

Research Article**Exploring the Adoption of E-Commerce among Small and Medium Enterprises in Saudi Arabia: A Technology-Organization-Environment Perspective****Abdel Ghaffar Ben Hamida**

Assistant Professor
Marketing Department
College of Business
King Abdulaziz University, Jeddah
21589, Saudi Arabia.
Email: radimahneb@kau.edu.sa
<https://orcid.org/0000-0002-3090-3118>

Citation

Ben Hamida, A.G. (2024). "Exploring the Adoption of E-Commerce Among Small and Medium Enterprises in Saudi Arabia: A Technology-Organization-Environment Perspective". *Digital Management Sciences Journal*, Vol.2 / Issue 1, pp. 1-17.

This is an open access article distributed under the terms of

[Creative Commons Attribution License \(CC BY\)](#).



The reproduction, distributions and use in other forum is permitted, provided copyright owner(s), and cited properly.

1 | INTRODUCTION

The Digital revolution has brought about drastic changes in the business environment across the globe with e-commerce playing a central role in defining new business strategies and market strategies (Chaffey & Ellis-Chadwick, 2019). E-commerce has thus become an important paradigm shift in business management as it has changed the way that business is done with ease of geographical barriers, change in consumer behavior and shift in competitive advantage being based on the digital strategies (Li & Xie, 2020). This change has been propelled even further by the COVID-19 outbreak which has revolutionized consumer behavior and business practices, thus rendering the digital presence indispensable for companies (McKinsey, 2021). Implementation of e-commerce in business has increased efficiency of operations, lowered the cost of transactions, enhanced customer interactions and increased access to markets (Wang et al., 2020). SMEs are in

ABSTRACT

This study investigates the factors influencing e-commerce adoption among Saudi Arabian Small and Medium Enterprises (SMEs) using the Technology-Organization-Environment (TOE) framework. The research aims to identify key determinants that either facilitate or hinder e-commerce adoption in the Saudi context. A web-based survey was conducted among 480 Saudi Arabian SMEs (32% owners, 68% managers), employing multiple regression analysis to test eight hypotheses derived from the TOE framework. Variables were measured using established scales with Cronbach's alpha exceeding 0.80, examining eight independent variables across technological, organizational, and environmental contexts. Results revealed technology infrastructure as the strongest predictor ($\beta = .576, p < .001$), followed by IT human resources ($\beta = .341, p < .001$), business infrastructure ($\beta = .156, p = .008$), business partner pressure ($\beta = .123, p = .039$), and technical infrastructure ($\beta = .075, p = .015$). Notably, competitive pressure, government support, and firm size did not show significant influence on e-commerce adoption. The model explained 33.3% of the variance in e-commerce adoption. Study limitations include its cross-sectional design, sample size representing less than 10% of total Saudi SME population, and potential limited generalizability beyond the Saudi Arabian context. Future research should consider longitudinal studies and cross-country comparisons. The findings suggest organizations should prioritize investment in technology infrastructure and IT human resources, while policy makers need to reassess current support mechanisms for SME digital transformation. Technology providers should focus on integrated solutions addressing both technical and business infrastructure needs. These results can inform strategies to achieve Saudi Vision 2030 digital transformation goals. This study provides the first comprehensive analysis of e-commerce adoption factors among Saudi SMEs using the TOE framework, challenging traditional assumptions about technology adoption drivers and offering evidence-based insights for stakeholders involved in Saudi Arabia's digital transformation.

KEYWORDS: Business Technology Adoption, E-Commerce Adoption, Technology-Organization-Environment Framework (TOE), Digital Transformation

a very good position to take advantage of the current technological developments in order to foster economic development and innovation. According to the World Bank, small and medium enterprises are more than 90% of businesses globally and are the source of most jobs and economic growth, especially in developed as well as developing countries (World Bank, 2022). Thus, when the SMEs adopt e-commerce technologies, they are able to compete better in the global markets, enhance their productivity and make a greater impact in the economic growth (OECD, 2021). According to Johnson and Lee (2021), SMEs that integrate e-commerce solutions into their business are able to increase their revenues by 15-20% and enhance customer satisfaction significantly.

Due to the huge potential that is presented by e-commerce, several governments across the globe have come up with different policies and regulations that have encouraged the integration of SMEs. Some of the examples include Singapore, South Korea and the United Arab Emirates that have put in place strategic digital transformation programs which provide financial support, technical assistance and legal requirements that promote the use of e-commerce (Zhang & Liu, 2022). Digital transformation has also been given a high priority in Saudi Arabia specifically through Vision 2030 which has put in place several programs that aims at enhancing the integration of digital technologies including e-commerce among SMEs (Saudi Vision 2030). “Monsha’at” or the Small and Medium Enterprises General Authority has been set up by the Saudi government while the E-Commerce Council has been created to support the digital transformation of SMEs (Monsha’at, 2022).

Despite these substantial efforts and support structures of the government in implementing e-commerce, the uptake of e-commerce by Saudi SMEs is still relatively low as compared to large enterprises in the kingdom. While 78% of large Saudi firms have already adopted e-commerce, only 24% of SMEs have done so (Saudi Chamber of Commerce, 2023). This difference indicates that there are certain obstacles and challenges that the SMEs encounter in the process of integrating e-commerce technology even though there is government support and resources (Al-Somali and Clegg, 2022). The difference between potential returns and actual adoption highlights the need to explore the factors that affect Saudi SMEs’ decisions regarding e-commerce adoption.

