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# E-commerce adoption by SMEs and its effect on marketing performance: An extended of TOE framework with ai integration, innovation culture, and customer tech-savviness

Omar Hasan Salah *, Mohannad Moufeed Ayyash

*The College of Business and Economics, Palestine Technical University, Kadoorie, Tulkarm, Palestine*

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ABSTRACT

Even though the benefits of e-commerce for Small and Medium-Sized (SMEs) are enormous, not many SMEs have adopted e-commerce, especially in Palestine. Therefore, knowing what factors encourage SMEs to adopt e-commerce is necessary. However, e-commerce research has only been carried out on large-scale businesses. In contrast, studies on SMEs companies, especially regarding adopting e-commerce, have not been widely conducted. So, this research is important to determine what factors drive the adoption of e-commerce and the effect on marketing performance in Palestinian SMEs. The study's theoretical foundation is based on the TOE framework with AI Integration, Innovation Culture, and Customer Tech-Savviness. Using a simple random sampling technique from an online questionnaire, 305 SMEs were chosen as the sample for the study. The data were evaluated using partial least squares structural equation modelling (PLS-SEM) to explore the relationships among exogenous, mediator, and endogenous variables. Based on the study's results, it can be concluded that AI Integration, Customer Savviness, innovative culture, competitive pressure and business partner pressure factors positively and significantly influence e-commerce adoption. In addition, adopting E-commerce positively and significantly affects SMEs' Marketing Performance. Based on the results of this study, theoretical implications for E-Commerce adoption in Palestinian SMEs and managerial implications are recommended accordingly.

## 1. Introduction

E-commerce is becoming more and more widespread, and many companies are prioritising it above everything else. By enabling improved access to information, skills, and knowledge, e-commerce also greatly contributes to bridging the digital gap between developed and underdeveloped nations. However, a number of obstacles, such as a poor infrastructure and limited access to technology, prevent poorer nations from progressing (Awiagah et al., 2016; Ocloo et al., 2020). E-commerce adoption is essential for the effective expansion of Small and Medium Sized Enterprises)SMEs( because it has been shown to boost their productivity (Alrousan and Jones, 2016; Hamad et al., 2018). SMEs are essential to socioeconomic growth in Palestine since they boost GDP, enhance production capacity, and reduce unemployment and poverty. Palestinian SMEs now make up 55% of the nation's GDP, up from 24% in 2004 (Ramadan and Ahmad, 2017). E-commerce gives SMEs in Palestine the chance to switch from conventional to electronic trade. Even though e-commerce has only recently begun to develop off, it is unknown how much of Palestine's commercial sector it will be able to penetrate.

Numerous studies have investigated current knowledge in both developed and developing countries. For example, Al-Alawi and Al-Ali (2015) recommended a model of organizational, technological and environmental factors to persuade SMEs to adopt e-commerce. Alrousan and Jones (2016) proposed a conceptual framework to comprehend the degree of e-commerce adoption by SMEs in Jordan. In addition, Hamad et al. (2018) examined the level of B2B e-commerce adoption among Egyptian manufacturing SMEs, while Abebe (2014) investigated the influence of entrepreneurial orientation on the correlation between e-commerce adoption and SMEs' performance. Awa et al. (2015) proposed a framework that considers geographic location as a context-dependent construct between e-commerce adoption and top management of enumerated SMEs located in five industries in three geopolitical regions of Nigeria.

Furthermore, Morteza et al. (2011) Examined the factors influencing e-commerce adoption decisions and the level of e-commerce adoption within the TOE framework. Additionally, Pearson and Grandon (2005)

* Corresponding author.
*E-mail address:* omar.h.m.salah@gmail.com (O.H. Salah).

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investigated SMEs managers/owners to determine factors that distinguish e-commerce adopters from non-adopters. Saffu et al. (2008) investigated the relationship between owner/managers' perceptions of the strategic value of e-commerce and e-commerce adoption among 107 SMEs in the transitional economy of Ghana. Sutanonpaiboon and Pearson (2006) investigated the factors that affect SMEs' adoption of e-commerce in Thailand. Wang and Lin (2009) created a hierarchical analysis framework to help SMEs predict implementation success and identify steps before B2B e-commerce implementation to improve the feasibility of e-commerce plans. Nasution et al. (2021) investigated how SMEs in north Sumatra differed in entrepreneurship, knowledge management, and ability to adopt e-commerce quickly. Fonseka et al. (2022) investigated senior managers' perceptions of how e-commerce adoption affected business performance in Sri Lankan SMEs.

These studies have looked at various issues, some of which are organizational, technological, and environmental. Several nations, including Jordan, Egypt, Nigeria, Ghana, Thailand, Indonesia, Sri Lanka, and China, have conducted these studies. These research findings have shown SMEs' possibilities and challenges in embracing e-commerce in various nations and the variables that influence this adoption. But a careful examination of the available research reveals that there aren't many studies on the adoption of e-commerce by SMEs in the Arabic region. Despite e-commerce's rising popularity and potential advantages, little research has been done on how SMEs in the Arabic region implement it. Additional empirical research is required to comprehend the particular opportunities and challenges that SMEs in this region face when adopting e-commerce and identify the most efficient methods.

Furthermore, while these studies provide a substantial understanding of e-commerce adoption, they have largely overlooked the role of AI integration, innovation culture, and customer technology savviness on SMEs' E-Commerce adoption among SMEs. Engineers, IT specialists, and analysts have been the main groups interested in AI, but it is gradually spreading outside of these professions and gaining ground in management and marketing. As the volume of consumer information accessible online, within large data platforms, and on mobile devices continues to grow, artificial intelligence (AI) has become a vital partner in the field of marketing. This is due to its reliance on data analysis across a wide range of application domains. (Parisini, 2022). However, there is still a little academic research regarding business-related AI in developing countries. In order to address the issues with AI in emerging countries, additional theoretical and empirical investigations are required (Zhou et al., 2022).

The TOE framework also frequently presents top management support and technological readiness as crucial organisational factors influencing SMEs to adopt e-commerce. These factors, however, have already been extensively studied as organizational factors (Abed, 2020; El-Gohary, 2012; Jeyaraj et al., 2006; Oliveira et al., 2019; Sabherwal et al., 2006; Wang and Lin, 2009). Thus, to contribute a new perspective, this study highlights innovation culture as a significant variable influencing e-commerce adoption among SMEs (Gu, 2023; Skare, Gavurova and Rigelsky, 2023; Wang and Esperança, 2023). Moreover, technology savviness, an often neglected but equally critical factor, can significantly effect e-commerce adoption among SMEs. In the contemporary digital age, the ability to adeptly navigate and utilize technology is not just an asset but a necessity. SMEs with high levels of technological proficiency can adapt more readily to e-commerce platforms, harnessing their full potential to improve business operations and customer interactions. Hence, understanding the role of Technology Savviness in e-commerce adoption is crucial in providing a more comprehensive analysis of the digital transformation in SMEs (Ifinedo, 2011; Nguyen and Waring, 2013; AlBar and Hoque, 2019).

According to the TOE framework, business partners and competitive pressure are significant environmental elements that impact SMEs' adoption of e-commerce (Amini and Jahanbakhsh Javid, 2023). The following criteria are given a lot of weight in this study: competitive pressure and its function in promoting an innovative culture. We contend that to enhance their performance in e-commerce marketing, SMEs are motivated by this culture to integrate AI and other developing technologies into their strategy. Business partners' influence may act as a catalyst for developing customer technological competence, inspiring SMEs to improve their e-commerce strategy. However, our research adopts a unique strategy by including these well-established criteria to investigate their relationship with emergent ones: innovation culture, AI integration, and consumer technological savvy.

