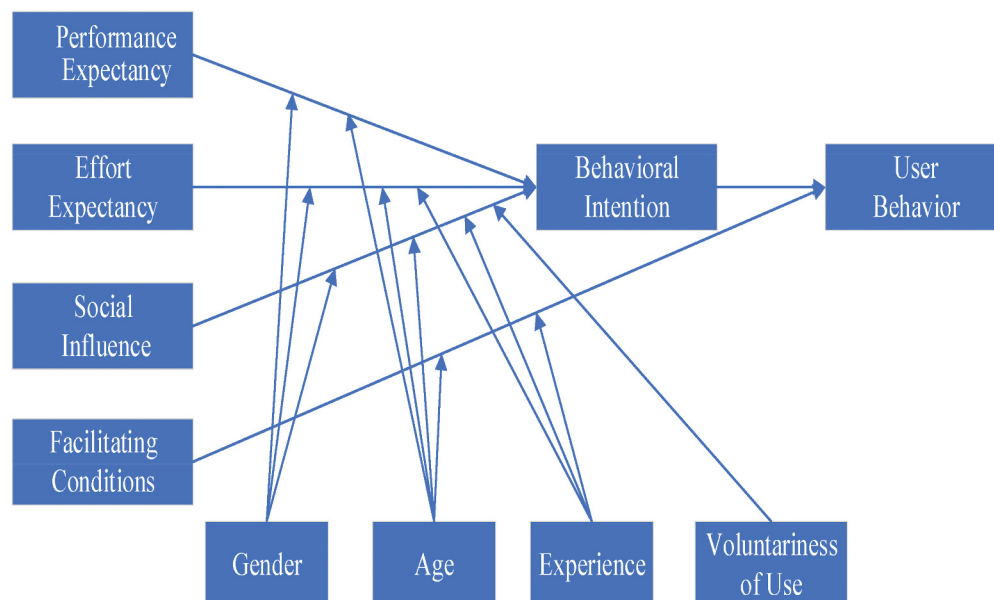
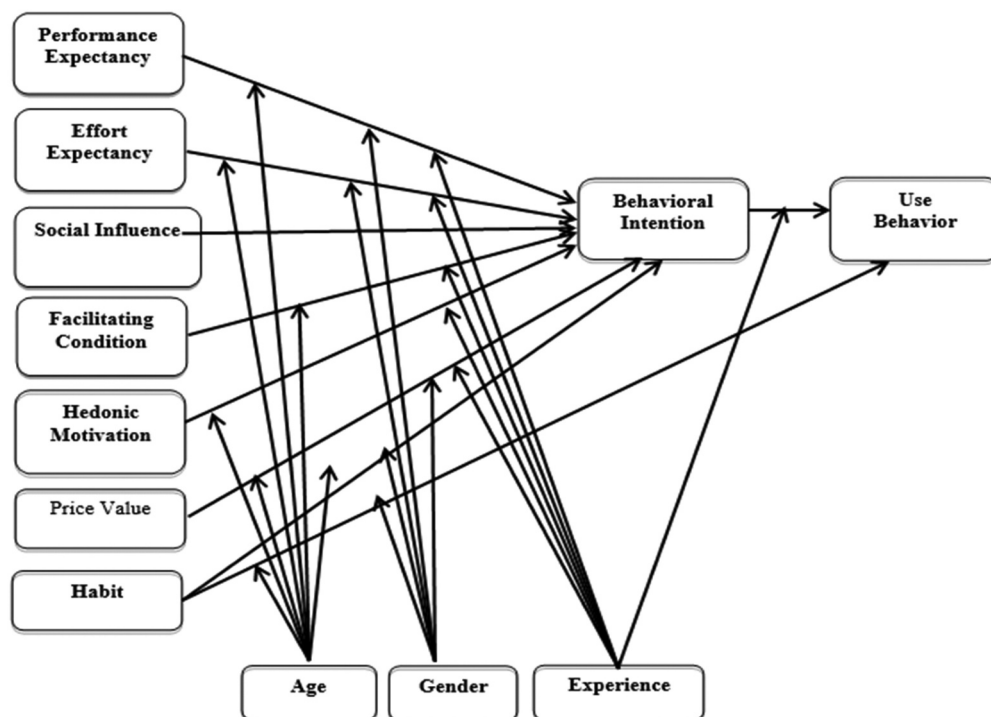


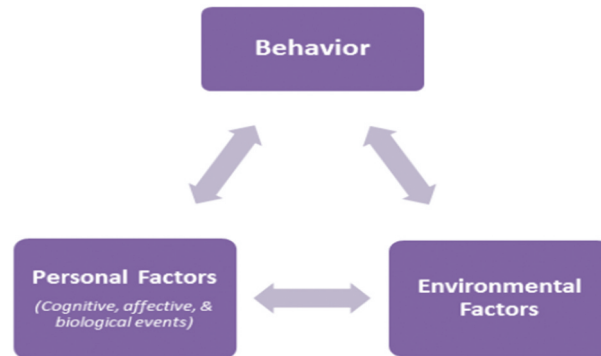
Figure 16. UTAUT 2 “Venkatesh et al. (2003)”.



3.10. Social Cognitive Theory (SCT)

SCT is a psychological, educational, and communication theory that emphasizes the role of social experiences, interactions, and external influences in an individual’s acquisition of knowledge developed by Bandura in 1960s. According to SCT, individuals learn and develop their understanding by observing others and the social contexts in which they interact, as well as by being influenced by various forms of media. SCT was developed based on three key factors: behaviour, personal factors, and the environment as shown in Figure 17. These factors interact in a bi-

Figure 17. SCT “Bandura (1986)”.



directional manner to predict and understand both individual and group behaviour. Observing a model can also serve as a stimulus for the viewer to perform behaviour that they have already learned (Bandura, 1986, 2008).

4. The models and theories of organizational

Firm performance theory encompasses the study of a company's performance and outcomes across various dimensions. Several theoretical frameworks have been developed to explain firm performance and provide guidance on how to enhance it.