This research seeks to fill this important gap by examining the factors that affect the adoption of e-commerce by Saudi SMEs with the help of the Technology-Organization-Environment (TOE) framework. Knowing these factors is important for the following reasons: first, it will support the policymakers in developing relevant and effective strategies; second, it will help the SMEs to better plan for the shift towards digitalization; and third, it will support the overall objective of the Saudi Vision 2030 in developing the digital economy. Through the identification and analysis of the factors that influence e-commerce adoption, this research will be able to offer practical recommendations to the stakeholders focusing on the enhancement of digital adoption among the Saudi SMEs.

Despite the growing body of literature on e-commerce adoption, there is a notable research gap in understanding the specific factors influencing e-commerce adoption among SMEs in the Saudi Arabian context. Previous studies have primarily focused on developed economies or larger enterprises, leaving a significant knowledge gap regarding the unique challenges and opportunities faced by Saudi SMEs. Furthermore, while existing research has examined individual factors affecting e-commerce adoption, few studies have provided a comprehensive analysis using the

Technology-Organization-Environment (TOE) framework in the Saudi Arabian context.

The primary problem this research addresses is the limited understanding of the factors that either facilitate or impede e-commerce adoption among Saudi SMEs. This knowledge gap has practical implications for policymakers and business leaders who need evidence-based insights to develop effective strategies for digital transformation. Additionally, the varying levels of e-commerce adoption among Saudi SMEs suggest that some organizations face greater barriers than others, but the nature and impact of these barriers remain insufficiently explored.

This research therefore seeks to establish the adoption of e-commerce among the Saudi SMEs using the TOE framework which is a widely used theoretical framework in analyzing technological innovation among organizations (Tornatzky and Fleischer, 1990). The TOE framework focuses on the interactions between contextual, organizational and technological factors in explaining the decision making of firms. Using this theory, this study seeks to determine the contributing factors that help or hinder the Saudi SMEs' adoption of e-commerce and to determine the contextual elements that need to be taken into consideration.

The outcomes of this research will advance our current understanding on digital transformation especially of the SMEs in the Saudi Arabian market. Therefore, this study seeks to contribute management recommendations that will help the business owners, policymakers, and industry leaders to create a favorable environment for e-commerce adoption, and hence promote digitalization of SMEs and achieve the goals of Saudi Vision 2030 (Alghamdi, 2020).

Based on the objectives stated earlier, the research question to be addressed in this study is: ***Which variables are most crucial in determining the adoption of e-commerce in the Saudi context?***

The research specifically aims to:

1. Identify and analyze the key technological, organizational, and environmental factors influencing e-commerce adoption among Saudi SMEs.
2. Evaluate the relative importance of these factors in the decision-making process of SMEs regarding e-commerce adoption.
3. Develop actionable recommendations for stakeholders to facilitate greater e-commerce adoption among Saudi SMEs.

2 | LITERATURE REVIEW

In this section we discuss the technology-organization-environment theory and its practical application relevant to adopting technology innovation in general. In the second paragraph, we concentrate on the application of this theory in an e-commerce setting.

2.1. TOE FRAMEWORK

The technology-organization-environment model is a valuable theory established by Tornatzky et al. (1990). This concept has gained extensive empirical support since it has explored numerous forms of technology adoption (Maduku et al., 2016; Grant et al., 2018). Prior studies using TOE framework served as the foundation for our variable identification to collect the crucial factors for studying E-commerce adoption (Oliveira et al. 2019; Ajmal, F. et al., 2017; Venkatesh and Bala, 2012).

From the technological context, we considered Technical infrastructure (Jennex et al., 2004) and Business infrastructure (Molla and Licker, 2005) as significant. Among the organizational factors, we determined Enterprise resources, constituted of the Technology infrastructure (Todd and Javalgi, 2007) and the IT human resources, also termed in the literature digital skills (Golden et al., 2004), and the Business size (Huy and Filiatrault, 2006).

Partner pressure (Sila,2013), competitive pressure (Sila, 2013), and government support (Kartiwi, 2006; Salem and Md Nor, 2020) were the most significant factors in the environmental setting.