As a result, factors like AI integration, innovation culture, competitive pressure, business partner pressure, and technology savviness are becoming increasingly important in the modern digital environment. They will likely impact SMEs' adoption, successful e-commerce implementation, and marketing efficiency. A deeper understanding of the dynamics of e-commerce adoption among SMEs and how this adoption impacts their marketing success calls for more investigation of these topics. This study aims to fill the vacuum in the empirical research by investigating the connection between AI integration, innovation culture, technical savvy, and SMEs' effectiveness in e-commerce marketing. This study provides a complete overview of the complicated factors that affect how SMEs embrace e-commerce and its effects on marketing performance. To address these complex dynamics, this study seeks to answer the following research questions:

- How does AI integration impact SMEs' adoption of e-commerce?
- What role does innovation culture play in influencing SMEs' e-commerce adoption?
- To what extent does customer technology savviness affect SMEs' e-commerce adoption?
- How does competitive pressure influence the adoption of e-commerce among SMEs?
- What is the impact of business partner pressure on SMEs' e-commerce adoption?

We will investigate these questions to provide a comprehensive overview of the various factors that shape SMEs' e-commerce adoption and its subsequent impact on marketing performance.

The rest of the research is organised as shown below. In Section 2, a review of the literature is provided. Section 3 presents the research model and the development of the hypothesis. Section 4 of the research technique is discussed. Section 5 presents the data analysis findings. Section 6 discusses the analysis and its implications for future study. Limitations and upcoming studies are presented in Section 8. In Section 9, findings are presented.

## 2. Literature review

Several studies have been conducted on the adoption of E-commerce by SMEs in different countries, as shown in Table 1. In the context of Malaysia, many studies have explored the factors influencing SMEs' adoption of e-commerce, specifically focusing on how SMEs embrace e-commerce. Shah Alam et al. (2011) conducted study using data from a sample of 200 SMEs in order to identify the factors impacting the adoption of e-commerce. The study finds that SMEs' adoption of e-commerce is highly influenced by relative advantage, compatibility, organisational readiness, managerial qualities, and security.

Additionally, Abebe (2014) examined the relationship between the performance of SMEs and the uptake of e-commerce in terms of the degree of owner-managers' entrepreneurial attitude. The results showed that SMEs' average sales growth rate was greatly boosted by adopting e-commerce, and that adopters of e-commerce technology had greater average sales growth than non-adopters. The research also discovered that the adoption of e-commerce had an even greater favourable effect on SMEs' yearly sales growth rate when compared to SMEs with lower entrepreneurial orientation.

In related study, the factors influencing SMEs' adoption of e-commerce in Semarang, Indonesia, were also studied by Tusyanah et al.

**Table 1**
Comparative Overview of Studies on SMEs' E-Commerce Adoption.

| Study | Context | Factors | Contribution |
|---|---|---|---|
| Shah Alam, Ali, and Mohd. Jani (2011) | Malaysia | Relative Advantage, Compatibility, Organizational Readiness, Managerial Qualities, Security | Identified key factors influencing e-commerce adoption in Malaysian SMEs |
| Abebe (2014) | USA | Entrepreneurial Attitude, Sales Growth | Demonstrated the positive impact of e-commerce adoption on SMEs' sales growth. |
| Tusyanah et al. (2021) | Semarang, Indonesia | Trade partner readiness, perceived service quality, consumer readiness, perceived trust, current circumstances, social influence, perceived ease of use, perceived usefulness, individual differences factors, and competitive pressure | Explored the complicated factors influencing e-commerce adoption by SMEs entrepreneurs |
| Alzahrani (2019) | Saudi Arabia | Technology, cultural, financial, and organizational factors | Found a positive relationship between e-commerce and business strategy in Saudi Arabian SMEs |
| Dahbi and Benmoussa (2019) | Developing Nations | Organizational, Cultural, Financial, Technological Factors | Emphasized the significance of multiple factors in SMEs' readiness for e-commerce implementation |
| Gu (2023) | China | CEO's Prenatal Testosterone Exposure, Absorption Ability | Highlighted the unique influence of CEO characteristics on e-commerce adoption in Chinese SMEs |
| Kartiwi et al. (2018) | Malaysia | Customer and Competitor Need | Investigated how external factors affect e-commerce benefits for Malaysian SMEs |
| Miao and Tran (2018) | Saudi Arabia | Institutional Factors | Explored the temporal effects of institutional factors on e-commerce adoption in Saudi Arabian SMEs |
| Adam et al. (2020) | 135 Countries | National-Level Factors | Examined the influence of national-level factors on B2C e-commerce adoption |
| Susanty et al. (2020) | Yogyakarta, Indonesia | Transition from Traditional to Online Sales | Investigated the push-pull factors affecting SMEs' shift to e-commerce |

(2021). The findings indicated that the decision to adopt e-commerce by SMEs entrepreneurs is influenced by a number of factors, including trade partner readiness, perceived service quality, consumer readiness, perceived trust, current circumstances, social influence, perceived ease of use, perceived usefulness, individual differences factors, and competitive pressure. Alzahrani (2019) also found that e-commerce positively affects business strategy in Saudi Arabian SMEs and that various factors, including technology, cultural, financial, and organizational factors, might impact this relationship. Insights into the variables affecting SMEs' adoption of e-commerce in developing nations are provided by Dahbi and Benmoussa (2019). The findings emphasize how important organizational, cultural, financial, and technological aspects are in deciding how ready SMEs are to implement e-commerce.

Significant variables impacting the adoption of e-commerce by SMEs in China include the CEO's prenatal testosterone exposure and absorption ability (Gu, 2023). E-commerce use and the second-to-fourth digit ratio, a gauge of foetal testosterone exposure, had a bad correlation. According to Gu (2023) study, the CEO's prenatal exposure to testosterone and their capacity for absorption have a substantial impact on the adoption of e-commerce by SMEs in China. The adoption of e-commerce was shown to be negatively correlated with the second-to-fourth digit ratio, which represents prenatal testosterone exposure.

The study also discovered a connection between SMEs' adoption of e-commerce and their potential for absorptive innovation, encompassing market, process, and marketing innovation. Kartiwi et al. (2018) investigated how external factors, such as consumer and competitor need, affected the advantages Malaysian SMEs derived from adopting e-commerce. The findings demonstrated those SMEs influenced by customer demand to adopt e-commerce were less likely to achieve a decrease in operational costs. Furthermore, Miao and Tran (2018) investigated the temporal effects of institutional factors on SMEs' adoption decisions of e-commerce in Saudi Arabia. The results showed that, in terms of institutional determinants, there is a clear distinction between the first adoption of e-commerce and institutionalization in SMEs. Adam et al. (2020) looked at factors influencing the adoption of B2C e-commerce. They employed PLS-SEM to evaluate data from 135 different nations. The findings demonstrated that at the national level, factors including access to information and communication technology, the political and regulatory environment, and human resource development favor B2C e-commerce adoption. Using a push-pull mooring system, Susanty et al. (2020) provided a methodology to analyze how 100 SME owners in the batik sector moved from traditional marketing to online sales. Additionally, it was investigated whether the push-pull mooring variable hinders or helps batik SMEs transition to online sales. The findings indicate that two factors have a major impact on the decision of batik SMEs to switch from traditional retail to e-commerce.