4.1. Resource-Based View (RBV)

RBV aims to explain and predict how firms can achieve a sustainable competitive advantage by acquiring and managing valuable, rare, inimitable, and non-substitutable resources (Barney, 1991; Peteraf, 1993). These resources can be tangible or intangible assets that play a crucial role in the production and delivery of products and services (Grant, 1991). RBV provides valuable insights for management at the individual business level by helping to distinguish between resources that contribute to a firm's competitive advantage and those that are of lesser value (Barney, 1991). It also highlights the distinction between resources that can be obtained through factor markets and those that are internally developed within the firm. For a resource to confer a competitive advantage, it must be unique to the firm, difficult for competitors to replicate, and positively impact firm performance (Barney, 1991).

4.2. Control Theory (CT)

The Performance Management system plays a crucial role in aligning individual performance with organizational goals. It involves the continuous process of identifying, measuring, and developing performance within an organization, ensuring that each individual's objectives are linked to the overall mission and goals (Aguinis, 2011). Various strategies and approaches are utilized to simplify and enhance the performance management process. One notable approach is CT, which focuses on establishing control mechanisms between the organization and its systems. According to CT, all system actions should be in harmony with the organization's goals and objectives (Barrows & Neely, 2012). This helps sustain an effective performance management system within the organization.

CT emphasizes the implementation of control mechanisms throughout an organization. These mechanisms can take various forms to achieve desired results, including:

- (1) Organizational structure: The design and arrangement of roles, responsibilities, and reporting lines within the organization.
- (2) Behavioural controls: Norms and policies that guide employee behaviour and actions within the organization.
- (3) Performance measurement mechanisms: Tools and systems used to evaluate and monitor individual and organizational performance.

These control mechanisms work together to ensure that the organization's operations align with its goals and objectives, enabling effective performance management and achieving desired outcomes.

4.3. Agency Theory (AT)

AT, a longstanding theory in finance, explains the principal-agent relationship and has found application in various areas of corporate finance and management. It has been particularly relevant in understanding the relationship between ownership, risk, and firm performance, especially in the banking sector. Numerous empirical studies have tested and validated the theory's applicability in different contexts, including within the Gulf Cooperation Council Countries.

The theory highlights the separation of ownership and management in firms, with shareholders playing a controlling and funding role. It addresses agency problems that arise when there is dispersed ownership and limited incentives for shareholders with small stakes to monitor managers. AT has shed light on the inner workings of firms, exploring the contractual relationships among different factors of production, each motivated by self-interest (Jensen & Meckling, 1976).

Additionally, AT has been extended to explain corporate behaviour, ownership structure, and management practices. It revolves around a contractual relationship between owners (principals) and managers (agents), where decision-making authority is delegated. The primary objective is to provide ongoing monitoring to mitigate agency problems that arise from the interplay between owners and managers.

4.4. Institutional Theory (IT)

According to Lincoln, IT focuses on how company structures and processes derive meaning and achieve stability, rather than solely emphasizing their effectiveness and efficiency in achieving desired outcomes, such as aligning with the company's vision and mission. IT encompasses two main variants: the sociological variant driven by legitimacy and the economic variant. Institutions exert three types of isomorphic pressures on organizations: coercive pressures (organizations depend on the resources of others), normative pressures (organizations conform to professional standards and practices), and mimetic pressures (organizations imitate successful counterparts when uncertain about appropriate actions).

IT has been employed to explain that companies engaged in social and green initiatives are motivated not only by monetary gains but also by considerations of legitimacy and brand image (Brønn & Vidaver-Cohen, 2009). This implies that organizations consciously or unconsciously adopt successful managerial practices from other companies (Huang et al., 2010) when facing uncertainty about their future business strategies. In essence, IT highlights the influence of motivations beyond financial factors and the tendency for organizations to imitate successful practices to navigate uncertain business landscapes.

4.5. Stakeholder Theory (ST)

ST is a comprehensive theory in organizational management and business ethics that considers the impact of various constituents affected by business entities, including employees, suppliers, local communities, creditors, and others. It addresses moral and value-related aspects of managing an organization, such as corporate social responsibility, market economy, and social contract theory (Lin, 2018).

The stakeholder view of strategy combines elements from the RBV and market-based view while incorporating a socio-political dimension. One common version of stakeholder theory aims to identify the specific stakeholders of a company (normative theory of stakeholder identification) and examines the factors that influence how managers treat these stakeholders (descriptive theory of stakeholder salience) (Phillips, 2003).

ST has challenged conventional frameworks in areas like law, management, and human resources by proposing that stakeholders' needs should be prioritized at the forefront of decision-making processes (Harrison & Colle, 2010). Some scholars, such as Geoffroy Murat, have even explored the application of stakeholder theory to unconventional contexts like irregular warfare (Connelley & Tripodi, 2012).

The essence of ST lies in organizations emphasizing a broader set of interests beyond solely pursuing shareholder wealth. It calls for considering social and environmental performance alongside financial performance. Freeman and McVea (2001) emphasize that the stakeholder approach involves managing the business environment, nurturing relationships, and promoting shared interests as essential for long-term survival. Freeman (2004) highlights the importance of alignment between organizational values, stakeholder expectations, and societal issues in determining a firm's ability to effectively market its products. Additionally, Freeman (1984) suggests that satisfying stakeholders' interests can ultimately enhance firm performance.

4.6. Resource Dependency Theory (RDT)

RDT focuses on how board directors play a crucial role in providing necessary resources for the firm (Awotundun et al., 2011). These resources can be obtained from insiders, experts, support specialists, and influential individuals in the community. Directors leverage their expertise in specific areas to contribute specific resources such as legal advice, skills, and information. In strategic decision-making, firms apply RDT to ensure the provision and security of essential resources by establishing external networks. Effective resource management is vital for organizational functioning, performance, and survival. RDT emphasizes the importance of managing resources effectively and efficiently as a key determinant of organizational success (Van Ness et al., 2013). Furthermore, beyond directors' expertise, the ability to access external networks is essential. This enables the company to tap into new markets, secure sources of finance, and gain reputation benefits. Additionally, the diversity of corporate board members is a critical factor that broadens corporate networks and improves financial performance (Pfeffer, 1972). RDT is also utilized by firms to reduce dependency and uncertainty through changes in organizational interdependence. Mergers and acquisitions are commonly employed strategies to minimize dependency levels (Pfeffer, 1987). These actions help firms reduce competition, exchange operations and expertise, and align objectives and goals in a collective manner.