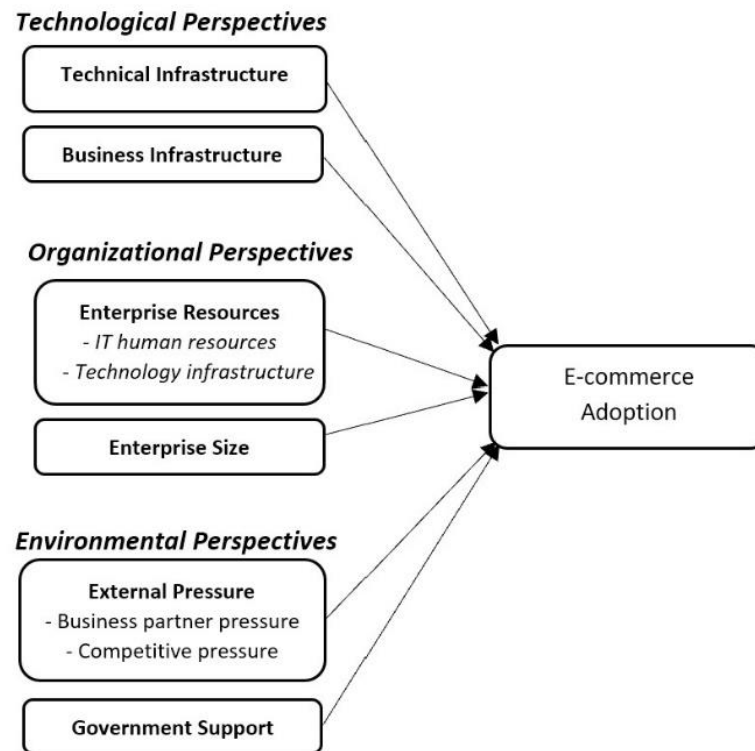


Figure 1. The Technology, Organization, and Environment (TOE) Model

2.2. E-COMMERCE ADOPTION BY SMEs

It has been determined that SMEs use e-commerce as one of the crucial strategies that support the growth and survival of SMEs in the current global economy. For SMEs, the integration with e-commerce presents a way of enhancing the market reach, increasing customer engagement and efficiency of operations (Oliveira and Martins 2011). Nonetheless, a variety of factors influence the adoption process, these include technological readiness, organizational capabilities, and the external environment (Thong 1999).

The study has identified some challenges that SMEs face in the implementation of e-commerce, including limited resources, lack of skills in technology, security and privacy concerns among others that may discourage their uptake (Kraus et al., 2020). Although there are several challenges that may prevent e-commerce from becoming widely adopted, if done correctly, the advantages that can be obtained include enhanced customer relations and business competitiveness, as well as reduction of costs in the local and international markets (Bharadwaj, 2000). Hence, it is crucial to

know the elements that influence or prevent SMEs from implementing e-commerce in order to enhance the strategies that facilitate digital change and enhance the small and medium firms' ability to compete.

a. Technology Impact on the Adoption of E-Commerce

In this research, technological factors are related to two variables, which are technical infrastructure and Business infrastructure. (Molla and Licker, 2005). Jennifer et al. (2004) discovered a list of infrastructural success determinants for e-commerce enterprises. Client interface, business infrastructure, and technical infrastructure were highlighted as key success factors. These elements guarantee e-commerce implementation. According to Laosethakul and Boulton (2007), two technical infrastructure components are the computer literacy of all partners involved in the transaction or relationship and the availability of connection and service equipment.

Lin and Lin (2008) examined the technical drivers of e-business dissemination in Taiwan and discovered that information technology infrastructure is a critical component determining e-business diffusion. Hence, we propose the following hypotheses:

H1. A positive correlation exists between technology infrastructure and the e-commerce adoption by SMEs.

H2. A positive correlation exists between IT human resources and the e-commerce adoption by SMEs.

b. Organizational Impact on the Adoption of E-Commerce

The organizational context, which describes the organizational characteristics influencing the organizational adoption of new technologies, may have an impact on the adoption of e-commerce in firms, according to the TOE approach. (Huy and Filiatrault, 2006; Todd and Javalgi, 2007). In the TOE model, enterprise resources are described as both technology infrastructure resources (software and hardware) and IT human resources like expertise and skills that an enterprise accumulates for adopting E-commerce (Kabanda, 2011). According to Laosethakul and Boulton (2007), two components of technological resources are computer knowledge involved in the transaction or relationship and the availability of access and service equipment. According to Hsin-Pin Fu et al. (2014), the more IT infrastructure resources a business owns, the more likely it is to embrace new innovative technologies, such as E-commerce. Kinkel et al. (2022) demonstrate that digital skills are required to apply new AI technologies and that they have a significantly positive influence on the AI technologies adoption in SMEs production. Ghobakhloo (2015) demonstrates that E-commerce knowledge is crucial to its success as well as the success of e-business in general for SMEs. According to the research, IS knowledge user is a strong predictor of EC usage and satisfaction. The previous findings give rise to the following two hypotheses:

H3. Technology infrastructure has a positive correlation with the e-commerce adoption by SMEs.

H4. IT human resources are positively correlated with the e-commerce adoption by SMEs.

The company's size is one of the variables used to explain why new technological practices are adopted. At the same time, several studies in the industry have concluded that organization size is a poor predictor of the acceptance of new technologies (Hamad et al. 2018; Priambodo et al. 2021;

Rahayu and Day 2015). In contrast, several studies demonstrate that company size is a determinant in the new technologies' adoption (Dukino et al., 2020). According to Abdulkarem and Hou (2021) research on the organizational context impacts the degree of adoption of e-commerce in China. It was found that the organizational context, mainly firm size, has a significant impact in creating E-Commerce at different levels. In the same vein, Setiyani and Rostiani (2021) found that organizational indicators, such as organization readiness, culture, cost, top management support, and organization size, significantly influenced Indonesian firms' intention to integrate e-commerce. Accordingly, it is proposed that:

H5. A positive relationship exists between technology infrastructure and the e-commerce adoption by SMEs.