The extensive literature review above reveals that empirical investigations of e-commerce adoption by SMEs have been conducted in a variety of countries. These include the United States (Pearson and Grandon, 2005; Abebe, 2014), the United Kingdom (Al-Somali et al., 2015; Yang et al., 2022), Malaysia (Shah Alam et al., 2011; Kartiwi et al., 2018), Nigeria (Egbokhare et al., 2011; White et al., 2014; Awa et al., 2015), Denmark and Australia (Scupola, 2009), Indonesia (Nasution et al., 2021; Tusyanah et al., 2021), Saudi Arabia (Al-Somali et al., 2015; Alzahrani, 2019), the UAE (Momin, 2020; Yang et al., 2022), and India (Chhibber and Chadha, 2020; Dutta and Shivani, 2020). Yet, within Palestine, empirical studies exploring the relationship between AI integration, innovation culture, technology savviness, and SMEs' e-commerce marketing performance are remarkably scant. Only three empirical studies have been conducted in Palestine, specifically focused on e-commerce adoption (Abualrob and Kang, 2016; Herzallah AT and Mukhtar, 2016; Al-Sharafi et al., 2020). These studies, however, did not thoroughly examine the impact of AI integration, innovation culture, and technology savviness on the e-commerce marketing performance of SMEs.

Given the unique socioeconomic context of Palestine, there is a critical need for a nuanced understanding of these factors within the local landscape. This research gap highlights the current study's importance and timeliness, which aims to investigate the relationship between AI integration, innovation culture, technology savviness, and SMEs' e-commerce marketing performance in Palestine. By bridging this gap, the study aims to contribute to understanding e-commerce adoption in Palestine and potentially guide future policy decisions and strategies for SMEs operating in similar environments.

## 3. Theoretical background and hypotheses development

The Technology-Organization-Environment (TOE) framework, originally proposed by Tornatzky and Fleischer (1990), stands as a valuable theoretical model for understanding the adoption of information

technology. This framework explains how organizational characteristics, technology factors, and environmental factors are mutually reinforcing and how this influences how IT solutions are adopted (Bose and Luo, 2011; Baker, 2012; Venkatesh and Bala, 2012). Importantly, the TOE framework has drawn significant scholarly interest for its comprehensive ability to address the diverse factors that contribute to IT adoption, with a focus on the contexts of developing countries (Ghobakhloo et al., 2011; Lip-Sam and Hock-Eam, 2011; Rowe et al., 2012; Dwivedi et al., 2017; Oliveira et al., 2019). For the objectives of this research, our main emphasis is on using the TOE framework to clarify the complexities associated SMEs adoption of e-commerce. The proposed research model is depicted in Figure 1.

### 3.1. (AI) Integration

Artificial Intelligence," as defined by Shankar (2018)., pertains to software, algorithms, machinery, and systems that showcase intelligent capabilities. Instances of artificial intelligence encompass machines that emulate certain aspects of human intelligence and replicate behaviors characterized as "intelligent human behavior," as noted by (Davenport et al., 2020). Only a few of the essential technologies that AI depends on are deep learning, natural language processing, machine learning, neural networks, and decision process automation (Huang and Rust, 2018). AI can properly understand externally created data, get insight from that data, and present pliable alteration because to the deployment of these crucial technical instruments (Kaplan and Haenlein, 2019). According to Eriksson et al. (2020), AI in marketing has recently been gradually included in essential organisational functions, resulting in business development and success across many industries. By automating data-driven tasks that enhance customer experience and boost revenue, AI. in marketing reduces costs and increases marketing team production (Mishra and Pani, 2021). According to earlier research, AI improves financial performance, customer satisfaction, internal business process efficiency, and learning and growth efficiency for SMEs (Basri, 2020; Abrokwah-Larbi and Awuku-Larbi, 2023). In addition, previous studies found that AI Integration positively effects e-commerce adoption (Areiqat et al., 2021; Fonseka et al., 2022; Wei and Pardo, 2022). Thus, AI integration is significant in influencing SMEs' E-Commerce adoption. The following hypothesis was therefore proposed:

**H1**. There is a significant positive relationship between AI Integration and SMEs' E-Commerce Adoption.

### 3.2. Customer tech-savviness

Technological advancements have permeated nearly every facet of life, necessitating a certain level of technical proficiency from general consumers, ranging from basic to advanced (Zaman et al., 2022). Tech savviness represents an individual's ability to interact effectively with contemporary technology, exhibiting an intuitive understanding of technical operations and an aptitude for handling technical devices, particularly computers (Apergis, 2019). It is posited that such user competence and expertise play a significant role in fostering the adoption of technology (Ghobakhloo et al., 2011; Satar and Alarifi, 2022). Yet, in the realm of e-business, prior research on e-business has predominantly focused on assessing the tech savviness of owners within the SMEs environment (Boone et al., 1996; Fillis et al., 2004; Johnson, 2010; Ifinedo, 2011; H. Nguyen and S. Waring, 2013; AlBar and Hoque, 2019). In this study, we propose a shift in this perspective. We aim to delve into the influence exerted by the tech savviness of customers on the e-commerce adoption process within SMEs. This approach provides a new lens through which to examine the dynamics of e-commerce integration, foregrounding the effect of tech-savviness on the success of such endeavours. Therefore, the following hypothesis can be suggested:

**H2**. There is a significant positive relationship between customer tech-savviness and SMEs' E-Commerce Adoption.

### 3.3. Innovation culture

According to Halim et al. (2015); Wiesböck and Hess (2020), innovation is a new paradigm that challenges conventional management practices and strategies. This is so because innovation encourages organisations to embrace novel ideas or behaviours (Ghasemzadeh et al., 2019). It might be a new service, product, or technology the company has created. According to Kneipp et al. (2019), businesses may successfully reduce possible negative consequences by applying innovative sustainable practices. As such, firms with a robust innovation culture exhibit greater flexibility, demonstrating an enhanced capacity to adapt swiftly to changes during unstable periods and seize new opportunities. Recognizing this, the integration of innovation and e-commerce models becomes crucial to advancing sustainable development on a global scale (Faccia et al., 2023). Adopting such practices, however, may present major difficulties for organizations without a well-established innovation culture. As a result, it becomes crucial for businesses to promote innovation throughout all aspects of daily operations. Recent studies have found that the adoption of E-Commerce by SMEs is positively effected by such an innovation culture (Gu, 2023; Skare, Gavurova and Rigelsky, 2023; Wang and Esperança, 2023). This insight highlights the criticality of cultivating an innovation-centric organizational culture within SMEs. This environment appears helpful in promoting adaptability, encouraging novel approaches, and facilitating a successful e-commerce adoption process. As a result, innovation culture greatly effects how SMEs adopt e-commerce. So, it is hypothesized that:

**H3**. There is a significant positive relationship between innovation culture and SMEs' E-Commerce Adoption.

### 3.4. Competitive pressure

According to Al-Jabri and Alabdulhadi (2016), competitive pressure describes how much an organization responds to pressure from rivals and prompts it to adopt new technologies. According to some research (Addy et al., 2023; Amini and Jahanbakhsh Javid, 2023; Zhong and

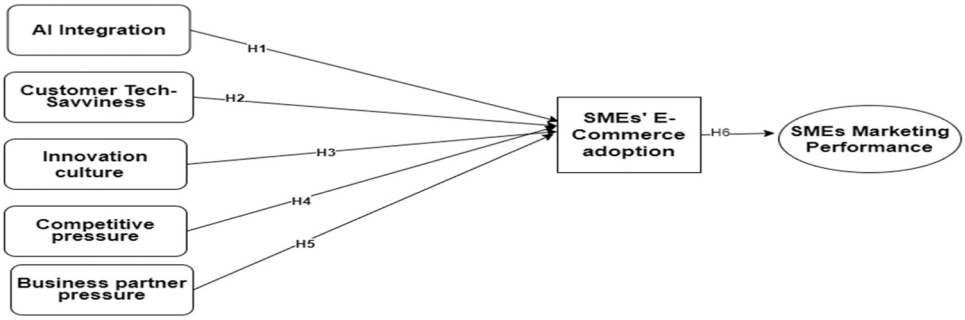


**Fig. 1.** Research Model.

Moon, 2023), businesses with competitive pressure will embrace new technologies more quickly. Companies are more likely to react quickly and be watchful of competitor behaviour when they are under pressure from their rivals (Hasani et al., 2023). As a result, they will be more ready to embrace new technology at the same pace as their rivals. Competition pressure has a considerable beneficial effect on the adoption of e-commerce in Egyptian SMEs, according to research by Abou-Shouk and Lim (2012) and Hamad, Elbeltagi, and El-Gohary (2018). As a result, this study proposes the following:

**H4**. There is a significant positive relationship between competitive pressure and SMEs' E-Commerce adoption.

### 3.5. Business partner pressure

Another key environmental element for SMEs' adoption of e-commerce is pressure from business partners. Since they probably rely on their trade partners for existence, small enterprises are susceptible to pressure from them (Hamad, Elbeltagi and El-Gohary, 2018). Simatupang and Sridharan (2005) also claim that organisations are more likely to adopt new technologies if their suppliers and partners are more competent. According to research by Gutierrez et al. (2015) and Sila (2013), the adoption of new innovative technology is significantly influenced by pressure from business partners. Ching and Ellis (2004) discovered that business partner pressure substantially affected SMEs adoption of e-commerce in the context of their industry. The following theory is formed in light of the aforementioned study results:

**H5**. There is a significant positive relationship between business partner pressure and SMEs' E-Commerce adoption.

### 3.6. SMEs' E-Commerce Adoption and Their Marketing Performance

Previous studies found that e-commerce adoption has a positive and significant effect on the performance of SMEs (Ramanathan et al., 2012; Wirdiyanti et al., 2022; Gao et al., 2023). However, the type of goods provided by the SMEs effects the adoption of e-commerce. Certain goods, notably those that are vulnerable, quickly spoilable, or of poor strength, might not be appropriate for online sales, especially if they need to be sent to far-off places (Octavia et al., 2020). The need for additional specific packaging, the possibility of damage during shipment, and other logistical difficulties may raise costs and operational complexity, which can balance any possible benefits of using e-commerce. In this context, the effectiveness of SMEs e-Commerce Adoption in enhancing marketing performance depends on product suitability for online sales and the organization's ability to manage logistical challenges. Therefore, while E-Commerce presents many opportunities for improving marketing performance, SMEs must carefully consider these factors when adopting it as a marketing strategy. However, e-commerce adoption has the potential to boost an organization's marketing performance by amplifying its uniqueness in terms of cost-efficiency, speed, ease of use, and provision of real-time experiences (Cao et al., 2021; Davis and DeWitt, 2021; Wang et al., 2021; Fonseka et al., 2022; Terho et al., 2022; Bao and Zhu, 2023; Khan, 2023). Based on the above arguments, it is proposed that:

**H6**. There is a significant positive relationship between SMEs' E-Commerce Adoption and marketing performance.

## 4. Method

### 4.1. Data collection and participants

To test the study's hypotheses, a cross-sectional design was employed. A sample was drawn from SMEs affiliated with the Palestinian Information Technology Association of Companies (PITA).

Palestine has a total of 14,359 enterprises where 99% of which belongs to the Palestinian SMEs. These SMEs employ 82% of the total workforce in the territory (Ismail Mohammad Ramadan and Bin Ahmad, 2018).Through random sampling, 450 SMEs were selected as participants for the study. Before distributing the survey to these businesses, its contents underwent verification and validation. Over the course of a three-month data collection period, a total of 390 responses were received from the selected SMEs. Out of these, 305 (0.78) complete and usable responses were ultimately included in the subsequent comprehensive analysis. This response rate was achieved after countless efforts to encourage the participation respondents in the study. According to (Salah et al., 2021), a response rate of 50% or more is sufficient and acceptable for analysis, 60% and over is good, and over 70% is excellent. Thus, the rate of response to this internet survey is acceptable in this study.

### 4.2. Measurement and survey instrument

From the literature review and email interviews, an instrument was developed to examine the factors that effect E-Commerce adoption among Palestinian SMEs. Data was collected using a structured questionnaire. The questionnaire was divided into two parts. The first part enquired about the demographics of the respondents (i.e., gender, year of Experience, you Position in organization, and age), and the second part examined the selected variables, in which the items were measured by a five-point Likert scale with the following ratings: 1: strongly disagree, 2: disagree, 3: slightly agree, 4: agree, and 5: strongly agree. The measurement questions were developed through an extensive literature review. Minor modifications were made on these items to fit. .

## 5. Data analysis

### 5.1. Measurement model

The first piece of research employs the well-established approach given by renowned academics (Fornell and Larcker, 1981; Hair et al., 2014a, 2014b) to assess the constructs' reliability, convergent validity, and discriminant validity. According to a study by Hair et al. (2013), the discriminant validity—the ability to distinguish between different variables—and the convergent validity the capacity to accurately measure the intended variables—are both necessary for a measurement model to be reliable. Using indicator loadings and Cronbach's Alpha (), the researchers assessed the instrument's dependability. To discover if the construct indicators were accurate in measuring the study's variables, they evaluated them. Average Variance Extracted (AVE) and Composite Reliability (CR), two measures that the researchers utilised to represent the performance of the indicators. As indicated in Table 3, they discovered that the factor loadings of the model's constituent parts were at least 0.6.

When compared to the stated threshold value of 0.7, the observed values of displayed a statistically significant increase, indicating a good degree of dependability for all variables. It is also important to note that all of the study's variables' composite reliability (CR) ratings were higher than the required level of 0.7, which indicates a high degree of internal consistency. Additionally, as shown in Table 1, the average variance extracted (AVE) values were found to be substantially more significant than the standard of 0.50 recommended by industry experts. The findings of the current study provide further evidence for the validity and consistency of the research's concept.