5. Research methodology

Systematic literature reviews can be classified into different categories: domain-based, theory-based, method-based, and meta-analytical reviews. Domain-based reviews cover a wide range of subject areas, including business-related disciplines like management, marketing, finance, accounting, entrepreneurship, as well as non-business-related fields. Meta-analytical reviews are increasingly popular across various subjects (Paul & Feliciano-Cestero, 2020).

In this research, the focus is on conducting a domain-based review specifically related to the challenges faced by MSMEs in technology adoption. The researchers have utilized a longitudinal approach, reviewing a series of research papers on the subject. The methodology involves conducting a structured review by making tables. The researchers have searched for relevant papers from databases such as ScienceDirect, Scopus and Google Scholar, covering the past decade of literature. This comprehensive review aims to identify common challenges encountered by MSMEs in adopting technology as Table 1. By integrating the findings from the literature review and analysis, this research seeks to provide a robust foundation for understanding technology adoption in the context of micro and small businesses.

Table 1. The challenges of technology adoption among small business in 2013–2023

No.	Authors	Challenges
1	Shemi and Procter (2013)	SMEs face various challenges in adopting e-commerce applications, including technical, administrative, ecological, and executional challenges. These obstacles hinder the successful integration and utilization of e-commerce technologies within SMEs operations.
2	Lewandowski et al. (2013)	When it comes to implementing and utilizing efficient Enterprise Resource Planning Software as a Service (ERP SAAS), SMEs commonly encounter challenges in terms of functionality, consistency, compatibility, and serviceability. These challenges can impact the successful implementation and ongoing usage of ERP SAAS systems by SMEs.
3	Mba and Cletus (2014)	SMEs in Port-Harcourt City, Nigeria faces several challenges that hinder their day-to-day operations and hinder their overall performance. These challenges include inadequate funding, limited social infrastructure, insufficient administrative skills, and high taxation. Addressing these issues comprehensively is crucial to enabling the outstanding performance of SMEs in Port-Harcourt City.
4	Dahnil et al. (2014)	Compared to large enterprises, SMEs often face challenges related to a lack of capital, human resources, and technological resources, which can make the adoption, implementation, and execution of IT in their business processes costly and difficult. In Malaysia, one of the fundamental problems faced by SMEs is a lack of expertise in effectively utilizing social media marketing practices.
5	Bharathi and Mandal (2015)	The adoption of ERP services in SMEs presents various challenges, including implementation cost, organizational cost, security cost, and organizational functionality factors. To prioritize and address these challenges, the Analytic Hierarchy Process (AHP) can be utilized. AHP helps identify the most critical aspects of cloud ERP that contribute to the justifiable business performance of SMEs. By using AHP, SMEs can make informed decisions and allocate resources effectively to enhance their ERP adoption and overall business performance.
6	Awa et al. (2015)	SMEs face significant challenges when implementing e-commerce, including the lack of supportive infrastructure, facilitative conditions, organizational size, employees' attitude towards e-commerce applications, and perceived service quality. These challenges can hinder the successful adoption and utilization of e-commerce platforms by SMEs. Overcoming these obstacles requires addressing infrastructure gaps, creating an enabling environment, fostering a positive attitude towards e-commerce, and ensuring high-quality service provision to enhance the e-commerce implementation process for SMEs.
7	Chatzoglou and Chatzoudes (2016)	The author has identified key factors that significantly impact the implementation of e-business by SMEs. These factors include IT support, technical skills, organizational size, administrator expertise, implementation cost, government and supplier support, competitive pressure, consumer willingness, and perceived acceptance.
8	Coleman et al. (2016)	SMEs in Europe face multiple challenges in adopting big data analytics. These challenges include a lack of understanding of new business trends, limited awareness of the potential benefits, resistance to adopting advanced practices, a shortage of expertise in data analytics and skilled analysts, limited access to consultancy services, concerns about data security, and financial constraints.
9	Shah et al. (2017)	SMEs face significant challenges when adopting and implementing big data. These challenges can be categorized as technical, economic, and managerial. Technical challenges involve issues related to data infrastructure, integration, and analysis. Economic challenges include the cost of acquiring and managing big data technologies. Managerial challenges encompass issues such as data governance, talent management, and decision-making processes.

(Continued)

Table 1. (Continued)