c. Environment Impact on the Adoption of E-Commerce

Numerous studies have proved that technical innovation is a critical factor in an organization's ability to stay competitive (Jennex et al., 2004; Looi, 2005; Huy and Filiatrault, 2006; Kartiwi, 2006; Sila, 2013; Wamba et al. 2020; Salem and Md Nor, 2020). Hamad et al. (2018) mentioned that competitive pressures could be one of the most influential factors driving e-commerce adoption. They concluded that Egyptian SMEs used B2B e-commerce in response to competitive pressure, believing that they would lose consumers to rivals if they did not. As an environmental component, Kim et al. (2018) shows that industry competitiveness has an important secondary influence on the adoption of Semantic Web via the innovativeness and data capabilities of the organization. Cruz-Jesus et al. (2019) affirmed that competitive pressure emerged as the more powerful and complicated predictor of CRM adoption phases. It is the only element relevant at each step of CRM adoption and the only one that exhibits negative impacts throughout the process. Oliveira and Martins 2010 and Sila (2013) discovered that competitive pressure is a crucial factor influencing the adoption of e-Business. Moreover, Oliveira and Martins (2009), Rahayu and Day (2015) and Abdulkarem and Hou (2021) found that the adoption of e-commerce in SMEs was positively impacted by competitive pressure. These findings reaffirm the favorable association between competitiveness and innovation, which results in increased investment in technologies such as e-commerce. In this regard, it is proposed that:

H6. Competitive pressure is positively linked with SMEs' adoption of e-commerce.

Another critical environmental element affecting the adoption of e-commerce in SMEs is partners' pressure. Small firms are particularly vulnerable to pressure from trade partners since they are often reliant on them for existence (Hamad et al., 2018). In the technology adoption field, trading partner pressure is the amount of impact and pressure an organization receives through relational channels like suppliers and customers to embrace e-commerce technologies (Saprikis and Vlachopoulou, 2012; Abou-Shouk et al., 2016). Business partners' pressure was discovered to be a substantial element in predicting the use of e-commerce and positively affected the adoption of technology in SMEs.

The business partner pressure in this research refers to the pressure exerted by suppliers and customers on the organization and the adoption of e-commerce adoption. Several studies show a strong association between partner pressure and e-commerce adoption. Maqueira-Marin et al. (2017) revealed that trade partners were the element having the most significant effect on the

adoption of cloud computing in their research into the environmental drivers of company use of cloud computing. This impact seems to be contingent upon the suppliers' and consumers' characteristics like habits, geographical distance, tradition, and purchasing behavior (Rasid and Al-Qirim, 2001). Therefore, supplier and customer pressures are considered antecedent variables that positively influence e-commerce adoption by SMEs. Based on this, we propose the following:

H7. Supplier and customer pressure are positively related to SMEs' adoption of e-commerce.

The concept of "government support" involves improving business adoption of recent technology via governmental intervention (Zhu et al. 2006). The establishment of technical support groups and economic incentives are examples of the government's supply-side strategies to spur innovation, directly or indirectly (Luken and Van Rompaey 2007). In this case, it is shown that in emerging electronic economies, government participation is a crucial driver of technology dissemination (Javalgi et al.,2004). Many authors confirmed the key role of the government support in Information Technology adoption and especially on E-commerce.

In this context, Walker et al. (2016) demonstrated that external pressure had significantly predicted e-commerce adoption by Slovakian SMEs. Furthermore, they recognize external pressure as both social factors and government support for Information Technology is critical and suggested that SMEs demand more support than large firms. Abdulkarem Hou (2021) studied the cross-border e-commerce adoption in Chinese SMEs and found that regulatory and legal environment of both host country and the target country of cross-border e-commerce may support or inhibit the adoption of e-commerce on two distinct levels. Consequently, e-commerce appears to be more influenced by government support. Based on this, it is proposed that:

H8. Government support is positively linked with SMEs' adoption of e-commerce.

The model and hypothesis of our research are the following:

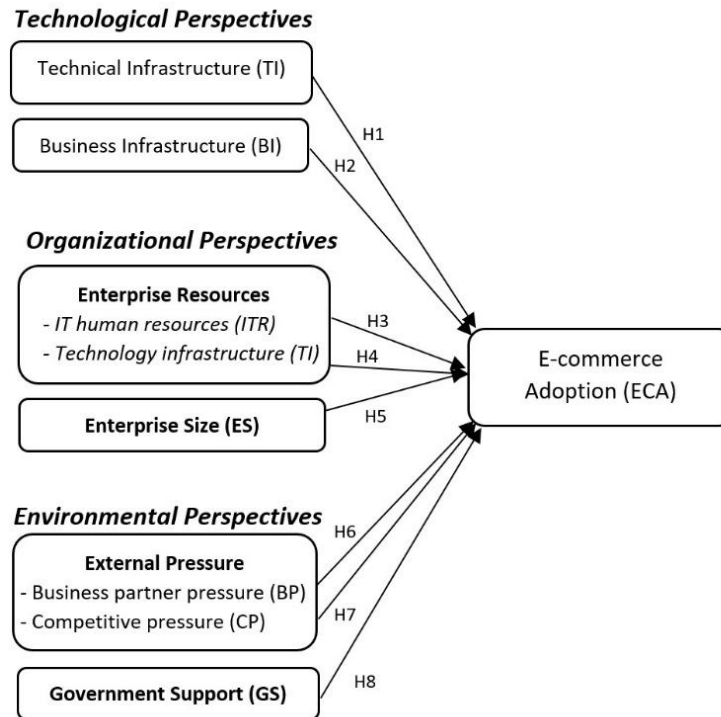


Figure 2. Research Model and Hypothesis

3 | RESEARCH METHODS

To gather data, we implemented a web-based survey instrument. This digital approach offered several key advantages over traditional methods - it reduced costs, enhanced data quality, streamlined collection, and simplified the administration process, as highlighted in Callegaro et al. (2015) research. The survey questions were constructed by building upon established research instruments from the literature.