The researchers used correlation analysis to determine the relationship between the variables under examination. By examining the average variance extracted (AVE) and factor loading values, the convergence validity was evaluated. All of the constructs' average variance extracted (AVE) values were determined to be higher than the cutoff point of 0.50. This suggests that at least 50% of the observed variance was explained by the latent variables underlying these components. The square root of the average variance extracted (AVE) was

**Table 2**
Scale items of the selected constructs.

| Constructs | References | Items |
|---|---|---|
| AI Integration (AII) | (Fonseka, Jaharadak and Raman, 2022) | We believe that AI Integration will Monitor consumer behaviour<br>AI Integration Provide product information faster<br>We believe using AI integration can Capture consumer imagination<br>AI integration may be used to track and manage an online retailer's inventory.<br>AI Integration can be used to Identify fake customers and their patterns. |
| Customer Savviness (CUS) | (Kumar et al., 2016; Titiloye et al., 2022) | Instead than reading a printed material, I rather prefer to read information online.<br>I'm fascinated by modern technologies.<br>Finding the information I need on the internet is simple.<br>My internet activity is really active.<br>If it weren't for technology, my existence would be dull. |
| Innovative Culture (INC) | (Škerlavaj, Song and Lee, 2010) | The management actively looks for fresh ideas and welcomes innovation recommendations.<br>Innovation is rejected because it is seen as being too risky.<br>People are not punished for novel ideas that fail.<br>Program/project managers encourage and support novel approaches, attempts, and creative methods.<br>The management actively looks for fresh ideas and welcomes innovation recommendations. |
| Competitive Pressure (COP) | (Salah et al., 2021) | If we don't implement e-commerce, we fear that our consumers will go to our rivals.<br>To compete in the market, we believe that e-commerce is strategically essential.<br>Adopting e-commerce is a strategic need to compete in the market.<br>If E-commerce hadn't been introduced, our company would have faced competitive disadvantages.<br>If we don't embrace E-commerce in the digital transition, we fear we'll lose market share.<br>Competition pressure has forced our company to pursue e-commerce. |
| Business Partner Pressure (BPP) | (Sharma et al., 2023) | Our company associates advise implementing e-commerce.<br>The adoption of E-Commerce has been demanded by our business partners.<br>If E-Commerce hadn't been used, my company would have been at a competitive disadvantage.<br>The opportunity to exceed the competition would rise with the introduction of E-Commerce. |
| E-commerce Adoption (ECA) | Venkatesh and Bala (2008);Chen (2012) | In the near future, my company plans to integrate E-Commerce into its operations.<br>We must implement e-commerce technologies since it is crucial to my job.<br>The use of E-Commerce technologies has been a goal for my company.<br>We want to use e-commerce in our daily operations. |
| SMEs Marketing Performance (SMEMP) | Drew (1997); Mohamad ( et al. (2014) | E-commerce was taken into consideration by my company for use in its operations.<br>The use of E-Commerce technology by my company will accelerate the rate of revenue growth.<br>Since using E-Commerce technology, my firm has increased its market share.<br>We are more profitable now than we were before e-commerce technologies was used.<br>E-Commerce technology adoption will improve the interaction between my business and its clients.<br>Following the introduction of E-Commerce technologies, the interaction between my firm and its clients shows a good situation. |

**Table 3**
Factor loading and discriminant validity.

| Variables | Item | Standard Loadings | Cronbach-α | CR | AVE |
|---|---|---|---|---|---|
| AI Integration | AII1 | 0.844 | 0.763 | 0.840 | 0.526 |
| | AII2 | 0.840 | | | |
| | AII3 | 0.735 | | | |
| | AII4 | 0.749 | | | |
| Customer Savviness | CUS1 | 0.805 | 0.762 | 0.799 | 0.555 |
| | CUS3 | 0.652 | | | |
| | CUS4 | 0.640 | | | |
| | CUS5 | 0.880 | | | |
| Innovative Culture | INC1 | 0.847 | 0.888 | 0.917 | 0.689 |
| | INC2 | 0.850 | | | |
| | INC3 | 0.867 | | | |
| | INC4 | 0.830 | | | |
| | INC5 | 0.751 | | | |
| Competitive Pressure | COP1 | 0.766 | 0.839 | 0.881 | 0.554 |
| | COP2 | 0.778 | | | |
| | COP3 | 0.630 | | | |
| | COP4 | 0.770 | | | |
| | COP5 | 0.744 | | | |
| | COP6 | 0.767 | | | |
| Business Partner Pressure | BPP1 | 0.877 | 0.753 | 0.848 | 0.594 |
| | BPP2 | 0.460 | | | |
| | BPP3 | 0.810 | | | |
| | BPP4 | 0.860 | | | |
| E-commerce Adoption | ECA1 | 0.759 | 0.787 | 0.855 | 0.544 |
| | ECA2 | 0.738 | | | |
| | ECA3 | 0.673 | | | |
| | ECA4 | 0.644 | | | |
| | ECA5 | 0.856 | | | |
| SMEs Marketing Performance | SMP1 | 0.688 | 0.796 | 0.860 | 0.553 |
| | SMP2 | 0.736 | | | |
| | SMP3 | 0.855 | | | |
| | SMP4 | 0.738 | | | |
| | SMP5 | 0.692 | | | |

used as a metric to evaluate the discriminant validity of the investigated constructs. As shown by the square root of the average variance extracted (AVE) being more significant than the correlations shown with other variables, the study's results demonstrated discriminant validity (Henseler, Ringle and Sarstedt, 2015). Table 4 provides a summary of these findings.

The Fornell-Larcker criteria was used by the researchers to assess the discriminant validity of the instrument before moving on to the next stage. Strong discriminant validity was shown by the criteria, proving that the instrument is capable of accurately differentiating between several variables. Table 2 displays the outcomes of the Fornell-Larcker criteria.

**Table 4**
Discriminant validity (Fornell-Larcker Criterion).

| | AII | BPP | COP | CUS | ECA-Adoption | INC | SMEMP |
|---|---|---|---|---|---|---|---|
| AII | 0.794 | | | | | | |
| BPP | 0.585 | 0.771 | | | | | |
| COP | 0.467 | 0.591 | 0.744 | | | | |
| CUS | 0.422 | 0.694 | 0.544 | 0.710 | | | |
| ECA-Adoption | 0.823 | 0.745 | 0.651 | 0.645 | 0.738 | | |
| INC | 0.080 | 0.137 | -0.024 | 0.433 | 0.100 | 0.830 | |
| SMEMP | 0.513 | 0.878 | 0.743 | 0.725 | 0.708 | 0.120 | 0.744 |

Moreover, Kock (2015) proposed the full collinearity test as a comprehensive procedure for simultaneously assessing vertical and lateral collinearity. Through this procedure, which is fully automated by Smart PLS software, variance inflation factors (VIFs) are generated for all latent variables in a model. The occurrence of a VIF more significant than 3.3 is proposed as an indication of pathological collinearity and a sign that a model may be contaminated by common method bias. Therefore, based on the threshold value mentioned earlier, the model can be considered free of common bias if all VIFs resulting from a full collinearity test are equal to or lower than 3.3 as shown in Table 5.

### 5.2. Assessment of structure model

A total of 5000 resamples were used in the current investigation to perform the bootstrapping approach. This method was used to evaluate the model's statistical significance. The suggested model tries to build linkages between the different structural model elements via one or more dependency relationships. The authors of the research done by Hair et al. (2017) focused on a certain phenomena or subject. Their investigation intended to look into and evaluate numerous issues surrounding this topic. The results of their research offered insightful conclusions. Hair et al. (2014a), (2014b) suggested including several statistical metrics together with path significance. These metrics include effect magnitude (F2), predictive relevance (Q2), and coefficient of determination (R2). The aforementioned indicators provide insightful information about the endogenous variable's variability. The significance of correlation was underlined much further. The results of the structural model analysis are shown in Table 3, along with the associated threshold limit used for these assessments in the current research.