No.	Authors	Challenges
10	Kabanda and Brown (2017)	Successful ICT adoption and effective implementation in Tanzanian SMEs are hindered by several challenges. These challenges include inadequate utilization of websites for marketing purposes, limited usage of mobile technology for transactions, and difficulties in collaborating with technical service providers to address technical issues. These factors contribute to the obstacles faced by Tanzanian SMEs in adopting and leveraging ICT for their business operations.
11	Kumar and Ayedee (2018)	SMEs face various challenges that affect their financial performance and brand image. These challenges include a lack of funds, unskilled labor, lower quality standards, limited financial resources, and an unhealthy work culture. Due to these factors, SMEs often struggle to prioritize quality and establish a strong brand image, which ultimately impacts their monetary flow and competitiveness compared to larger enterprises.
12	AlSharji et al. (2018)	The most significant challenge faced by SMEs in the UAE regarding social media adoption is the alignment of Technological Setting, Organizational Framework, and Environmental Situation.
13	Salleh et al. (2018)	The most common challenges faced by SMEs in adopting cloud computing are related to data safety and secrecy concerns, difficulties in switching vendors due to costs, internet connectivity and speed issues, and network availability. Additionally, SMEs may also encounter challenges in handling market fluctuations and changing customer preferences.
14	Jaganathan et al. (2018)	The article explores challenges faced by MSMEs in adopting and implementing ICT. These challenges include limited managerial abilities, poor project management, lack of technical resources, knowledge, and support, inadequate infrastructure, resistance to change, high implementation costs, cultural and legal issues, and difficulty obtaining funding for ICT implementation. It emphasizes the significance of innovative strategies and effective ICT deployment to enhance survival and growth in the dynamic business environment.
15	Afifah et al. (2018)	The article highlights various challenges confronted by MSMEs in embracing digital marketing. These challenges encompass a lack of awareness and comprehension regarding the advantages of ICT, apprehensions about security and privacy, scarcity of skilled workers, limited integration of computer technology in business operations, cultural barriers, and financial constraints. The research also discovered that the government's training efforts resulted in minimal success, with less than 10% of MSMEs continuing to adopt e-commerce. The primary reason cited for this reluctance was the perceived difficulty in fully adopting digital marketing practices.
16	Prause (2019)	The challenges in the adoption of Industry 4.0 in Japan can be summarized as a combination of overall and specific technological factors, administrative hurdles, and environmental considerations.
17	Singh et al. (2019)	The Indian food sector faces challenges related to financial issues, lack of technical assistance, scarcity of skilled labor, outdated technologies, and governance issues.
18	Kumar and Ayedee (2019a)	The main hurdles in technology implementation are the lack of professional training and switch-over cost.
19	Matias and Hernandez (2019)	MSMEs in the Philippines encounter several challenges in adopting cloud computing, including worries about IT capability, a scarcity of professionals with cloud computing skills, and the necessity for training.
20	Kumar et al. (2020)	During the COVID-19 pandemic, technology adoption by SMEs is hindered by unskilled employees. SMEs face significant challenges related to the cost of traditional marketing channels and finding it expensive to hire marketers. Additionally, achieving CSR goals becomes challenging when trying to address environmental concerns.
21	Kumar et al. (2020)	The main challenge faced by SMEs in adopting Industry 4.0 applications is the lack of enthusiasm and support from business partners and clients. Moreover, the fear of failure associated with Industry 4.0 technology impacts the overall group performance.

(Continued)

No.	Authors	Challenges
22	Azman et al. (2020)	The most significant challenge faced by MSMEs, particularly micro-entrepreneurs, is the shortage of capital or limited access to finance.
23	Mohanty and Mishra (2020)	These challenges include a lack of technical knowledge and skills, perceptions of the cost of implementing unaffordable technologies, the need for human resources with adequate technological capabilities, and internet network problems.
24	Chang and M (2021)	The adoption of Industry 4.0 technologies is profoundly impacted by technical aspects, including readiness to adopt, technological infrastructure, and integration. Additionally, the adoption is also influenced by organizational factors such as financial obligations, lack of top management support, competitive pressure, and environmental uncertainty. These factors play a significant role in determining the successful implementation of Industry 4.0 technologies.
25	Kumar and Ayedee (2021)	During COVID-19, SMEs encountered various challenges in their operations. These challenges included deficiencies in ICT infrastructure, lack of standards, concerns about data security, high investment requirements, shortages in skilled workforce, and the absence of a monitoring framework. These hurdles placed unwanted strain on SMEs as they navigated through the pandemic.
26	Maisiri (2021)	In sub-Saharan African developing countries, sustainable adoption of Industry 4.0 faces explicit inhibitors. These inhibitors include lagging industrial development, insufficient innovation systems, slow and deliberate adoption, restricted access to Industry 4.0 technology, limited internet supply, and a scarcity of critical skills. These challenges impede the widespread implementation of Industry 4.0 practices in the region.
27	Turkyilmaz (2021)	Kazakhstan enterprises encounter critical challenges in adopting Industry 4.0. These challenges include a deficiency of skilled personnel in SMEs and a lack of acute strategy. Additionally, data safety issues at the current ICT level and overall structure of Kazakhstan are also significant concerns. These obstacles hinder the smooth adoption and implementation of Industry 4.0 practices in the country.
28	Ali (2021)	The successful adoption of effective social media platforms by SMEs faces key challenges related to the organizational construct. These challenges encompass internal characteristics of firms, employees' size, organizations' turnover, administrative structure, restricted resources, correlated issues, economic uncertainty, trading partner pressure, and competition enforcement. These factors collectively influence the adoption and implementation of Social Media strategies in SMEs, making it essential for businesses to address these challenges to leverage the full potential of social media platforms.
29	Viswanathan and Telukdarie (2021)	The World Economic Forum survey identifies the lack of professional skills training at academic institutes as a significant obstacle limiting entrepreneurship potential. In the current scenario, the market is volatile with increasing demand, particularly in customer-oriented service industries. To navigate these challenges, robust supply chain management and vigorous adoption of technology are crucial for businesses.
30	Nasution (2021)	The effective implementation of e-commerce by SMEs in North Sumatera is influenced by various factors. These factors include the innovativeness and proactiveness of Entrepreneur Orientation (EO), risk-taking and proactiveness of EO, knowledge management process, future uncertainty, primitiveness of EO, and dynamic capability (DC). These aspects play a vital role in shaping the successful adoption and utilization of e-commerce among SMEs in the region.
31	Elissa et al. (2022)	The challenges include low levels of financial literacy among MSMEs in Indonesia, limited access to external funding sources, over-reliance on internally generated funds, challenges in adopting new technologies, and the need for more research on the effectiveness of government financial support for MSMEs during a crisis. The main challenge of the study is to identify the most effective strategies to support MSMEs during a crisis, given the complex and dynamic nature of such situations.

(Continued)

Table 1. (Continued)

No.	Authors	Challenges
32	Gandhi et al. (2021)	MSMEs in Indonesia face numerous challenges in obtaining product certification. These challenges encompass various aspects, including financial constraints, limited resources to cover certification costs, low technological capabilities, inadequate technical production capacity, weak management and organizational capacity, and a shortage of qualified human resources to implement and maintain the certification. Additionally, MSMEs encounter typical hurdles seen across the sector, such as technical obstacles, institutional barriers to market access, financial difficulties in adopting suitable technologies to meet certification standards, compliance challenges with regulations, documentation concerns, and the overall cost and organizational implications of certification processes.
33	Wahyuni et al. (2021)	The article does not provide information specifically about the challenges facing MSMEs in Bandung city in using blockchain technology. However, it does discuss the challenges faced by MSMEs in Indonesia in terms of technology adoption, such as a lack of technical knowledge and skills, perceptions of high costs, and a need for human resources with adequate technological capabilities. These challenges may also apply to MSMEs in Bandung city when it comes to adopting blockchain technology.
34	Shanmugam and Shanmugam (2021)	Technology adoption in the manufacturing industry is shallow, and its application is limited due to a scarcity of available sources.
35	Hasbolah et al. (2021)	The article addresses various challenges encountered by MSMEs, such as financial assistance, insufficient training of staff, lack of experience, low commitment to technology implementation, and high-cost maintenance. The complexity of technology use can be particularly challenging for small-scale entrepreneurs, especially those from rural backgrounds, to grasp quickly.
36	Islami et al. (2021)	The article highlights various challenges encountered by MSMEs, such as inadequate managerial management practices, missed opportunities in the digital era, and a lack of effort in seeking information to enhance product quality and business growth. Furthermore, some MSMEs disregard or overlook competitors.
37	Barroga et al. (2021)	The article identifies challenges faced by MSMEs in the Philippines regarding the adoption of smart manufacturing technologies. These challenges include high technology costs, inadequate infrastructure, a shortage of skilled employees, and lack of knowledge. Knowledge and financial constraints are cited as the primary barriers to the adoption of cutting-edge technologies.
38	Kurniawati et al. (2021)	The article addresses challenges faced by MSMEs in Indonesia when adopting digital technologies, such as the lack of knowledge and skills among employers and workers in online methods, poor telecommunication infrastructure, consumers' limited understanding of technology, and the unreadiness of MSME human resources for online business. Additionally, the adaptation process to new technologies, like e-commerce, can be complicated for MSMEs. These challenges underscore the need for improving human resource quality and educating on digitalization strategies.
39	Kumar et al. (2022)	The challenges include identifying the factors that influence Indian MSMEs to adopt ICT during and following the COVID-19 crisis, checking whether ICT applications in MSMEs can deliver benefits, analyzing the impact of the pandemic on people, economy, and environment.
40	Yeong et al. (2022)	The challenges faced by women-owned small and medium-sized enterprises (WOSMEs) in Malaysia when it comes to adopting e-business practices. These challenges are related to the digital gender gap between men and women, which continues to expand in developing countries, and the potential for greater gender inequalities between WOSMEs and SMEs owned by men as a result of digital transformation.

(Continued)

No.	Authors	Challenges
41	Wulandari and Koe (2022)	MSMEs are facing a downturn amid the COVID-19 pandemic, and a significant contributing factor to this slump is their unpreparedness to embrace digital buying and selling transactions. The article emphasizes the importance of adopting digital marketing strategies to enhance business flexibility and efficiency. However, it acknowledges that many MSMEs are still in the early stages of digital adoption and need further support to fully embrace digital marketing practices.
42	Nurqamarani et al. (2022)	The challenges facing MSMEs related to the COVID-19 pandemic include vulnerability due to size, scale of business, and availability of financial resources. Additionally, challenges in adopting new technologies include lack of technical knowledge and skills, perceptions of cost, and obstacles faced due to social mobility restrictions. The article suggests that the adoption of ICT, specifically social media, can help MSMEs overcome these challenges.
43	Rashida et al. (2022)	The article examines multiple challenges faced by MSMEs, encompassing the necessity for innovation to bolster market position and performance, the struggle for long-term sustainability, funding limitations, high initial capital costs, and expertise gaps in sustainability initiatives. Moreover, it delves into the impact of the COVID-19 pandemic on MSMEs and explores the roles of Islamic crowdfunding, financial literacy, and technology adoption in addressing these challenges.
44	Jalil et al. (2022)	The article identifies challenges in MSMEs' technology adoption, such as financial constraints, limited resources, and insufficient technical expertise among employees. Furthermore, the COVID-19 pandemic has notably impacted MSMEs, especially in developing countries, leading to shifts in entrepreneurial businesses.
45	Jamalut et al. (2022)	MSMEs in the agrofood sector encounter numerous challenges, such as slow and limited adoption of modern innovation technology, lack of awareness and understanding of IoT technology, and underutilization of high-tech machinery.
46	Salim et al. (2022)	MSMEs in Indonesia and Malaysia face multiple challenges, including difficulties in accessing sufficient capital resources, limited effectiveness of investment programs for human resource development, marketing capabilities, financing, technology access, and creating a favorable policy environment. Moreover, they encounter limited awareness of ICT's potential, security concerns, and expensive ICT expenses. Additionally, MSMEs lack knowledge and expertise in technology, particularly online payment technology.
47	Tupamahu (2022)	MSMEs in Indonesia confront several challenges, including limited competitiveness attributed to quality and technological constraints. To maintain competitiveness, resolving issues of economy of scale becomes crucial. Additionally, enhancing business capabilities is essential for MSMEs to increase their income and welfare.
48	Fauzi and Sheng (2022)	MSMEs encounter significant obstacles, including limited financial access, unskilled management, restricted access to the latest technology, and unprofitable relationships with big companies.
49	Charoennan et al. (2022)	The COVID-19 pandemic posed significant challenges to MSMEs in Thailand, making them more vulnerable than ever. Containment measures led to temporary halting or permanent closure of businesses due to reduced consumer purchasing power. This sudden revenue reduction affected their cash flow and viability. Moreover, MSMEs in Thailand faced obstacles in technology adoption and innovation due to high risks, costs, resource limitations, organizational culture, and added workload brought about by change.
50	Kilay et al. (2022)	The article discusses challenges faced by MSMEs in Indonesia regarding the implementation of e-payment and e-commerce services in the supply chain. These challenges include limited competence and human resource capabilities for analyzing changes in organizations, business partners, and customers. MSMEs also face difficulties in creating e-commerce service systems that align with required business processes and capabilities.

(Continued)

Table 1. (Continued)

No.	Authors	Challenges
51	Parvand and Rasiah (2022)	The article highlights that MSMEs mills encounter notable challenges in adopting innovative and complex milling technologies. Their size often leads to a lack of financial resources, making it difficult for them to absorb the risks associated with technology adoption.
52	Amornkitvikai et al. (2022)	The article addresses challenges faced by Thai MSMEs in adopting e-commerce technology, such as outdated tools, limited access to necessary technology, a digital gap between large and small firms, and a lack of marketing knowledge and experience. Additionally, older MSMEs may find it challenging to adopt IT solutions.
53	Shetty and Panda (2022)	The article addresses challenges encountered by SMEs in adopting cloud technology. These challenges include the high cost of maintaining a monolithic IT infrastructure and unresolved issues, such as savings not materializing, vendor lock-ins, service level agreements, and migration interfaces. Additionally, technology-business dynamics can impact small enterprises' business processes, and the financial implications for cloud operational expenditure, such as internet access, business process migration, cloud administration, and training, are significantly high.
54	Anggadini et al. (2023)	The challenges facing MSMEs in the article include low levels of financial literacy among Indonesian entrepreneurs compared to other ASEAN countries, which can hinder their ability to understand different financing provisions and navigate complex loan application procedures. This low level of financial literacy also results in SMEs having minimal access to external funding sources, limiting their role in economic development. Additionally, the COVID-19 pandemic has put many small businesses at risk of running out of money due to their over-reliance on internally generated funds to leverage their operations, and their difficulty accessing financial services from formal financial institutions. The adoption of new technologies, such as those needed for business digital transformation, can also be challenging for MSMEs due to a lack of technical knowledge and skills, perceptions of the cost of implementing unaffordable technologies, and internet network problems.
55	Aligarh, Sutopo and Widarjo (2023)	The article points out that technology adoption in MSMEs is distinct from large companies due to their limited capital capabilities and lower technology acceptance. Moreover, cloud computing service providers must address high computer anxiety to instill confidence and comfort in their services. These challenges can hinder MSMEs from readily adopting new technologies like cloud computing.
56	Ananda et al. (2023)	The article addresses two main challenges hindering the effective application of cashless systems among MSMEs. The first challenge is connectivity issues, encompassing compatibility problems with cashless payment terminals and the need for 4G network upgrades in urban areas, as well as slower internet data speeds in rural areas. The second challenge is practicality issues, especially for MSME owners belonging to the baby boomers' generation and low-income earners, who face difficulties in effectively using cashless systems.
57	Lashitew (2023)	The article discusses challenges faced by CEOs in adopting and utilizing digital technologies during the COVID-19 pandemic. These include the high investment risks, adaptability to change, and integrating new technologies into existing practices. The adoption of remote work and e-commerce necessitates virtual coordination and output-based assessment, which can be challenging for some managers. CEO attributes like gender and experience can influence technology adoption. For SMEs, challenges in adopting digital technologies during the pandemic include differences in IT capabilities and resources, both at firm and geographic levels, impacting technology's marginal productivity and adjustment costs. Limited resources, such as financial constraints and lack of technical expertise, can hinder adoption. However, successful adoption and modernization can improve long-term competitiveness and resilience for SMEs.

(Continued)

No.	Authors	Challenges
58	Soluk et al. (2023)	The article explores challenges encountered by SMEs, such as limited financial and human resources, lack of skills and capabilities for digital technology adoption, and being located in deprived areas. These obstacles can hinder SMEs in developing dynamic capabilities and embracing digital technologies.
59	Lin et al. (2023)	The article examines how information asymmetry poses challenges for SMEs in making informed decisions about innovation adoption. The study reveals that information asymmetry related to financial, business regulation, and court information reduces the likelihood of SMEs adopting product innovation.
60	Al-Azzama et al. (2023)	SMEs encounter challenges in effectively handling and leveraging big data to gain a competitive edge. While big data analytics (BDA) offers advantages, SMEs are not able to fully harness its potential as efficiently as larger firms. The hesitance of SMEs to adopt BDA can pose a significant threat to their competitiveness. Furthermore, in cases where BDA has been introduced, implementation has been sluggish.
61	Martini et al. (2023)	In the ever-changing business environment, all businesses, including micro and small enterprises (MSEs), must embrace technology to confront challenges and ensure survival. However, it is acknowledged that MSEs may encounter difficulties in adopting digital technology, primarily due to financial constraints and a lack of innovation capability.
62	Ta and Lin (2023)	The article highlights various challenges faced by SMEs in adopting digital transformation. These challenges encompass limited financial and human resources for development, a shortage of technical and managerial skills, restricted access to finance, technology, and markets, as well as the need for effective business structures. Additionally, SMEs contend with environmental uncertainty arising from unpredictable changes in the economy.

6. Results and discussion

After conducting a thorough literature review spanning the past decade, numerous recurring challenges have been identified concerning MSMEs' adoption of diverse technologies, encompassing technology 4.0, social media tools, e-commerce, m-commerce, and other technological solutions as Table 2.

Based on the analysis of the challenges, the significant obstacles for micro and small businesses owners and managers are:

6.1. Challenges of adoption

Adoption challenges in technology implementation are closely linked to employee attitudes, budget limitations, and internal organizational characteristics. Resistance to change, particularly among older employees who prefer routine practices, can hinder the adoption process. Lewin's change management model has also highlighted the reluctance of employees towards new changes (Kumar & Ayedee, 2019a; Kumar et al., 2020). Financial constraints at the organizational level also pose challenges to adoption. Moreover, the willingness of internal executives to embrace new technology, encourage creativity, and foster innovation, as well as concerns about data secrecy, are additional factors that influence the technology adoption process.

6.2. Lack of technical and efficiency

A significant challenge in technology adoption is the insufficient technical skills and efficiency of employees, managers, and owners. Many lack adequate knowledge and training in technology adoption, with some organizations even lagging behind in adopting basic technologies like social

Table 2. Recurring Challenges in MSMEs' Adoption of Technologies

No.	Authors	Challenges	Frequency
1	Ta and Lin (2023), Soluk et al. (2023), Frank et al. (2023), Anggadini et al. (2023), Amornkitvikai et al. (2022), Parvand and Rasiah (2022), Kilay et al. (2022), Charoennan et al. (2022), Abu and Margaret (2022), Tupamahu (2022), Salim et al. (2022), Jamalut et al. (2022), Jalil et al. (2022), Kumar et al. (2022), Kurniawati et al. (2021), Islami et al. (2021), Hasbolah et al. (2021), Wahyuni et al. (2021), Gandhi et al. (2021), Kumar and Ayedee (2021), Elissa et al. (2021), Nasution (2021), Viswanathan and Telukdarie (2021), Chang and M (2021), Turkyilmaz (2021), Maisiri (2021), Mohanty and Mishra (2020), Kumar et al. (2020), Singh et al. (2019), Prause (2019), Matias and Hernandez (2019), Kumar and Ayedee (2019b), Jaganathan et al. (2018), Salleh et al. (2018), Afifah et al. (2018), AlSharji et al. (2018), Kumar and Ayedee (2018), Shah et al. (2017), Kabanda and Brown (2017), Coleman et al. (2016), Chatzoglou and Chatzoudes (2016), Mba and Cletus (2014), Dahnil et al. (2014), Shemi and Procter (2013), Lewandowski et al. (2013)	Insufficient technical expertise and effectiveness	45
2	Salim et al. (2022), Kurniawati et al. (2021), Turkyilmaz (2021), Afifah et al. (2018), Salleh et al. (2018), Coleman et al. (2016)	Lack of safety or security	6
3	Anggadini et al. (2023), Gandhi et al. (2021), Ali (2021), Chang and M (2021), Turkyilmaz (2021), Maisiri (2021), Kumar and Ayedee (2021), Mohanty and Mishra (2020), Kumar et al. (2020), Kumar et al. (2020), Prause (2019), Matias and Hernandez (2019), Kumar and Ayedee (2018), Jaganathan et al. (2018), AlSharji et al. (2018), Shah et al. (2017), Coleman et al. (2016), Chatzoglou and Chatzoudes (2016), Mba and Cletus (2014), Dahnil et al. (2014), Shemi and Procter (2013), Lewandowski et al. (2013)	Lack of organizational support	22
4	Ta and Lin (2023), Martini et al. (2023), Al-Azzama et al. (2023), Lin et al. (2023), Soluk et al. (2023), Lashitew (2023), Ananda et al. (2023), Aligarh, Sutopo and Widarjo (2023), Anggadini et al. (2023), Shetty and Panda (2022), Amornkitvikai et al. (2022), Parvand and Rasiah (2022), Kilay et al. (2022), Charoennan et al. (2022), Abu and Margaret (2022), Tupamahu (2022), Salim et al. (2022), Jamalut et al. (2022), Jalil et al. (2022), Rashida et al. (2022), Nurqamarani et al. (2022), Wulandari and Koe (2022), Yeong et al. (2022), Kumar et al. (2022), Kurniawati et al. (2021), Maisiri (2021), Barroga et al. (2021), Islami et al. (2021), Hasbolah et al. (2021), Shanmugam and Shanmugam (2021), Wahyuni et al. (2021), Gandhi et al. (2021), Elissa et al. (2021), Nasution (2021), Viswanathan and Telukdarie (2021), Ali (2021), Kumar and Ayedee (2021), Mohanty and Mishra (2020), Azman et al. (2020), Kumar et al. (2020), Kumar et al. (2020), Prause (2019), Matias and Hernandez (2019), AlSharji et al. (2018), Jaganathan et al. (2018), Afifah et al. (2018), Kumar and Ayedee (2018), Salleh et al. (2018), Kabanda and Brown (2017), Coleman et al. (2016), Chatzoglou and Chatzoudes (2016), Awa et al. (2015), Bharathi and Mandal (2015), Mba and Cletus (2014), Shemi and Procter (2013), Lewandowski et al. (2013)	Challenges to adoption	56

(Continued)

No.	Authors	Challenges	Frequency
5	Charoennan et al. (2022), Abu and Margaret (2022), Salim et al. (2022), Gandhi et al. (2021), Elissa et al. (2021), Viswanathan and Telukdarie (2021), Singh et al. (2019), Salleh et al. (2018), AlSharji et al. (2018), Chatzoglou and Chatzoudes (2016)	Less government supports	10
6	Singh et al. (2019)	Internet and obsolete technologies	1
7	Shetty and Panda (2022), Salim et al. (2022), Gandhi et al. (2021), Maisiri (2021), Kumar and Ayedee (2019a), Kumar and Ayedee (2018), Jaganathan et al. (2018), Shah et al. (2017), Bharathi and Mandal (2015)	Technology and infrastructure costs	9

media tools (referred to as technology 2.0). As digital marketing becomes a crucial marketing trend, micro and small businesses owners require training to improve their technical proficiency and meet the expectations of the rapidly changing business landscape.

6.3. Lack of organizational support

For micro and small businesses to fully transition to new technology, corporate assistance is crucial. Corporate sponsorship can be evaluated based on various aspects. Organizations should provide financial support, training, adequate time for the switch over, expert guidance, supportive infrastructure, and a well-planned change management process to facilitate effective implementation.

6.4. Less government supports

Governments play a crucial role in promoting technology adoption at the organizational level. Government-funded training programs can assist micro and small businesses owners, managers, and employees in adopting technology. Additionally, special schemes and support from the government can contribute to successful adoption. Furthermore, governmental assistance can facilitate the establishment of necessary technological infrastructure for technology adoption.

6.5. Technology and infrastructure costs

While technology adoption can eventually lead micro and small businesses to economies of scale and cost reduction, there are initial hurdles to overcome. Researchers have highlighted the high initial cost of technology implementation and the challenges in setting up the required infrastructure. Micro and small businesses owners and managers must address these challenges before considering the adoption of any technology at the organizational level.