3.1. SAMPLING METHOD

The research focused on individuals who owned or managed small and medium enterprises (SMEs) in Saudi Arabia. For this investigation, an SME was defined as an organization employing fewer than 250 people. The “Small and Medium Enterprise General Authority (2020)” maintains a comprehensive national registry of all SMEs in the country, which served as our sampling framework. After the survey's first dissemination, we conducted two reminder email campaigns to encourage participation. The final sample comprised 480 SMEs, with owners representing 32% of respondents and managers accounting for 68%. Overall participation remained under 10% of the total contacted population.

3.2. MEASUREMENT

a. Independent Variables:

The assessment of technical infrastructure incorporated three indicators adapted from Jennex et al. (2004), while business infrastructure was evaluated using six measures developed by Molla and Licker (2005). IT human resources were measured through two key indicators derived from Golden et al. (2004). The technology infrastructure construct utilized six indicators sourced from

Molla and Licker's (2005) framework. To capture firm size, one distinct measure was employed following Zhu et al. (2003) approach, encompassing employee count.

Business partner pressure was assessed using four indicators identified by Sila (2013), while competitive pressure was measured with two indicators, also derived from Sila (2013). Finally, government support was assessed using four indicators developed by Salem and Md Nor (2020). The study utilized five-point Likert scales across all measurement instruments. Internal consistency reliability was confirmed through Cronbach's alpha analysis, with all measures demonstrating robust reliability coefficients exceeding 0.80.

b. Dependent Variable:

E-commerce adoption served as the dependent variable, measured through the extent of e-commerce technology implementation within SMEs' operations. Following Rahayua and Day's (2015) methodology, the study employed a binary scoring system where participants indicated their use (scored as 1) or non-use (scored as 0) of e-commerce tools in their business functions. These individual scores were then aggregated to determine overall adoption levels.

4 | RESULTS

We used a multiple regression analysis to understand how the independent variables affect the E-commerce implementation in Saudi SMEs. Prior to conducting the primary analysis, the dataset underwent rigorous diagnostic testing to satisfy regression assumptions. These preliminary assessments included screening for outliers, evaluating multicollinearity among predictors, confirming data normality, verifying linear relationships, and testing for homoscedasticity. The regression findings are presented in the subsequent tables.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,577 ^a	,333	,322	,27564

Table 1: Model Summary

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18,296	8	2,287	29,456	,000 ^b
	Residual	36,569	471	,078		
	Total	54,866	479			

Table 2: Anova

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,467	,086		5,419	,000
	Firm Size	,017	,018	,035	,917	,359
	Technical infrastructure	,024	,023	,075	2,280	,015
	Business infrastructure	,062	,028	,156	2,874	,008
	IT human resources	,161	,021	,341	5,834	,000
	Technology infrastructure	,594	,039	,576	15,194	,000
	Business partner pressure	,105	,051	,123	2,014	,039
	Competitive pressure	,013	,022	,041	,609	,543
	Government support	-,024	,023	-,067	1,025	,306

Table 3: Coefficients

The regression model presents a value of an adjusted R square equal to .333. This means that the model explains 33.3% of the variance in the adoption of the e-commerce by the independent variables. The significance value of the multiple regression model is .00 (Table 2) explaining that the model is highly statistically significant, and all the independent variables collectively have a significant correlation with E-commerce adoption. Table 3 indicates that the multiple regression analysis was used to examine factors influencing e-commerce adoption. The model explained 33.3% of the variance in e-commerce adoption ($R^2 = .333$, $F(8, 471) = 29.456$, $p < .001$). Technology infrastructure emerged as the strongest predictor ($\beta = .576$, $p < .001$), followed by IT human resources ($\beta = .341$, $p < .001$), business infrastructure ($\beta = .156$, $p = .008$), business partner pressure ($\beta = .123$, $p = .039$), and technical infrastructure ($\beta = .075$, $p = .015$). Interestingly, competitive pressure, government support, and firm size showed no significant influence on e-commerce adoption. These findings suggest that internal technological capabilities and business partner influence are more crucial for e-commerce adoption than external competitive pressures or organizational size. Hence, the hypothesis H1, H2, H3, H4 and H6 are fully supported in this research.

5 | DISCUSSION

This research identifies eight factors, categorized into three groups, as illustrated in the TOE acceptance model: organizational, technological, and environmental context—as key elements impacting Saudi SMEs' use of e-commerce technologies.

a. Technological Context

The analysis of the technological context reveals compelling evidence that technology-related variables play a crucial influence in e-commerce adoption decisions. Most notably, technology infrastructure emerged as the most influential predictor ($\beta = .576$, $p < .001$), demonstrating that organizations' technological capabilities serve as the cornerstone of e-commerce adoption. This finding strongly aligns with Ramdani et al.'s (2013) research, which emphasized the fundamental role of technological infrastructure in enabling digital transformation. Similarly, Zhu and Kraemer (2005) found that technology competence significantly shapes e-business adoption success. The technical infrastructure, while showing a smaller but still significant effect ($\beta = .075$, $p < .015$), further supports the importance of technological readiness. This finding resonates with Teo et al.'s (2009) research, which highlighted how technical compatibility influences organizations' decisions to adopt new technologies. These results collectively suggest that the technological foundation

remains a crucial determinant in e-commerce adoption decisions, supporting the established literature on technology adoption in organizational contexts.

b. Organizational Context

Within the organizational context, the findings reveal a complex interplay of internal factors affecting e-commerce adoption. IT human resources emerged as the second most influential factor ($\beta = .341, p < .001$), underscoring the critical importance of human capital in technology adoption. This finding strongly supports Zhu et al.'s (2006) research, which emphasized how IT expertise fundamentally shapes e-business adoption success. The significant influence of business infrastructure ($\beta = .156, p = .008$) aligns with Wang and Ahmed's (2009) findings on the importance of organizational readiness in technology adoption. Interestingly, firm size showed no significant relationship with e-commerce adoption ($\beta = .035, p = .359$), contrasting with some previous studies like Zhu et al. (2006) but aligning with Grandon and Pearson's (2004) findings. This suggests that in the current business environment, size may be less relevant to e-commerce adoption than an organization's technological capabilities and human resources.

c. Environmental Context

The examination of environmental factors reveals interesting patterns in how external influences affect e-commerce adoption. Business partner pressure demonstrated a significant though moderate influence ($\beta = .123, p = .039$), supporting Teo et al.'s (2009) findings regarding the impact of trading partner influence on technology adoption decisions. This aligns with Zhu et al.'s (2006) research highlighting the role of business ecosystem pressures in technology adoption. However, competitive pressure showed no significant relationship ($\beta = .041, p = .543$), contrasting with Pan and Jang's (2008) findings where market competition significantly influenced adoption decisions. Likewise, government support was found to be non-significant ($\beta = -.067, p = .306$) which is different from Zhu and Kraemer's (2005) conclusion that regulatory support is critical to the adoption of technology. This contrast with previous research suggests that may be a change in the elements that influence e-commerce adoption decision-making in the current business environment which may suggest that internal factors are now more important than the external forces.

CONCLUSION

The purpose of this study was to determine the elements that influence SMEs' adoption of e-commerce in Saudi Arabia. By applying the Technology-Organization-Environment (TOE) framework, we investigated how widely SMEs have adopted e-commerce in Saudi Arabia and identified the key factors influencing this adoption. The research revealed several significant findings regarding the variables influencing e-commerce adoption. Technology infrastructure emerged as the strongest predictor ($\beta = .576, p < .001$), indicating that robust technological capabilities are fundamental for successful e-commerce implementation. SMEs with better technology infrastructure demonstrated a higher likelihood of successfully adopting and implementing e-commerce solutions. IT human resources proved to be the second strongest predictor ($\beta = .341, p < .001$), emphasizing the crucial role of human capital and validating that technical expertise and digital literacy among staff are essential for e-commerce adoption. Business infrastructure showed a moderate but significant impact ($\beta = .156, p = .008$), suggesting that well-structured business operations facilitate easier e-commerce integration. Business partner pressure, while showing a relatively weaker influence ($\beta = .123, p = .039$), highlighted the role of

the business ecosystem in driving e-commerce adoption decisions. Technical infrastructure, though showing the weakest significant effect ($\beta = .075$, $p = .015$), still contributed meaningfully to e-commerce adoption.

Interestingly, there were some variables that did not predict e-commerce adoption. Competitive pressure was analyzed, and it was seen that it was not significant ($\beta = .041$, $p = .543$) hinting that external market competition might not be the major factor influencing the Saudi SMEs. Government support ($\beta = -.067$, $p = .306$) was also found to be non-significant, which suggests that there might be a need to redesign and enhance the existing government initiatives. Also, firm size ($\beta = .035$, $p = .359$) was also found to have non-significant relationship with adoption of e-commerce which questions the conventional thoughts that large firms have advantages in adopting technology and integrating it into their business.

There are several limitations of the study which should be taken into consideration. The cross-sectional nature of the data used in this study is a major drawback as it only paints a static picture at a particular point in time thus giving limited insight into the dynamic nature of adoption over time. There is a possibility of response bias in this survey as it is self-reported and the sample size, even though adequate, is representative of less than one-tenth of the SME population. Geographical limitations are confined to Saudi Arabia; thus, the findings cannot be assumed to hold true for other regions as well, and the study did not examine regional differences within Saudi Arabia. Furthermore, the study was based on adoption decisions only while the success or failure of adoption and implementation was not taken into account, and no distinction was made between different forms of e-commerce.

Future research should also involve longitudinal research in order to track how and when adoption factors vary and to monitor the progress of e-commerce adoption and its consequences for business performance. This research could be extended to the Gulf Cooperation Council (GCC) countries and other comparative research between the developed and developing countries will be useful. Research on post-adoption success factors and creation of implementation guidelines for Saudi SMEs will be useful for practical applications. A sectoral analysis of adoption to see how it varies across different sectors and an analysis of sectoral challenges would also add to the current knowledge. Also, an assessment of particular government measures and their results and the creation of a policy recommendations framework on the basis of the findings would be useful for the policy makers.

The findings have implications for the practical application of the study for several stakeholders. Thus, SME managers should pay attention to the investment in the technology structure and staff of the IT department in order to enhance the development of effective business processes for e-commerce strategies. It has been observed that policy makers need to formulate specific support systems for the development of technological capabilities and initiate measures to bridge the IT skills gap in the SME sector. Technology providers should undertake the design of solutions in a way that would meet the particular requirements and conditions of Saudi SMEs and offer packages that include the enhancement of both the technical and the business structures. All these comprehensive findings can enhance the theoretical framework and practical application of e-commerce adoption strategies in the Saudi Arabian SMEs with recognition of the need for future research in this dynamic field.

References

- Abdulkarem, A., & Hou, W. (2021). The impact of organizational context on the levels of cross-border E-commerce adoption in Chinese SMEs: the moderating role of environmental context. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(7), 2732-2749.
- Abou-Shouk, M. A., Lim, W. M., & Megicks, P. (2016). Using competing models to evaluate the role of environmental pressures in ecommerce adoption by small and medium sized travel agents in a developing country. *Tourism Management*, 52, 327-339.
- Ajmal, F. (2017). Factors influencing electronic commerce adoption in Malaysian small and medium sized enterprises (SMES) (Doctoral dissertation, University of Malaya (Malaysia)).
- Alghamdi, S. (2020). «Digital transformation in Saudi SMEs and its impact on competitive advantage». *Journal of Business and Technology*, 15(4), 49-61.
- Alharbi, A., & Drew, S. (2020). «Adoption of e-commerce by Saudi SMEs: Challenges and opportunities». *International Journal of E-Business Research*, 16(3), 1-14.
- Almazan, M., Ruiz, T., & Martínez, M. (2021). «E-commerce adoption in small and medium enterprises: An empirical study in the Middle East». *Journal of Digital Business*, 9(1), 22-38.
- Al-Somali, S. A., & Clegg, B. (2022). Factors affecting e-commerce adoption in Saudi Arabian SMEs: A qualitative study. *Journal of Business Research in the Middle East*, 15(2), 78-96.
- Bharadwaj, A. (2000). «A resource-based perspective on information technology capability and firm performance: An empirical investigation». *MIS Quarterly*, 24(1), 169-196.
- Callegaro, M., Manfreda, K. L., & Vehovar, V. (2015). *Web survey methodology*. Sage.
- Chaffey, D. (2020). «Digital marketing: Strategy, implementation, and practice». Pearson Education.
- Chaffey, D., & Ellis-Chadwick, F. (2019). *Digital Business and E-Commerce Management: Strategy, Implementation and Practice* (7th ed.). Pearson Education Limited.
- Cruz-Jesus, F., Pinheiro, A., & Oliveira, T. (2019). Understanding CRM adoption stages: empirical analysis building on the TOE framework. *Computers in Industry*, 109, 1-13.
- Fu, H. P., & Su, H. T. (2014). A FRAMEWORK FOR A TECHNOLOGY-ORGANIZATION-ENVIRONMENT IMPLEMENTATION MODEL IN TAIWAN'S TRADITIONAL RETAIL SUPERMARKETS. *International Journal of Organizational Innovation*, 6(3).
- Ghobakhloo, M., Hong, T. S., & Standing, C. (2015). B2B e-commerce success among small and medium-sized enterprises: A business network perspective. *Journal of Organizational and End User Computing (JOEUC)*, 27(1), 1-32.
- Golden, W., Hughes, M., & Ruane, L. (2004). Traits of Successfully E-Enabled Irish SMEs. *Electronic Commerce in Small to Medium-Sized Enterprises*, 165–179.
- Grandon, E. E., & Pearson, J. M. (2004). Electronic commerce adoption: an empirical study of small and medium US businesses. *Information & management*, 42(1), 197-216.
- Grant, D. & Yeo, B. (2018). A global perspective on tech investment, financing, and ICT on manufacturing and service industry performance. *International Journal of Information Management*, (43), 130-145.
- Hamad, H., Elbeltagi, I., & El-Gohary, H. (2018). An empirical investigation of business-to-business e-commerce adoption and its impact on SMEs competitive advantage: The case of Egyptian manufacturing SMEs. *Strategic Change*, 27(3), 209–229.

- <https://doi.org/10.1002/jsc.2196>
- Huy, L. V., & Filiatrault, P. (2006). The adoption of e-commerce in SMEs in Vietnam: A study of users and prospectors. *PACIS 2006 proceedings*, 74.
- Javalgi, R. G., Martin, C. L., & Todd, P. R. (2004). The export of e-services in the age of technology transformation: challenges and implications for international service providers. *Journal of services marketing*, 18(7), 560-573.
- Jennex, M. E., & Olfman, L. (2004). Assessing knowledge management success/effectiveness models. *Proceedings of the Hawaii International Conference on System Sciences*, 37, 3687–3696. <https://doi.org/10.1109/hicss.2004.1265571>
- Jennex, M. E., Amoroso, D., & Adelakun, O. (2004). E-Commerce Infrastructure Success Factors for Small Companies in Developing Economies. *Electronic Commerce Research* 2004 4:3, 4(3), 263–286.
- Johnson, M., & Lee, K. (2021). Digital transformation impact on SME performance: A global study of adoption patterns and revenue growth. *International Journal of Electronic Commerce*, 25(3), 289-312.
- Kabanda, S. (2011). “E-Commerce Institutionalization is not for us”: SMEs perception of E-Commerce in Tanzania. *The African Journal of Information Systems*, 3(1).
- Kartiwi, M. (2006). Case studies of e-commerce adoption in Indonesian SMEs: The evaluation of strategic use. *Australasian Journal of Information Systems*, 14(1).
- Kim, D. J., Hebler, J., Yoon, V., & Davis, F. (2018). Exploring determinants of semantic web technology adoption from IT professionals' perspective: industry competition, organization innovativeness, and data management capability. *Computers in Human Behavior*, 86, 18-33.
- Kinkel, S., Baumgartner, M., & Cherubini, E. (2022). Prerequisites for the adoption of AI technologies in manufacturing—Evidence from a worldwide sample of manufacturing companies. *Technovation*, 110, 102375.
- Kraus, S., Rehman, S. U., & Hashim, M. (2020). «Factors influencing e-commerce adoption by SMEs: A systematic literature review». *Journal of Small Business Management*, 58(2), 239-264.
- Laosethakul, K., & Boulton, W. (2007). Critical Success Factors for E-commerce in Thailand: Cultural and Infrastructural Influences. *The Electronic Journal of Information Systems in Developing Countries*, 30(1), 1-22.
- Li, X., & Xie, Q. (2020). The evolution of e-commerce business models in the digital age: A systematic review. *Technology in Society*, 61, 101-125.
- Lin, H. F., & Lin, S. M. (2008). Determinants of e-business diffusion: A test of the technology diffusion perspective. *Technovation*, 28(3), 135-145.
- Link, M., Dukino, C., Ganz, W., Hamann, K., & Schnalzer, K. (2020). The Use of AI-Based Assistance Systems in the Service Sector: opportunities, challenges, and applications. In *Advances in Human Factors and Systems Interaction: Proceedings of the AHFE 2020 Virtual Conference on Human Factors and Systems Interaction, July 16-20, 2020, USA* (pp. 10-16). Springer International Publishing.
- Looi, H. C. (2005). E-Commerce Adoption in Brunei Darussalam: A Quantitative Analysis of Factors Influencing Its Adoption. *Communications of the Association for Information Systems*, 15.
- Luken, R. A., & Van Rompaey, F. (2007). Environment and industry in developing countries: assessing the adoption of environmentally sound technology. In *Environment and Industry*

- in Developing Countries. Edward Elgar Publishing.
- Maduku, D. K., Mpinganjira, M., & Duh, H. (2016). Understanding mobile marketing adoption intention by South African SMEs: A multi-perspective framework. *International Journal of Information Management*, 36(5), 711-723.
- Maqueira-Marín, J. M., Bruque-Cámara, S., & Minguela-Rata, B. (2017). Environment determinants in business adoption of Cloud Computing. *Industrial Management and Data Systems*, 117(1), 228–246. <https://doi.org/10.1108/IMDS-11-2015-0468/FULL/XML>
- McKinsey & Company. (2021). The COVID-19 recovery will be digital: A plan for the first 90 days. McKinsey Digital Report.
- Molla, A., & Licker, P. S. (2005). eCommerce adoption in developing countries: a model and instrument. *Information & management*, 42(6), 877-899.
- Monsha'at. (2022). Saudi Arabia SME Digital Transformation Report. Small and Medium Enterprises General Authority.
- OECD. (2021). The Digital Transformation of SMEs. OECD Studies on SMEs and Entrepreneurship. OECD Publishing.
- Oliveira, T., & Martins, M. F. (2010). Understanding e-business adoption across industries in European countries. *Industrial Management & Data Systems*.
- Oliveira, T., & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *Electronic journal of information systems evaluation*, 14(1), pp110-121.
- Oliveira, T., & Martins, M. O. (2009, July). Determinants of information technology adoption in Portugal. In *International conference on e-business* (Vol. 1, pp. 264-270). Scitepress.
- Oliveira, T., Martins, R., Sarker, S., Thomas, M., & Popovič, A. (2019). Understanding SaaS adoption: The moderating impact of the environment context. *International Journal of Information Management*, 49, 1-12.
- Pan, M. J., & Jang, W. Y. (2008). Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications industry. *Journal of Computer information systems*, 48(3), 94-102.
- Priambodo, I. T., Sasmoko, S., Abdinagoro, S. B., & Bandur, A. (2021). E-Commerce readiness of creative industry during the COVID-19 pandemic in Indonesia. *The Journal of Asian Finance, Economics and Business*, 8(3), 865-873.
- Rahayu, R., & Day, J. (2015). Determinant factors of e-commerce adoption by SMEs in developing country: evidence from Indonesia. *Procedia-social and behavioral sciences*, 195, 142-150.
- Ramdani, B., Chevers, D., & Williams, D. A. (2013). SMEs' adoption of enterprise applications: A technology-organisation-environment model. *Journal of Small Business and Enterprise Development*.
- Rashid, M. A. (2001). E-commerce technology adoption framework by New Zealand small to medium size enterprises.
- Salem, M. A., & Nor, K. M. (2020). The effect of COVID-19 on consumer behaviour in Saudi Arabia: Switching from brick-and-mortar stores to E-Commerce. *International Journal of Scientific & Technology Research*, 9(07), 15-28.
- Saprikis, V., & Vlachopoulou, M. (2012). Determinants of suppliers' level of use of B2B e-marketplaces. *Industrial Management & Data Systems*, 112(4), 619-643.
- Saudi Chamber of Commerce. (2023). Annual Report on Digital Commerce in Saudi Arabia. Research and Studies Department.

- