

RESEARCH ARTICLE

From clicks to success: The mediating role of electronic commerce adoption in Malaysian service micro, small, and medium-sized enterprises

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ABSTRACT - The adoption of e-commerce is crucial for enhancing the performance of micro, small, and medium-sized enterprises (MSMEs), yet research on its impact in developing economies, particularly within the service sector, remains limited. This study investigates the influence of e-commerce adoption on the organizational performance of Malaysian service MSMEs, utilizing an integrated Technology-Organization-Environment (TOE) and Resource-Based View (RBV) framework. The findings reveal that organizational factors (top management support, organizational culture) and competitive pressures significantly drive e-commerce adoption, which in turn mediates their impact on performance. The study contributes to theory by integrating RBV and TOE, and to practice by highlighting the need for support from technology vendors and policymakers to facilitate e-commerce adoption and enhance MSME competitiveness.

ARTICLE HISTORY

Received : 21-12-2024
 Revised : 21-03-2025
 Accepted : 26-05-2025
 Published : 30-07-2025

KEYWORDS

E-commerce adoption
Malaysia
MSMEs
Organisational performance
Resource based view
TOE framework

1. INTRODUCTION

In the fiercely competitive modern business landscape, many micros, small, and medium-sized enterprises (MSMEs) encounter substantial obstacles to achieving sustainable growth (Aligarh et al., 2023). The strategic adoption of digital platforms, offering capabilities for rapid information processing, adaptation, and dissemination, is emerging as a crucial response to these challenges (Amran, Tharumarajah & Cheah, 2023; Cheah et al., 2018; Kumar et al., 2023). The transformative impact of e-commerce has been particularly significant, reshaping global business operations (Santoso et al., 2023) and empowering even small firms to compete globally through improved efficiency and fortified stakeholder relationships (Lee et al., 2023). Digital technologies present a wealth of new business opportunities for small organisations, including MSMEs (Ramdani et al., 2021). The effective utilisation of these technologies can lead to expanded market share, improved financial performance, strengthened collaboration, and a greater capacity for product innovation, ultimately culminating in a competitive advantage. The adoption of digital technologies can level the playing field, enabling MSMEs to compete effectively with larger multinational corporations (Ramdani et al., 2021). In the context of developing countries, digital technologies are increasingly viewed as a potential catalyst for accelerating the development of the MSME sector.

In Malaysia, MSMEs form the backbone of economic growth, playing a role even more crucial than in many developed economies (SME Corporation Malaysia, 2021; Mansor & Cheah, 2024). However, the performance of Malaysian MSMEs has not yet reached its full potential. Despite representing 98.5% of businesses in Malaysia, their contribution to the gross domestic product (GDP) stands at 38.3%, significantly lower than the 61.7% contributed by non-MSMEs (large companies and multinational corporations) (SME Corporation Malaysia, 2021). Recognising this disparity, the Malaysian government launched the Shared Prosperity Vision 2030 in July 2019, aiming to stimulate MSME growth and address this performance gap. The adoption of technology has become essential for Malaysian MSMEs seeking to gain competitive advantages and elevate their organizational performance. Digital technologies offer a transformative pathway for MSMEs to access skills and expertise, expand their market reach, drive product development, and enhance their overall competitiveness (Gao et al., 2023). However, despite the widely acknowledged importance of technology-based capabilities, there remains a scarcity of quantitative research exploring their actual impact on organizational performance, particularly within the Malaysian context (Cunningham et al., 2023; Dambiski Gomes et al., 2021; Dutta & Kannan Poyil, 2023).

This scarcity of research extends to the specific area of e-commerce adoption by MSMEs in developing countries. Rahayu & Day (2017) noted a lack of studies focusing on the proven benefits of e-commerce adoption, with most research concentrating on influencing factors. While some studies have explored related areas, such as the impact of digital transformation on Taiwanese textile industries, e-trade performance based on capability and asset specificity, the influence of ICT on Chilean MSMEs, the role of ICT innovation in Kenyan firms, and drivers for ICT adoption by Chinese SMEs, a comprehensive understanding of the impact of e-commerce adoption on the performance of Malaysian MSMEs remains elusive. This empirical study aims to address this critical gap in the literature by answering the following research questions:

Q1: Does e-commerce adoption positively affect organizational performance?

Q2: What are the driving forces behind e-commerce adoption intention among MSMEs in Malaysia?

By delving into these questions, this research is poised to uncover valuable theoretical and practical implications for various stakeholders. From a theoretical standpoint, it seeks to elucidate the impact of e-commerce adoption on the performance of Malaysian MSMEs through the lens of the RBV, incorporating technological, organizational, and environmental factors based on the TOE framework. This integrated approach, as noted by Gregory et al. (2019), has not been extensively utilized in prior research on MSME performance, further highlighting the novelty and potential contribution of this study.

2. LITERATURE REVIEW

The positive correlation between e-commerce adoption and the overall performance of MSMEs is well-established in the literature (Kim & Lee, 2016; Saridakis et al., 2018). The adoption of information technology, broadly speaking, has been shown to favourably influence firm performance. Studies indicate that it aids MSMEs in enhancing operational efficiency, leading to increased revenue generation (Cataldo et al., 2020). The literature also suggests that factors such as relative advantages and compatibility positively impact technology adoption, while complexity can act as a deterrent (Joshi et al., 2024; Chege et al., 2020). This underscores the critical role of organisational factors, particularly top management support and organisational culture, in fostering technology adoption. Furthermore, a less stringent regulatory environment and a favourable competitive landscape have been consistently shown to exert a positive influence on technology adoption within business organisations (Santoso et al., 2023).

However, despite these established relationships, there remains a scarcity of research specifically exploring the impact of e-commerce adoption on the performance of MSMEs in developing countries, particularly within the context of developing economies like Malaysia. This study aims to address this gap by examining the influence of e-commerce adoption on organisational performance among Malaysian MSMEs in the service sector, utilising the TOE framework in conjunction with the RBV. This integrated approach allows for a comprehensive understanding of the interplay between technological, organisational, and environmental factors in shaping e-commerce adoption and its subsequent impact on performance.

2.1 Resource-Based View and Organisational Performance

The RBV, initially proposed by Penrose in 1959, posits that an organisation's resources and capabilities are the key determinants of its competitiveness and overall performance (Santoso et al., 2023). These resources encompass both tangible and intangible assets, including physical assets, financial resources, and intellectual property, all of which contribute to enhancing an organisation's efficiency and productivity (Barney, 2018). In the era of digital technologies and the ongoing Industrial Revolution 4.0, these technologies have emerged as vital resources for firms seeking to establish and maintain a competitive advantage (Elia et al., 2021). The ability to access and integrate these resources is considered a distinctive capability, essential for achieving superior performance in the market (Krasniqi & Mustafa, 2016; Cheah et al., 2024).

E-commerce adoption, as a key aspect of technology utilisation, has been identified as a means for organisations to achieve a competitive advantage and enhance customer satisfaction (Elia et al., 2021). The impact of technology adoption, particularly e-commerce, is particularly significant for the performance of small and medium-sized enterprises (SMEs), leading to improved business processes and overall organisational performance (Ramdani et al., 2021). Indicators of organisational performance encompass a range of factors, including profitability, competitiveness, customer satisfaction, and internationalisation (Barroga et al., 2023; Wirdiyanti et al., 2023). For MSMEs, performance can be measured through various indicators, including sales and profit figures, return on assets, revenue growth, job opportunities, employee wages, product quality, resource utilisation, operational flexibility, and the nature of relationships with suppliers (Grant & Yeo, 2018). The adoption of e-commerce is a strategic move that ensures the effective maintenance of resources for MSMEs, ultimately contributing to their competitive advantage in the market (Kurniawan et al., 2023; Santoso et al., 2023).

2.2 Electronic Commerce

In the context of an increasingly globalised economy, digital technology has catalysed a transformative shift in traditional business models, particularly in developing countries. Electronic-commerce (E-commerce), encompassing economic activities conducted over the internet, is at the forefront of this transformation (Rahayu & Day, 2017). E-commerce enhances marketing agility and accessibility, effectively extending business hours worldwide. Operationally, e-commerce activities are classified as Business-to-Business (B2B) when businesses engage with other companies and as Business-to-Consumer (B2C) when interacting directly with consumers (Awiagah et al., 2016). Despite its transformative potential, MSMEs, especially in developing nations, lag in e-commerce adoption. They grapple with challenges such as limited development, technological constraints, and high failure rates (Chege et al., 2020). The realisation that e-commerce adoption could unlock new business opportunities remains elusive for many MSMEs in developing countries (Cunningham et al., 2023; Loo et al., 2023). Understanding the intricacies that influence e-commerce adoption by MSMEs in developing nations is crucial, as e-commerce adoption can revolutionise their business operations, potentially bridging the gap between untapped opportunities and the underutilization of digital avenues.

2.3 Technology-Organization-Environment Framework

The investigation of technology adoption at the organisational level has given rise to a variety of theories and models. While the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance Model (UTAUT) have been instrumental in understanding technology adoption, their focus often leans towards either external environmental factors or technological aspects, primarily at the individual level in developed countries (Albar & Hoque, 2019). The present study, focusing on e-commerce adoption among MSMEs in a developing country context, necessitates a more holistic approach.

The TOE framework provides a comprehensive perspective for investigating technology adoption at the organisational level, encompassing a broad range of influential factors (Albar & Hoque, 2019; Wong et al., 2020). The TOE framework's three pivotal dimensions—technological, organisational, and environmental—provide a nuanced understanding of how an organisation's internal and external context shapes its adoption of new technologies (Cunningham et al., 2023; Kurniawan et al., 2023). The applicability of the TOE framework extends to various technologies, including internet technologies, websites, e-commerce, and cloud computing, making it particularly suitable for the present study's focus on e-commerce adoption among MSMEs in Malaysia (Albar & Hoque, 2019). By employing the TOE framework, this research aims to uncover the multifaceted factors that influence e-commerce adoption decisions at the organisational level, contributing to a deeper understanding of the complexities involved in technology adoption in developing economies.

2.3.1 Technological context

The technological context plays a crucial role in shaping an organisation's e-commerce adoption decisions. Key factors within this context include relative advantage, compatibility, and complexity (Joshi et al., 2024). Relative advantage refers to the perceived superiority of e-commerce over existing alternatives, prompting MSMEs to consider its adoption (Loo et al., 2023). The decision to adopt e-commerce often hinges on recognising the tangible benefits it offers compared to other options, such as cost efficiency, expanded market reach, enhanced operational efficiency, heightened competitiveness, and innovation potential (Hamad et al., 2018; Rawash, 2021). Compatibility, or the ease with which e-commerce can be integrated with existing business processes and systems, is another critical factor (Sarfo & Song, 2021). MSMEs are more likely to adopt e-commerce when it seamlessly aligns with their current values, experiences, and operational demands (Lim et al., 2021). On the other hand, the perceived complexity of e-commerce can act as a barrier to adoption (Albar & Hoque, 2019). If MSMEs find e-commerce intricate or challenging to understand and implement, it may negatively impact their adoption intention (Kosasi et al., 2019).

2.3.2 Organizational Context

The organizational context, encompassing factors internal to the MSME, is a pivotal determinant of technology adoption (Albar & Hoque, 2019). Key components within this context, such as top management support and organizational culture, are fundamental for successful technology integration (Chege et al., 2020). Top management support, reflecting the extent to which leadership champions and facilitates e-commerce adoption, is particularly crucial (Wong et al., 2020). Positive support from top management fosters commitment, resource allocation, and strategic alignment, creating a conducive environment for e-commerce adoption. Organizational culture, the shared values, beliefs, and practices within an organization, also plays a pivotal role (Albar & Hoque, 2019). A culture that values innovation, encourages experimentation, and embraces change is more likely to foster a positive attitude toward e-commerce adoption (Mohtaramzadeh & Jones, 2018). Furthermore, MSMEs with a customer-centric culture are more inclined to adopt e-commerce to enhance customer satisfaction and meet evolving expectations (Herzallah et al., 2019; Fuadah et al., 2022).

2.3.3 Environmental context

The external environment in which an MSME operates significantly influences its e-commerce adoption decisions. The regulatory environment, encompassing the laws and government policies that govern business operations, can either facilitate or impede e-commerce adoption (Albar & Hoque, 2019; Arslan et al., 2019). Clear policies and incentives foster a supportive environment that encourages MSMEs to embrace e-commerce, whereas stringent or unclear regulations can create barriers (Hassen et al., 2019; Abdulkarem & Hou, 2021). The competitive landscape also shapes e-commerce adoption decisions (Mensah et al., 2023). In highly competitive markets, the pressure to gain an advantage can drive MSMEs to adopt e-commerce to increase market share and profitability (Walker et al., 2016; Wong et al., 2020). The fear of falling behind competitors who have already adopted e-commerce can be a strong motivator.

2.4 Research Hypothesis and Propose Framework

Grounded in the TOE framework, this research investigates the impact of perceived e-commerce adoption on the performance of Malaysian MSMEs. The TOE framework posits that technology adoption within organizations is influenced by a complex interplay of technological, organizational, and environmental factors. The following hypotheses are proposed, drawing upon existing literature and the theoretical underpinnings of the TOE framework:

2.4.1 Technological context

The technological context, a crucial dimension within the TOE framework, encompasses various factors that influence MSMEs' strategic decisions regarding e-commerce adoption (Mensah et al., 2023). The concept of relative advantage,

rooted in diffusion of innovations theory, is central to this context. It refers to the perceived superiority of an innovation, in this case, e-commerce, over existing practices. MSMEs recognize that e-commerce offers tangible benefits, such as cost efficiency, expanded market reach, improved operational efficiency, increased competitiveness, and opportunities for innovation (Sanchez-Torres & Juarez-Acosta, 2019; Rawash, 2021), which surpass the limitations of traditional business models. The recognition of these multifaceted benefits is expected to foster a positive attitude towards e-commerce adoption, as MSMEs are drawn to its transformative potential. The positive perception of e-commerce's relative advantage is hypothesized to encourage proactive adoption. The expectation of tangible benefits serves as a powerful motivator for MSMEs to embrace this technological innovation. The perceived relative advantage acts as a guiding principle, highlighting the potential for improved business performance and sustainable growth. The prospect of streamlined operations, cost savings, access to wider markets, and a stronger competitive position creates a compelling argument for e-commerce adoption. The attractiveness of these benefits is expected to outweigh any perceived complexities or uncertainties associated with the adoption process, thereby positively influencing the intention to adopt e-commerce among MSMEs.

H1: Relative advantages positively affect e-commerce adoption.

Compatibility is another key factor within the technological context of e-commerce adoption (Sarfó & Song, 2021). It emphasizes the importance of aligning technological innovations with the existing organizational infrastructure. The seamless integration of e-commerce with current business processes, software, and workflows is often crucial for successful adoption. The perceived 'fit' of e-commerce within an MSME's operational landscape significantly influences its willingness to embrace this digital transformation. When MSMEs perceive e-commerce as compatible with their values, experiences, and operational needs, it fosters a sense of coherence and minimizes disruptions. The ease with which e-commerce can be integrated into existing practices reduces perceived complexity and potential resistance to change. The alignment of e-commerce with the organizational ethos further strengthens the case for adoption. Compatibility acts as a catalyst, facilitating a smoother transition and increasing the likelihood of successful implementation (Lim et al., 2017). Thus, the positive association between compatibility and e-commerce adoption is not merely theoretical but a strategic imperative for MSMEs navigating the digital landscape.

H2: Compatibility positively affects e-commerce adoption.

Complexity is often perceived as a barrier to technology adoption (Albar & Hoque, 2019). The human mind has a limited capacity for processing new information, and when the cognitive load exceeds this capacity, it can lead to frustration, confusion, and ultimately, rejection of the new concept or technology. In the context of e-commerce adoption, complexity manifests as the perceived difficulty in understanding and implementing various aspects of e-commerce, from setting up online stores and payment gateways to managing inventory and logistics. The steeper the learning curve, the higher the cognitive load on MSMEs, particularly those with limited technological resources and expertise. Factors such as the intricacies of e-commerce platforms, the need for technical skills, and the potential for operational disruptions during the transition can contribute to the perception of complexity. If MSMEs find e-commerce too intricate or challenging, it can trigger apprehension. This can negatively impact their intention to adopt e-commerce, as the perceived costs and risks may outweigh the potential benefits (Albar & Hoque, 2019). The apprehension stemming from complexity can create inertia, hindering MSMEs from embracing e-commerce, even if they recognize its potential advantages (Kosasi et al., 2019). Therefore, the negative relationship between complexity and e-commerce adoption is a crucial consideration for policymakers and technology providers aiming to facilitate the digital transformation of MSMEs.

H3: Complexity negatively affects e-commerce adoption.

2.4.2 Organizational context

The organizational context significantly shapes e-commerce adoption decisions within MSMEs. The extent to which top management actively champions and participates in e-commerce adoption is particularly influential (Abbad et al., 2022). Research suggests that strong top management support significantly increases the likelihood of successful e-commerce adoption (Albar & Hoque, 2019; Chege et al., 2020). When top management demonstrates a clear commitment, it fosters a positive environment where employees feel empowered to embrace digital transformation. This translates into tangible benefits, including increased resource allocation, strategic alignment, and organizational commitment. Conversely, a lack of top management support can create substantial barriers. When leaders fail to recognize the importance of e-commerce or actively resist its implementation, it can lead to internal resistance, resource constraints, and a lack of strategic direction (Hussain & Hassan, 2020), hindering the MSME's ability to leverage digital technologies for growth and competitiveness.

H4: Top management support positively affects e-commerce adoption.

Organizational culture, the shared values, beliefs, and practices within an organization, also significantly influences e-commerce adoption within MSMEs (Albar & Hoque, 2019). The underlying values and norms can either foster or hinder the willingness to embrace new technologies and business models like e-commerce. A culture that champions innovation and encourages experimentation creates fertile ground for e-commerce adoption. In such an environment, employees are more likely to view e-commerce as an opportunity rather than a threat (Mohtaramzadeh et al., 2018). This positive attitude translates into a greater willingness to explore and invest in e-commerce solutions. Furthermore, MSMEs

with a customer-centric culture are particularly predisposed to e-commerce adoption, recognizing its potential to enhance customer satisfaction and meet evolving expectations (Herzallah et al., 2019; Fuadah et al., 2022).

H5: Organizational culture positively affects e-commerce adoption.

2.4.3 Environmental context

The external environment, particularly the regulatory environment, considerably influences e-commerce adoption by businesses. The regulatory environment encompasses the rules, regulations, and government policies that govern business operations, including the adoption of new technologies like e-commerce (Albar & Hoque, 2019; Arslan et al., 2019). A supportive and less stringent regulatory environment can act as a catalyst for e-commerce adoption. Clear, straightforward regulations that facilitate business activities reduce the complexity and uncertainty associated with adopting e-commerce, encouraging businesses to explore and invest in e-commerce solutions. Conversely, a stringent or ambiguous regulatory environment can create significant barriers. Complex and unclear regulations can lead to confusion, increased compliance costs, and potential legal risks, discouraging businesses, particularly MSMEs with limited resources, from embracing e-commerce (Hassen et al., 2019; Abdulkarem & Hou, 2021).

H6: A less stringent regulatory environment positively affects e-commerce adoption.

The competitive landscape within which MSMEs operate significantly influences their decision to adopt e-commerce. The pressure to differentiate and thrive in a market characterized by numerous rivals can motivate MSMEs to embrace e-commerce as a strategic tool (Mensah et al., 2023). By establishing an online presence, MSMEs can transcend geographical limitations, access new customer segments, and compete more effectively with larger, established businesses (Walker et al., 2016; Wong et al., 2020). E-commerce also enables MSMEs to enhance their market share by offering convenient shopping experiences, personalized recommendations, and competitive pricing. The potential for increased profitability through e-commerce further incentivizes adoption for MSMEs in competitive markets. By streamlining operations, reducing overhead costs, and reaching a wider audience, e-commerce can contribute to improved profit margins and overall business growth. Therefore, we hypothesize a positive relationship between market competition and the propensity for MSMEs to adopt e-commerce. A highly competitive environment fosters a sense of urgency, driving MSMEs to leverage e-commerce for gaining a competitive edge, expanding market share, and enhancing profitability.

H7: Competitive environment positively affects e-commerce adoption.

2.4.4 E-commerce adoption and organizational performance

The adoption of e-commerce can serve as a catalyst for enhancing efficiency, productivity, and overall performance within MSMEs. Through the integration of digital technologies, e-commerce facilitates the streamlining of business processes, automation of routine tasks, and reduction of operational costs. These improvements enhance the competitiveness of MSMEs and contribute to higher levels of customer satisfaction (Elia et al., 2021). This research employs a RBV to analyse how the perceived adoption of e-commerce influences the performance of Malaysian MSMEs (Hussain et al., 2022). The RBV posits that a firm's unique resources and capabilities are key determinants of its competitive advantage and performance. In this context, e-commerce adoption can be seen as a strategic resource that enables MSMEs to leverage digital technologies for competitive gain. E-commerce adoption is expected to lead to continuous performance improvements for MSMEs due to the numerous benefits and competitive advantages it offers (Kim & Lee, 2016; Saridakis et al., 2018; Soto-Acosta et al., 2016). These benefits include expanded market reach, increased sales opportunities, improved customer engagement, and enhanced brand visibility. Furthermore, successful e-commerce integration can positively impact multiple dimensions of MSME performance, including operational efficiency, financial outcomes, market competitiveness, and customer satisfaction (Hussain et al., 2020).

H8: E-commerce adoption positively affects organizational performance.

2.4.5 The mediating role of E-commerce adoption

The study further investigates the mediating role of e-commerce adoption in the relationship between the identified predictors (relative advantages, compatibility, top management support, organizational culture, regulatory environment, and competitive environment) and organizational performance. The RBV posits that e-commerce adoption can be considered a valuable strategic resource that contributes to a firm's competitive advantage (Barney, 2018; Cheah et al., 2023). The RBV emphasizes that a firm's unique resources and capabilities, when valuable, rare, inimitable, and non-substitutable, can lead to superior performance. By enabling firms to leverage digital technologies to streamline operations, reach new markets, and enhance customer experiences, e-commerce adoption can be a source of such competitive advantage.

The research hypothesizes that e-commerce adoption will positively mediate the relationship between several predictors and organizational performance. These include:

- **Relative advantages:** The perceived benefits of e-commerce over traditional business models can motivate its adoption, which, in turn, is expected to enhance organizational performance.
- **Compatibility:** The alignment of e-commerce with a firm's existing values, processes, and resources can facilitate its adoption and subsequent positive impact on performance.

- Top management support: Strong leadership backing for e-commerce initiatives can drive its successful adoption and contribute to improved organizational outcomes.
- Organizational culture: A culture that values innovation and customer-centricity can foster e-commerce adoption and its associated performance benefits.
- Less stringent regulatory environment: A supportive regulatory framework can facilitate e-commerce adoption, leading to improved firm performance.
- Competitive environment: The pressure to gain a competitive edge in a dynamic market can drive e-commerce adoption and its positive influence on performance.

The study also anticipates a negative mediating effect of e-commerce adoption on the relationship between complexity and organizational performance. The complexities inherent in implementing and managing e-commerce, such as technological integration, logistical challenges, and the need for new skills, can initially hinder performance. However, successful adoption and integration can overcome these complexities, leading to improved organizational performance in the long run.

- H9a: E-commerce adoption mediates the relationship between relative advantages and organizational performance.
- H9b: E-commerce adoption mediates the relationship between compatibility and organizational performance.
- H9c: E-commerce adoption mediates the relationship between complexity and organizational performance.
- H9d: E-commerce adoption mediates the relationship between top management support and organizational performance.
- H9e: E-commerce adoption mediates the relationship between organizational culture and organizational performance.
- H9f: E-commerce adoption mediates the relationship between a less stringent regulatory environment and organizational performance.
- H9g: E-commerce adoption mediates the relationship between competitive environment and organizational performance.

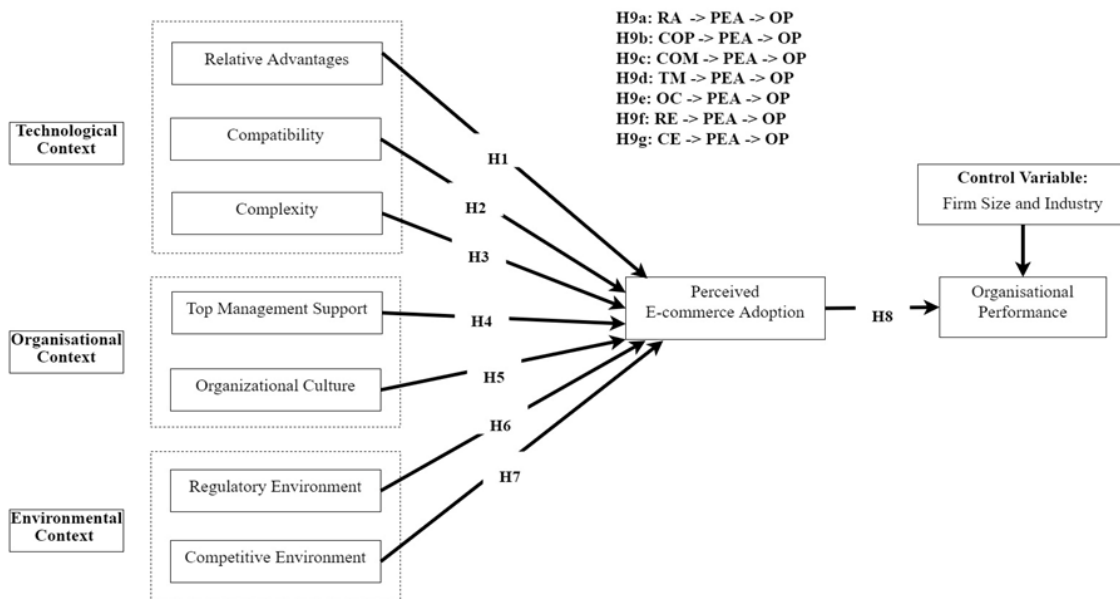


Figure 1. Research model and hypothesis development

3. METHODOLOGY

This study employed an online questionnaire to collect data, adhering to the methodological framework outlined by Mikalef & Krogstie (2020). A purposive sampling technique was utilised to target owners or top management personnel within Malaysian MSMEs. Contact information was sourced through Google searches and business directories, using keywords relevant to the service sector across all Malaysian states and federal territories. The initial list, compiled in September 2021, yielded 4,300 records. After data cleaning to remove duplicates and irrelevant entries, the remaining records constituted the study's sample frame. The survey, focusing on the organizational level, was conducted from September to October 2021, employing multiple rounds of email and WhatsApp invitations and reminders.

Table 1. Organisation and respondents' profile (N= 136)

(a) Company Background		
Demographics	Frequency	Percentage (%)
<i>Size of Company</i>		
Medium	10	7.35
Small	53	38.97
Micro	73	53.68
<i>Age of Company</i>		
Above 10 years	29	21.32
5.1 - 10 years	34	25.00
3.1 - 5 years	29	21.32
1.1 - 3 years	35	25.74
0 - 1 years	9	6.62
<i>Business Category</i>		
Wholesale and Retail Trade, Food & Beverages and Accommodation	119	87.50
Information & Communication and Transportation & Storage	3	2.21
Health, Education and Arts, Entertainment & Recreation	10	7.35
Other Services (e.g., Professional and Real Estate Agent)	4	2.94
<i>Annual Revenue of Company</i>		
3 million to less than 20 million	9	6.62
300,000 to less than 3 million	45	33.09
Less than 300,000	82	60.29
<i>Company Location</i>		
West Malaysia: Northern Region	54	39.71
West Malaysia: Central Region	28	20.59
West Malaysia: Southern Region	22	16.18
West Malaysia: East Coast Region	21	15.44
East Malaysia	11	8.09
(b) Personal Background		
Demographics		
<i>Gender</i>		
Male	70	51.47
Female	66	48.53
<i>Age of Respondent</i>		
30 or below	42	30.89
31-40	46	33.82
41-50	29	21.32
51 and above	19	13.97
<i>Managerial Level</i>		
Director	85	62.50
CEO/COO/CFO	19	13.97
Other (e.g.: Manager / Executive)	32	23.53
<i>Education Level</i>		
Secondary school	12	8.82
Diploma	41	30.15
Bachelor	63	46.32
Postgraduate	18	13.24
Other (e.g.: ACCA)	2	1.47

Despite these efforts, the valid response rate was 3.16% (136 usable responses out of 156 received). To mitigate concerns about non-response bias, a multiple group analysis (MGA) was conducted, comparing the first and last quartiles of respondents. The absence of significant differences in path coefficients (p-value > 0.05) across all relationships

suggested no significant non-response bias. The minimum required sample size, calculated using G*Power 3.1.9.2, was comfortably exceeded by the 136 participants in this study. Table 1 provides a detailed demographic profile of the participants and their organizations. The majority of respondents held top management positions and were over 30 years old with high levels of education. The participating MSMEs were predominantly micro or small-sized enterprises operating in the wholesale/retail trade, food & beverage, or accommodation sectors, with most located in West Malaysia.

The study employed a single-source, cross-sectional survey design, which can raise concerns about common method variance potentially inflating relationships between constructs. To mitigate this, several measures were taken. Full collinearity diagnostics (Variance Inflation Factor - VIF) and correlation matrix analysis were performed (Kock, 2015). VIF values below 3.3 and correlation coefficients below 0.90 for all constructs indicated that CMV did not significantly impact the results (Table 2). Additionally, Harman's single-factor test was used to assess common method bias (CMB) (Soto-Acosta et al., 2016). The first factor explained only 37.00% of the variance, falling below the 50% threshold, further suggesting the absence of substantial CMB.

Table 2. Reliability and validity measures

Item	Construct	Loading (>0.70)	AVE (>0.50)	Cronbach's Alpha (>0.70)	Composite Reliability >0.70)	VIF (<5.0)
RA1	Relative	0.905	0.739	0.822	0.894	2.311
RA2	Advantages	0.873				2.113
RA3		0.796				1.570
COP1	Compatibility	0.863	0.707	0.793	0.879	1.762
COP2		0.808				1.540
COP3		0.850				1.809
COM1	Complexity	0.892	0.619	0.793	0.879	1.483
COM2		0.578				1.357
COM3		0.852				1.552
TM1	Top Management Support	0.871	0.726	0.811	0.888	1.992
TM2		0.827				1.607
TM3		0.857				1.860
OC1	Organisational Culture	0.828	0.723	0.809	0.887	1.616
OC2		0.867				1.851
OC3		0.856				1.906
RE1	Regulatory Environment	0.880	0.697	0.782	0.873	2.159
RE2		0.828				1.896
RE3		0.795				1.400
CE1	Competitive Environment	0.899	0.753	0.844	0.901	3.231
CE2		0.871				1.596
CE3		0.832				2.845
PEA 1	Perceived E- commerce Adoption	0.779	0.693	0.926	0.940	2.273
PEA 2		0.812				2.730
PEA 3		0.870				3.255
PEA 4		0.788				2.212
PEA 5		0.861				3.001
PEA 6		0.836				3.221
PEA7		0.874				3.244
OP1	Organisation Performance	0.877	0.772	0.941	0.942	3.140
OP2		0.884				3.293
OP3		0.895				3.257
OP4		0.877				3.211
OP5		0.849				2.911
OP6		0.892				3.227

This study investigated factors influencing perceived e-commerce adoption and its impact on the performance of service-sector MSMEs. Grounded in the RBV, organizational performance (OP) and perceived e-commerce adoption (PEA) were conceptualised as predictors of the dependent variable. The predictive variables for PEA, derived from the TOE framework, included relative advantage (RA), compatibility (COP), complexity (COM), top management support (TM), organizational culture (OC), regulatory environment (RE), and competitive environment (CE). A seven-point Likert scale was used for OP, while a five-point Likert scale was used for independent and mediating variables. Thirty-four items adapted from previous studies were used to measure the constructs. OP was assessed using six items from Yunis et al. (2017), RA and COP with three items each from Chege et al. (2020), COM with three items from Albar &

Hoque (2019), TM and OC with three items each from Albar & Hoque (2019), RE and CE with three items each from Albar & Hoque (2019), and PEA with seven items from Dores et al. (2020).

4. RESULTS AND DISCUSSION

4.1 Measurement Model

Partial least squares structural equation modelling (PLS-SEM) was employed to evaluate the measurement model and assess the validity and reliability of the collected data (Hair et al., 2022). The assessment criteria in PLS-SEM analysis include outer loading (≥ 0.70), Cronbach's alpha (≥ 0.70), composite reliability (≥ 0.70), and average variance extracted (≥ 0.50) (Hair et al., 2022). The results, presented in Table 2, demonstrate that the data meet these criteria for all constructs, confirming their validity and reliability. Discriminant validity was further assessed using the heterotrait-monotrait (HTMT) ratio, which should be less than 0.90 (Henseler et al., 2015). As shown in Table 3, all constructs exhibit HTMT values below 0.90 when compared with other variables, indicating that all variables are distinct (Henseler et al., 2015).

Table 3. Heterotrait-Monotrait Ratio (HTMT)

	COP	COM	TM	OC	RE	CE	PEA	SP
RA	0.890	0.455	0.730	0.644	0.559	0.484	0.642	0.534
COP	-	0.595	0.798	0.639	0.651	0.617	0.688	0.533
COM	-	-	0.621	0.578	0.581	0.246	0.381	0.414
TM	-	-	-	0.896	0.607	0.639	0.843	0.735
OC	-	-	-	-	0.715	0.425	0.772	0.648
RE	-	-	-	-	-	0.418	0.526	0.601
CE	-	-	-	-	-	-	0.614	0.461
PEA	-	-	-	-	-	-	-	0.713

Note 1: Threshold value < 0.90 (Hair et al., 2017)

Note 2: RA = Relative Advantages; COP = Compatibility; COM = Complexity; TM = Top Management Support; OC = Organisational Culture; RE = Regulatory Environment; CE = Competitive Environment; PEA = Perceived E-commerce adoption; OP = Organisational Performance

4.2 Structural Model

The collected data were assessed for multivariate normality following Hair et al.'s (2022) recommendations. Mardia's multivariate skewness and kurtosis tests confirmed the non-normal distribution of the data. Consequently, path coefficients, standard errors, t-values, and p-values for the structural model were computed using a bootstrapping approach with 10,000 sub-samples, as recommended by Ramayah et al. (2018). Hypotheses were evaluated using a combination of p-values, confidence intervals, and t-values.

4.2.1 Direct effects

Table 4 presents the study's findings regarding direct effects. The results indicate that top management support (TM) and organizational culture (OC) are significantly associated with perceived e-commerce adoption (PEA), supporting H4 and H5, respectively. Additionally, the competitive environment (CE) has a positive and significant relationship with PEA, supporting H7. Finally, a positive association was found between PEA and organizational performance (OP), supporting H8. However, no significant associations were found between relative advantages (RA), compatibility (COP), or complexity (COM) and PEA, leading to the rejection of H1, H2, and H3, respectively. Similarly, no statistical association was found between the regulatory environment (RE) and PEA, thus H6 was not supported.

Table 4. Hypothesis testing for the direct path

Hypothesis	Relationship	Std. beta β	Std. Dev	t-value (t>1.65)	p-value (p<0.05)	Confidence Intervals		Supported (+/+ or -/-)
						5.0%	95.0%	
H1	RA \rightarrow PEA	0.091	0.091	0.917	0.180	-0.053	0.243	No
H2	COP \rightarrow PEA	0.096	0.099	1.020	0.154	-0.075	0.252	No
H3	COM \rightarrow PEA	-0.078	0.059	1.538	0.062	-0.172	0.018	No
H4	TM \rightarrow PEA	0.328	0.102	3.251	0.001	0.155	0.487	Yes
H5	OC \rightarrow PEA	0.293	0.100	2.952	0.002	0.127	0.464	Yes
H6	RE \rightarrow PEA	-0.009	0.068	0.080	0.468	-0.117	0.103	No
H7	CE \rightarrow PEA	0.212	0.076	2.808	0.003	0.089	0.330	Yes
H8	PEA \rightarrow OP	0.673	0.050	13.485	0.000	0.592	0.755	Yes

4.2.2 Indirect effect

Table 5 presents the findings regarding mediating or indirect effects. The results show that PEA mediates the relationship between TM and OP, as well as between OC and OP, supporting hypotheses H9d and H9e. Additionally,

PEA was found to mediate the relationship between CE and OP, supporting H9g. However, PEA did not significantly mediate the association between RA, COP, or COM and OP. Therefore, H9a, H9b, and H9c were not supported. Similarly, no mediating effect of PEA was found between RE and OP, indicating that H9f was not supported. The model's predictive power was assessed using the coefficient of determination (R^2), which quantifies the proportion of variance explained in the endogenous constructs. The analysis, in line with Hair et al. (2022), revealed substantial R^2 values of 0.636 for Perceived E-commerce Adoption (PEA) and 0.481 for Organizational Performance (OP), both comfortably exceeding the 0.10 threshold for acceptable explanatory power.

Table 5. Hypothesis testing for the indirect path (mediating variable)

Hypothesis	Relationship	Std. beta β	Std. Dev	t-value (t>1.65)	p-value (p< 0.05)	Confidence Intervals		Supported (+/+ or -/-)
						2.5%	97.5%	
H9a	RA → PEA → OP	0.061	0.060	0.934	0.351	-0.056	0.188	No
H9b	COP → PEA → OP	0.065	0.066	1.033	0.302	-0.066	0.200	No
H9c	COM → PEA → OP	-0.054	0.039	1.571	0.117	-0.132	0.022	No
H9d	TM → PEA → OP	0.222	0.067	3.373	0.001	0.099	0.350	Yes
H9e	OC → PEA → OP	0.199	0.072	2.767	0.006	0.054	0.341	Yes
H9f	RE → PEA → OP	-0.005	0.045	0.082	0.935	-0.093	0.080	No
H9g	CE → PEA → OP	0.146	0.051	2.839	0.005	0.047	0.243	Yes

The effect size (f^2) was also calculated to gauge the relative impact of the predictors on PEA and the influence of PEA on OP. The findings highlighted that Top Management Support (TM), Organizational Culture (OC), and Competitive Environment (CE) exhibited large effect sizes ($f^2 > 0.025$) on PEA, indicating their substantial influence. Conversely, PEA demonstrated a considerable effect size on OP, underscoring its pivotal role in shaping organizational performance. Furthermore, the model's predictive relevance was evaluated using the Q^2 metric, which assesses the ability to predict the endogenous constructs. The Q^2 values for both PEA and OP were greater than zero, confirming the model's predictive relevance for all endogenous constructs. The comprehensive results, encompassing path coefficients, R^2 , Q^2 , and f^2 , are visually summarized in Figure 2.

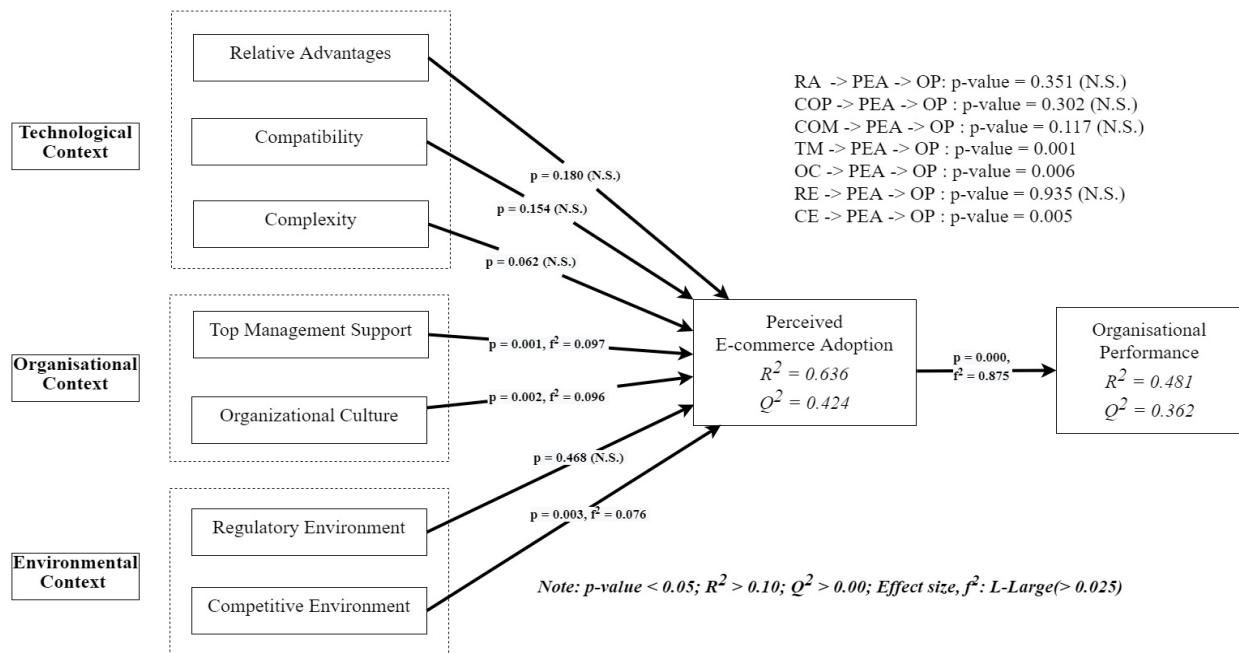


Figure 2. Summary finding for path coefficient, R^2 and f^2

5. DISCUSSION

This study investigates the factors influencing e-commerce adoption intention among Malaysian MSMEs and the impact of this adoption on their business performance. The analysis was conducted using PLS-SEM. The findings did not reveal a significant link between the relative advantages of e-commerce and the intention to adopt it ($\beta = 0.091$, $t = 0.917$, $p = 0.180$). This suggests that factors such as increased efficiency, cost-effectiveness, or competitive advantages may not be the primary motivators for Malaysian MSMEs to adopt e-commerce. The limited use of e-commerce among these MSMEs, as noted by Awiagah et al. (2016), could indicate a lack of awareness regarding its practical benefits. Therefore, promoting e-commerce adoption may require emphasizing and educating MSMEs about its tangible advantages. The non-significant association between compatibility and the intention to adopt e-commerce ($\beta = 0.096$, $t = 1.020$, $p = 0.154$)

suggests that current practices, systems, or values within MSMEs may not be conducive to seamless e-commerce integration, aligning with the findings of Hamad et al. (2018). These highlights potential challenges in integrating e-commerce and suggests the need for further research or strategic adjustments to enhance compatibility.

The results also indicate that the perceived complexity of e-commerce does not significantly influence adoption intention among MSMEs ($\beta = -0.078$, $t = 1.538$, $p = 0.062$), consistent with Hamad et al. (2018). This lack of perceived complexity as a barrier may be attributed to the low adoption rate of e-commerce in Malaysia, leading to limited awareness of the associated challenges. This underscores the need for increased awareness and understanding of the challenges involved in e-commerce adoption among Malaysian MSMEs. In contrast, the study confirms that top management support significantly influences e-commerce adoption intention ($\beta = 0.328$, $t = 3.251$, $p = 0.001$), as supported by Awiagah et al. (2016). Active support and encouragement from top leaders or managers are crucial in shaping a company's willingness to adopt e-commerce. Strong leadership support is likely to motivate and facilitate the adoption of e-commerce technologies throughout the organization.

Similarly, organizational culture significantly impacts e-commerce adoption intention ($\beta = 0.293$, $t = 2.952$, $p = 0.002$), aligning with Albar & Hoque (2019). A company culture that fosters innovation, openness to new technologies, and adaptability is more likely to be receptive to e-commerce. The organization's culture, including its approach to new ideas and technologies, is a key determinant of its willingness to integrate e-commerce. Contrary to expectations, the regulatory environment was found to have no significant relationship with e-commerce adoption intention ($\beta = -0.009$, $t = 0.080$, $p = 0.468$), consistent with Hamad et al. (2018). This suggests that existing rules, regulations, and government policies related to e-commerce may not be the primary factors influencing adoption decisions. Other factors, such as internal culture, leadership support, or perceived advantages, may be more influential. However, the competitive environment significantly influences e-commerce adoption ($\beta = 0.212$, $t = 2.808$, $p = 0.003$), as supported by Hamad et al. (2018). In a highly competitive market, the desire for a competitive edge can drive MSMEs to embrace e-commerce to enhance market share and profitability. Competitive pressure acts as an internal motivator for e-commerce adoption, making it a strategic imperative for remaining competitive.

Furthermore, this study found that e-commerce adoption significantly affects organizational performance ($\beta = 0.673$, $t = 13.485$, $p = 0.000$), consistent with Rahayu & Day (2017). According to the RBV, proper resource utilization improves organizational performance and competitive advantage. E-commerce adoption can provide MSMEs with competitive advantages such as cost reduction, increased market penetration, higher sales, improved processing speed, and increased productivity (Elbeltagi et al., 2016). The benefits of e-commerce may become more pronounced as adoption levels increase (Rahayu & Day, 2017). While specific indirect effects of technological context (RA, COP, COM) on organizational performance (OP) through perceived e-commerce adoption (PEA) were not statistically significant, specific indirect effects of organizational context (TM and OC) on OP through PEA were significant. This indicates that TM and OC positively influence OP through PEA, supporting hypotheses H9d and H9e. Top management's role in resource allocation for e-commerce adoption and the positive impact of organizational culture on employee attitudes after adoption contribute to long-term organizational performance (Albar & Hoque, 2019; Chege & Wang, 2020). The indirect effect of the regulatory environment (RE) on OP through PEA was not significant, while the indirect effect of the competitive environment (CE) on OP through PEA was significant. This suggests that while government support may not directly influence organizational performance through e-commerce adoption, competitive pressure does play a significant role. The lack of government support may hinder e-commerce adoption among Malaysian MSMEs, who often hesitate due to a lack of success stories, knowledge, and information about the potential impact of e-commerce on business performance (Rahayu & Day, 2017). However, competitive pressure can motivate businesses to adopt e-commerce to enhance their competitive advantages and improve organizational performance (Hamad et al., 2018).

6. CONCLUSIONS

The rapid global growth of information technology has enabled businesses to operate both domestically and internationally online at a reduced cost. E-commerce has facilitated closer connections between customers and organizations, allowing for the provision of personalized services. In this context, small organizations engaged in e-commerce are better equipped to compete with larger counterparts. The contribution of e-commerce is particularly significant for MSMEs when competing with large national or international firms. Despite the substantial benefits of integrating e-commerce into business operations for MSMEs, the adoption rate remains below expectations, especially in developing countries like Malaysia. Previous studies have scarcely investigated the reasons for this low adoption rate.

This study explores the factors that influence Malaysian MSMEs' adoption of e-commerce in today's technology-driven, globalized world. Additionally, it examines the impact of e-commerce adoption on their business performance. The findings indicate that top management support, organizational culture, and competitive environment significantly influence e-commerce adoption decisions by MSMEs, while relative advantage, compatibility, regulatory environment, and complexity do not. The study also reveals that e-commerce adoption mediates the relationship between top management support, organizational culture, competitive environment, and organizational performance. This suggests that these factors can enhance the organizational performance of MSMEs when effectively integrated with e-commerce technology in their daily operations. The findings underscore the significant influence of e-commerce adoption intention on business performance.

6.1 Theoretical Implication

This study makes several theoretical contributions. First, it addresses a gap in the literature concerning e-commerce adoption in MSMEs, particularly from the perspective of developing countries. By employing the TOE framework and extending it to include organizational performance, the study provides insights into the factors influencing e-commerce adoption and its impact on business performance, enriching the existing literature. Second, the integration of the RBV with the TOE framework offers a novel perspective on the effective utilization of organizational technology resources and its impact on overall organizational performance. This contributes a new dimension to the literature on e-commerce adoption by small and medium-sized organizations. Finally, the comprehensive proposed model, showcasing selected variables and causal relationships, including both direct and mediating effects, contributes to theory development. Methodologically, the study contributes to measuring predictive validity and utilizes second-generation analysis techniques (SEM-PLS) to offer a more thorough understanding in the field of organizational performance.

6.2 Managerial Implication

The widespread use of e-commerce globally enables organizations to connect with customers and thrive in a competitive business landscape. E-commerce is crucial for reaching customers and ensuring sustainable business operations. MSMEs, often operating with limited resources, face challenges competing with larger organizations. E-commerce can enhance their market position by providing a cost-effective way to reach and serve customers. While prevalent in developed countries, e-commerce adoption in developing countries like Malaysia remains limited. This study investigates the antecedents influencing e-commerce adoption intention and its impact on business operations, addressing the scarcity of research on the reasons for low e-commerce adoption among MSMEs in developing countries. The study's outcomes offer valuable insights for various stakeholders. MSMEs can understand the factors shaping e-commerce adoption and its potential impact on their performance, enabling informed decisions regarding e-commerce integration. Owners and managers gain crucial information for formulating effective strategies to improve competitiveness and overall performance. Policymakers and government agencies can leverage the results to design and implement policies supporting MSMEs in adopting e-commerce. Finally, the findings offer valuable insights for companies providing e-commerce solutions and technology services, enabling them to develop customized solutions that align with the identified driving forces.

6.3 Limitations of This Study

The present study acknowledges certain limitations that should be considered. The primary data collection involved an online questionnaire targeting owners and managers of MSMEs across Malaysia. Despite efforts to maximise participation through reminders, the response rate was relatively low (3.16%), which may limit the generalisability of the findings. Future research could explore alternative data collection methods, such as in-person interviews or focus groups, to potentially enhance response rates and data richness. The reliance on closed-ended questions in the questionnaire may have restricted respondents' ability to express nuanced perspectives, potentially introducing bias due to constrained choices. Future studies could employ a mixed-methods approach, incorporating open-ended questions alongside closed-ended ones, to capture a wider range of views and mitigate potential biases. Finally, while PLS-SEM is a robust statistical tool, its predominantly linear approach may have limitations in analysing the complex and potentially non-linear aspects of decision-making processes related to e-commerce adoption.

ACKNOWLEDGEMENT

Author would like to thank you to Graduate School of Business, Universiti Sains Malaysia, Penang, Malaysia for the support and encouragement.

AUTHORS CONTRIBUTION

Kuan-Zheng Chiew (Conceptualization; Data curation; Visualisation; Writing – original draft)

Razib Chandra (Writing – review & editing)

Jeffrey S. S. Cheah (Conceptualization; Writing – review & editing; Supervision)

CONFLICT OF INTEREST

The author(s), as noted, certify that they have NO affiliations with or involvement in any organisation or agency with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, jobs, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, expertise or beliefs) in the subject matter or materials addressed in this manuscript.

AVAILABILITY OF DATA AND MATERIALS

The data supporting this study's findings are available on request from the corresponding author.

ETHICAL STATEMENT

Not applicable.

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