6.6. Lack of safety or security

Another important challenge in technology adoption is the concern about safety and security. Micro and small businesses may be wary of potential risks and vulnerabilities associated with adopting new technologies. They may fear data breaches, cyberattacks, and unauthorized access to sensitive information. Ensuring robust cybersecurity measures and data protection protocols becomes crucial to address these security concerns.

6.7. Internet and obsolete technologies

In some cases, micro and small businesses may face challenges related to internet connectivity and the use of outdated technologies. Limited access to high-speed and reliable internet can hinder the effective implementation of technology solutions. Additionally, using obsolete

technologies may limit their ability to fully leverage the benefits of advanced technologies. Upgrading to more modern and efficient systems becomes essential to overcome these challenges and remain competitive in the digital era.

7. Conclusion

MSME are a critical component of the Malaysian economy, contributing significantly to the country's GDP and exports (Salim et al., 2022). However, these enterprises face numerous challenges that impact their competitiveness, including limited access to financing, low productivity, and inadequate technology adoption (Andalib & Darun, 2018; Hoque et al., 2017).

To address these challenges, several theories of technology adoption have been proposed, including the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Diffusion of Innovation (DOI), Unified Theory of Acceptance and Use of Technology (UTAUT), Social Cognitive Theory (SCT), Technology-Organization-Environment (TOE), and Theory of Planned Behaviour (TPB). These theories provide a framework for understanding how MSMEs can effectively adopt technology and improve their performance. Furthermore, several theories of organizational have been proposed including Resource-Based View (RBV), Control Theory (CT), Agency Theory (AT), Institutional Theory (IT), Stakeholder Theory (ST), and Resource Dependency Theory (RDT), offer valuable insights into the internal dynamics and external influences that shape technology adoption within MSMEs in Malaysia.

The DOI model emphasizes the importance of system characteristics, organizational attributes, and environmental factors in the technology adoption process. In contrast, the TOE model emphasizes the role of technological, organizational, and environmental contexts in technology adoption. The UTAUT model adds three new constructs, including HM, PV, and H, to the existing constructs of PE, EE, SI, and enabling conditions. Finally, SCT posits that individuals' behaviour and knowledge acquisition can be influenced by observing others in social interactions, experiences, and outside media influences.

In Malaysia, the government has set ambitious targets for MSMEs' contribution to the country's GDP and exports (Salim et al., 2022). However, achieving these targets will require a concerted effort to improve MSMEs' access to financing, increase productivity, and encourage technology adoption. The adoption of digital technology can help MSMEs improve their competitiveness and enhance their ability to compete in the global market.

8. Recommendations and future research

To address the phenomenon of low technology adoption among MSMEs in Malaysia, further research is needed to explore and understand the specific barriers and challenges that hinder their uptake of digital technology as follow:

8.1. Identify barriers to technology adoption

Conduct qualitative research to identify the specific barriers and challenges faced by MSMEs in adopting digital technology. This could involve interviews, surveys, and focus groups with MSME owners, managers, and employees to gain insights into their perceptions, concerns, and constraints related to technology adoption.

8.2. Assess the effectiveness of technology adoption theories

Evaluate the applicability and effectiveness of various technology adoption theories, such as the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Diffusion of Innovation (DOI), Unified Theory of Acceptance and Use of Technology (UTAUT), Social

Cognitive Theory (SCT), Technology-Organization-Environment (TOE), and Theory of Planned Behaviour (TPB), in the context of MSMEs in Malaysia. This research could help identify which theories are most relevant and useful for understanding technology adoption among MSMEs.

8.3. Examine government policies and support

Investigate the role of government policies and support in promoting technology adoption among MSMEs. Assess the effectiveness of existing initiatives and identify potential areas for improvement to better facilitate technology adoption and integration into MSME operations.

8.4. Study successful technology adoption cases

Conduct case studies of MSMEs that have successfully adopted and integrated digital technology into their business processes. Identify the strategies, best practices, and lessons learned from these successful cases that can be replicated or adapted by other MSMEs.

8.5. Explore capacity building and training needs

Examine the training and capacity-building needs of MSMEs to enhance their technical skills and knowledge related to technology adoption. Investigate the availability and effectiveness of existing training programs and identify gaps and opportunities for skill development.

8.6. Analyze the role of industry associations

Investigate the role of industry associations and networks in promoting technology adoption among MSMEs. Assess how these associations can facilitate knowledge sharing, collaboration, and technology adoption support among their members.

By conducting research in these areas, policymakers, industry stakeholders, and MSMEs themselves can gain valuable insights to devise targeted strategies and interventions to enhance technology adoption rates, thus bolstering the competitiveness and sustainability of Malaysian MSMEs in the global market.

9. Implications for MSMEs

MSMEs are a critical component of the Asian business landscape, making significant contributions to economic development. However, many MSMEs face challenges in adopting technology, and limited knowledge becomes a barrier for owners and managers. This study aims to provide guidance to MSME managers and owners by identifying initial level challenges in technology adoption.

Amid the COVID-19 pandemic, the need for technology adoption has become even more relevant as many MSMEs have experienced financial losses. Embracing technology enables remote work and maintains productivity, while digital marketing reduces costs compared to traditional methods. With tough competition both within and outside Asian countries, technology adoption becomes crucial for MSMEs to reach the level of developed countries and stay competitive.

MSMEs play a catalytic role in increasing market competition and enhancing economies. Governments in Asian countries should play a central role in supporting MSMEs in terms of cost and training challenges. Loan schemes and programs to improve digital literacy can aid MSMEs in technology adoption. Managers need to motivate employees and address their adoption challenges, fostering a positive and confident environment for technology integration.

By leveraging this study, MSMEs can better assess challenges, find solutions, and effectively communicate with employees to drive successful technology adoption. Governments and managers should collaborate to create an enabling environment, empowering MSMEs to thrive and contribute significantly to the growth of Asian economies.

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