A measurement of the percentage of variation in the endogenous latent components of ECA-Adoption and SMEMP that can be explained by the exogenous variables in the model is the R2 value, also known as the coefficient of determination. The R2 value for ECA-Adoption in this research was found to be 0.849, suggesting that exogenous factors may account for around 84.9% of the variation in ECA-Adoption. Similarly, the R2 value for SMEMP was found to be 0.501, indicating that external factors may account for around 50.1% of the variation in SMEMP. The Q2 values, which are 0.446 and 0.269, show an impressive degree of predictive power and a significant amount of relevance in the independent constructs. The statistical metric known as the effect size, abbreviated as F2, estimates the relative influence of a certain external latent variable on the endogenous latent variable. By altering the R2 coefficient of determination, this measurement is created. The percentage of unanticipated variability associated with the latent variable is compared to the enhanced R2, which is derived by include the linked route, in order to calculate the F2 value (Hair et al., 2016). The effect sizes obtained in the research were all determined to be within the suggested range, as shown in Table 6.

The significance of the direct relationships was evaluated through 5000 bootstrap subsamples and one-tailed critical t-values exceeding $\pm$ 1.65. The results revealed that all hypotheses were affirmed and held statistical significance at $p < 0.01$, as illustrated in Table 7 and Figure 2.

**Table 5**
Collinearity Statistics (VIF).

| | VIF |
|---|---|
| **AII1** | 1.911 |
| **AII2** | 1.902 |
| **AII3** | 1.618 |
| **AII4** | 1.630 |
| **COP1** | 2.853 |
| **COP2** | 2.925 |
| **COP3** | 1.419 |
| **COP4** | 1.934 |
| **COP5** | 2.070 |
| **COP6** | 1.733 |
| **CUS1** | 1.595 |
| **CUS3** | 1.915 |
| **CUS4** | 1.917 |
| **CUS5** | 1.656 |
| **INC1** | 3.117 |
| **INC2** | 2.231 |
| **INC3** | 3.252 |
| **INC4** | 2.775 |
| **INC5** | 2.343 |
| **ECAdoption 1** | 2.410 |
| **ECAdoption 2** | 1.807 |
| **ECAdoption 3** | 1.832 |
| **ECAdoption 4** | 1.307 |
| **ECAdoption 5** | 2.682 |
| **BPP1** | 2.361 |
| **BPP2** | 1.100 |
| **BPP3** | 1.752 |
| **BPP4** | 2.110 |

## 6. Discussion

The study objectives were achieved by employing a systematic approach and developing a research framework through a literature review and technological, organizational, and environmental framework. The main aim of this study is to assess how the integration of AI, customer savviness, innovative culture, competitive pressure, and business partner pressure influence the adoption of e-commerce and, subsequently, how e-commerce adoption effects the marketing performance of Palestinian SMEs. The study's results offer insights into the connections between exogenous and endogenous variables outlined in Table 8.

Our study supported H1, as the results showed that Artificial Intelligence in the technological context positively influences employees' intention to adopt E-commerce. This finding is consistent with prior literature, which has shown that the use of AI in small and medium-sized businesses (SMEs) has the potential to enhance productivity and reduce the SMEs' Risk (Drydakis, 2022; Uwagaba and Ekonomiczno-humanistyczna, 2023). The significance of artificial intelligence is unquestionable, particularly within the e-commerce sector, where it has transformed traditional trade and commerce into a

**Table 6**
Effect Size.

| AII | BPP | COP | CUS | RLA |
|---|---|---|---|---|
| 1.155 | 0.070 | 0.089 | 0.109 | 0.116 |

**Table 7**
Hypothesized Direct Effects of the Variables.

| Hypotheses | | Path Coefficient | t Statistics | p-Value | |
|---|---|---|---|---|---|
| H1 | AII -> ECA-Adoption | 0.547 | 15.461 | 0.000 | Supported |
| H2 | CUS -> ECA-Adoption | 0.208 | 5.171 | 0.000 | Supported |
| H3 | INC -> ECA-Adoption | -0.091 | 2.764 | 0.006 | Supported |
| H4 | COP -> ECA-Adoption | 0.177 | 4.737 | 0.000 | Supported |
| H5 | BPP -> ECA-Adoption | 0.193 | 4.918 | 0.000 | Supported |
| H6 | ECA-Adoption -> SMEMP | 0.708 | 22.733 | 0.000 | Supported |

modernized form.(Sazibur Rahman et al., 2022). Artificial Intelligence contributes to establishing a harmonious setting in which humans and machines collaborate to achieve profitability and sales. (Hennessey et al., 2022). Moreover, the utilization of AI in e-commerce enhances processes that positively influence the performance of businesses.(Fonseka, Jaharadak and Raman, 2022).

Furthermore, it has been found that customers' technological savviness significantly and directly effects E-commerce adoption in Palestinian SMEs (H2). Individuals who possess a strong interest in technology are less likely to be deterred by ease of use concerns. Similarly, individuals with a greater affinity for technology might view obstacles as enjoyable challenges(Wang et al., 2022) (Leung, Paolacci and Puntoni, 2018). Apergis has already defined tech savviness (Apergis, 2019), and Guan et al. discovered that having adequate knowledge of self-service technology stimulates consumers' intentions to adopt and utilize it (Guan et al., 2021). This finding underscores the importance of tech-savviness, which effects the adoption of E-commerce by Palestinian SMEs.

In addition, the study's findings revealed that innovative culture plays a significant role in E-Commerce adoption in Palestinian SMEs (H3), prompting employees to develop favourable value perceptions and adoption intentions. This result aligns with the majority of previous studies (Asrar-ul-Haq and Anwar, 2016) (Rahimi, 2017) (Zheng et al., 2022) (Alshehhi, Abuelhassan and Bhaumik, 2019). With their way of doing things and actions, top executives confirm that innovation culture is significant (Grošelj et al., 2020). Indeed, innovative culture fosters a favourable climate for employees to accept and adapt to changes. According to this study, companies with a creative culture are ahead of their competitors. This is because the innovations ultimately affect variables such as adopting E-commerce in Palestinian SMEs and financial performance. That helps businesses to grow on a larger scale. Our results indicate that within SMEs characterized by innovative cultures, employees are more willing to embrace digital technologies, as they hold a positive perception of the utility of incorporating digitalization into the workplace. This perception is linked to enhancing the work performance of SMEs (Venkatesh et al., 2003).

Furthermore, the results indicated that competitive environmental pressures significantly effect the adoption of e-commerce among Palestinian SMEs (H4), aligning with findings from other studies (Cruz-Jesus, Pinheiro and Oliveira, 2019; Abdulkarem and Hou, 2022; Shahadat et al., 2023), They highlight the correlation between increased competition among SMEs and higher rates of technology adoption

**Table 8**
Summary of the Tested Hypotheses.

| Hypothesis | | Results and is consistent with previous research findings |
|---|---|---|
| H1 | AII -> ECA-Adoption | The hypothesis is supported (β = 0547, t = 15.461, p = 0.000). These results are in line (Areiqat et al., 2021; Fonseka, Jaharadak and Raman, 2022; Wei and Pardo, 2022) |
| H2 | CUS -> ECA-Adoption | The hypothesis is supported (β = 0.208, t = 5.171, p = 0.000). These results are in line (Kumar et al., 2016; Satar and Alarifi, 2022; Zaman et al., 2022) |
| H3 | INC -> ECA-Adoption | The hypothesis is supported (β = −0.091, t = 2.764, p = 0.006). These results are in line (Zheng et al., 2022; Shahadat et al., 2023) |
| H4 | COP -> ECA-Adoption | The hypothesis is supported (β = 0.177, t = 4.737, p = 0.000). These results are in line (Fook Ming et al., 2018; Shahadat et al., 2023) |
| H5 | BPP -> ECA-Adoption | The hypothesis is supported (β = 0.193, t = 4.918, p = 0.000). These results are in line (Duan and Corbitt, 2010; Gui et al., 2015; Chittipaka, Kumar and Sivarajah, 2022) |
| H6 | ECA-Adoption -> SMEMP | The hypothesis is supported (β = 0.708, t = 22.733, p = 0.000). These results are in line (Ballerini, Herhausen and Ferraris, 2023) |

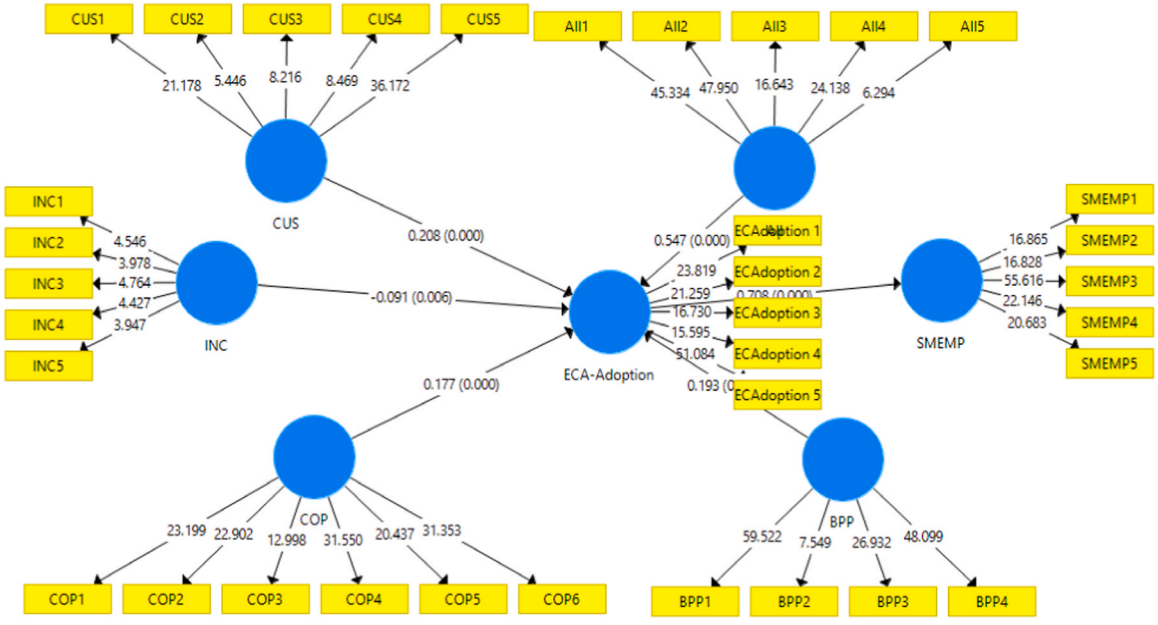


**Fig. 2.** Structurer Measurement.

within businesses, aimed at enhancing performance and achieving a competitive advantage. As competitors increasingly commit to utilizing the same platform for business operations, the pressure to stay competitive compels respondents to continue their adoption of e-commerce in later stages (Amunga, 2021). A study carried out by (Hossain et al., 2022) discovered that competitive pressure plays a significant role in facilitating the adoption of e-commerce by SMEs. This underscores the importance of competitive pressure in the context of e-commerce adoption. Furthermore, successful open innovation necessitates collaboration both within and between firms. Consequently, SMEs require consistent leadership skills and dedicated efforts to foster open innovation and promote firm growth. (Chang. SL, 2006; Sin et al., 2016) Thus, the present study considers the effect of competitive pressure on e-commerce as a strategic decision to improve Palestinian SMEs' overall performance. However, the utility of competitive pressure as a reliable predictor of the dependent variable is not universally supported. This observation contrasts with research conducted by Chang (2006) in Taiwan, which indicated that competitive pressure did not significantly contribute to the predictive model for the extent of e-commerce adoption based on the full range of predictors. This divergence in findings could potentially be attributed to cultural and societal differences.

Moreover, the findings of this study indicate that the business partner pressure (H5) in the environmental context substantially affects the usage of E-Commerce adoption in Palestinian SMEs. Our results align with prior qualitative studies (White and Grueger, 2017; Vanda, Firsty and Dachyar, 2022; Sharma et al., 2023), They revealed that the influence of business partners' pressure on adoption is substantial. Another pivotal factor affecting SMEs' engagement with the e-market is the influence exerted by business partners. Given that SMEs often depend on their trading partners for their economic sustenance, they are particularly responsive to pressure from these partners. (Duan and Corbitt, 2010; Elbeltagi and Jones, 2019). Hamad, Elbeltagi and El (2018) discovered that the pressure exerted by business partners had a notable influence on the adoption of e-commerce among SMEs. Consequently, this study aligns with previous research conclusions, substantiating that pressure from business partners distinctly affects the adoption of e-commerce in Palestinian SMEs.

Lastly, the present study analysis and findings showed a significant relationship between adopting E-Commerce and SMEs' marketing performance (H6). These results highlight the need to measure the performance of the SME sector better to increase their success in the market, as contended and supported by previous studies (Michael Nyoro1 et al., 2015; Gunawardana, 2017; Hamad, Elbeltagi and El, 2018; Fonseka, Jaharadak and Raman, 2022; Emon and Nahid, 2023); Nevertheless, our investigation has introduced a novel perspective for comprehending the interconnectedness of these two variables. The primary outcome of this study reveals that adopting e-commerce has a favorable effect on the performance of SMEs. This effect is even more pronounced when SME employees exhibit a higher entrepreneurial orientation. In such cases, SMEs managers display greater proactivity, a willingness to take risks, and an inclination towards innovation. When these managers embrace e-commerce technology, their entrepreneurial orientation is further amplified, substantially influencing the firm's annual sales growth rate. By utilizing various e-commerce tools, these proactive and risk-taking managers can seize more opportunities, explore new business avenues, develop fresh products or services, and promptly adapt to the ever-changing business landscape.

Finally, Adopting e-commerce could bring positive implications to the performance of SMEs (Koe and Wulandari, 2023), and (Odoom, Anning-Dorson and Acheampong, 2017) hey suggested that assessing both financial and non-financial performance could serve as a measure of SMEs' performance. Additionally, they noted that the adoption of e-commerce had an influence on the performance of SMEs.

## 7. Implications of the study

This research offers value to academic circles and business professionals, presenting novel insights into the determinants influencing the adoption of E-commerce among Palestinian SMEs—an unexplored area. Notably, it marks the inaugural exploration of this topic in Palestine, providing policymakers and senior SME managers with a framework to align their strategies for E-commerce adoption according to the identified factors' significance levels.

### 7.1. Theoretical implications

This research emphasises and strengthens the relationship between AI and e-commerce adoption in the SMEs sector, providing the academic community with useful insights. Our recognition of the user-centric factors driving digital transformations is further deepened by emphasising the effect of consumer tech-savvyness on e-commerce adoption. Our research highlights the crucial role that an innovative culture plays in influencing attitudes toward digital adoption in the context of organizational dynamics and sheds light on the underlying organizational factors that may facilitate or impede the integration of AI. Furthermore, we emphasize the tremendous influence of competitive pressure on e-commerce tactics by extending the conventional understanding of this concept, making it a crucial field of investigation for future scholars. The research also broadens the discussion of technology adoption to include relational influences from outside sources, particularly from business partners, hinting at the complex network of interdependencies that SMEs must manage. Finally, by demonstrating the relationship between e-commerce adoption and improved marketing performance in SMEs, we are filling in important gaps in the literature and providing a comprehensive picture of the development paths for SMEs in the digital age.

Finally, the TOE framework has been significantly broadened as a result of this research. The study has improved our knowledge of these fields by examining particular components like AI integration, consumer savvy, and innovation culture within technological and organizational dimensions. Using a narrower emphasis allows researchers to better understand the subtleties of each aspect, as opposed to just putting them all together under general organizational or technical titles.

### 7.2. Managerial implications

Decision-makers in SMEs must recognize the transformative potential of AI in e-commerce. AI significantly contributes to growth and risk reduction, making it indispensable. SME managers should invest in AI-driven tools like personalized product recommendations, customer service chatbots, and AI-powered data analytics to understand consumer behavior. Understanding that AI is not a passing trend but a competitive necessity is crucial for SMEs seeking to excel in the digital marketplace.

SME managers should thus be aware of their clients' degree of technical comfort and adapt their e-commerce tactics correctly. Numerous chances for development may be unlocked by identifying and serving a tech-savvy consumers. Offerings may include cutting-edge platforms or features for individuals who are tech aware while also assuring easier-to-use interfaces for non-techies. The development of frequent feedback channels and adaptation are key components of this strategy: SMEs that continuously update their online services based on consumer tech-savvy are likely to witness increased user engagement and loyalty. When an organization's internal culture is innovation-driven, this increased involvement and dedication may be further strengthened.

Therefore, encouraging an innovative culture is not only advantageous but also crucial for SMEs. The acceptance of new digital tools and solutions by workers is largely influenced by this culture. SMEs may boost their competitiveness by encouraging an atmosphere where innovation is valued and where staff members feel free to propose or

implement innovative e-commerce solutions. Training sessions, seminars, and incentives may be used to strengthen this culture. Employees are more willing to accept and promote new technology if they believe their company is progressive. In addition to this internal advocacy, it's essential to take a step back and comprehend the state of e-commerce.

In today's fast-paced business environment, staying abreast of competitors' technological advances is crucial. SME managers should continuously monitor their competitors' e-commerce strategies. Being agile and responsive to competitive pressures can determine market leadership. Regular competitive analyses, participation in industry conferences, and using tools to track competitors' digital strategies ensure proactive e-commerce endeavors.

Maintaining open communication with business partners is essential. Partners often offer fresh perspectives on e-commerce trends and best practices. SMEs that align with partners' technological benchmarks and industry standards ensure smoother integration and collaboration. Such partnerships can lead to joint ventures in e-commerce, combining resources and expertise for mutual benefit. Recognizing and leveraging this business partner pressure can position SMEs favorably in the broader ecosystem.

Positioning e-commerce at the forefront of marketing strategies can lead to significant SME growth. Managers should continually evaluate and optimize e-commerce platforms to meet or exceed customer expectations. Implementing tools to measure e-commerce-related KPIs provides valuable insights for improvement. Additionally, integrating e-commerce data with marketing campaigns refines strategies, ensuring they resonate with the target audience and enhance conversion rates. In essence, a robust e-commerce strategy directly influences SMEs' overall business performance.

## 8. Limitations and future research

Although the current study offers insightful information, it has several limitations. The adoption of a cross-sectional design to assess the research hypotheses is one major restriction. Even if such a design works well for a quick grasp, it falls short in terms of depth when examining the complex processes found in SMEs. As a consequence, future study would greatly benefit from using a longitudinal strategy to better understand how IP has changed inside SMEs over time. The study's generalization's breadth is a further significant limitation. The results primarily target Palestinian SMEs and, to a lesser degree, nations with Palestine-like situations and cultures. However, not all SME industry groupings within the Palestinian setting were included by this study. As a result, there is a significant potential for future research to examine the adoption of e-commerce across various businesses, sectors, and even other countries, opening the door to a more thorough understanding. Last but not least, this study believed that the main element driving the adoption of e-commerce was client tech proficiency. Future research may consider extending this viewpoint by looking at tech-savviness as a possible moderating variable, providing insights into how it could change or affect the link between other factors in adopting e-commerce.

## 9. Conclusion

In recent times, the business landscape has witnessed a surge in dynamism. Among the plethora of strategies to attract clientele, electronic commerce (E-commerce) stands out as the most extensively employed. Empirical observations highlight that E-commerce carries both favorable and unfavorable attributes. The contemporary business sphere is anchored in Internet utilization, resulting in a transition from conventional retail establishments to virtual market platforms. This research endeavor aimed to ascertain the influence of technological, organizational, and environmental factors on the inclination to adopt E-commerce among SMEs, as well as its subsequent effect on marketing performance.The study also extended the TOE Framework with AI Integration, Innovation Culture, and Customer Tech-Savviness, as demonstrated in the study's conceptual framework. Through simple random sampling, 305 valid responses were obtained and analyzed using PLS-SEM techniques to evaluate the study's validity, reliability, and structural model for assessing the study hypotheses.

The statistical evidence showed that the TOE factors are significantly and positively related to adopting e-commerce in Palestinian SMEs. Additionally, new factors such as AI Integration, Innovation Culture, and Customer Tech-Savviness remain relevant in adopting e-commerce. These factors have been proven and confirmed by several studies from different regions. The results also revealed that E-commerce adoption significantly and positively effected the marketing performance of SMEs. This implicitly confirms that the adoption of e-commerce by SMEs enterprises played a crucial role in mediating the relationship between TOE Factors and SMEs' marketing performance.

## Ethical approval

This study has received the approval of Palestine Technical University – Kadoorie Ethics Committee. The date on which the study was carried out in 05/2023.

## CRediT authorship contribution statement

Omar Hasan Salah and Mohannad Moufeed Ayyash conceived of the presented idea. Mohannad Moufeed Ayyash reviewed the literature, presented the research model, and developed the hypothesis. Omar Hasan Salah presented the data analysis, findings, and discussion. Omar Hasan Salah and Mohannad Moufeed Ayyash discussed the analysis, implications for future study, Limitations, upcoming studies and findings.

## Declaration of Competing Interest

All authors declare that they have no conflicts of interest.

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*Ethical Statement for Solid State Ionics*

Hereby, we / Omar Salah and Mohannad Ayyash consciously assure that for the manuscript /insert title/ the following is fulfilled:

1) This material is the authors' own original work, which has not been previously published elsewhere.
2) The paper is not currently being considered for publication elsewhere.
3) The paper reflects the authors' own research and analysis in a truthful and complete manner.
4) The paper properly credits the meaningful contributions of co-authors and co-researchers.
5) The results are appropriately placed in the context of prior and existing research.
6) All sources used are properly disclosed (correct citation). Literally copying of text must be indicated as such by using quotation marks and giving proper reference.
7) All authors have been personally and actively involved in substantial work leading to the paper, and will take public responsibility for its content.

I agree with the above statements and declare that this submission follows the policies of Solid State Ionics as outlined in the Guide for Authors and in the Ethical Statement.

## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.joitmc.2023.100183.

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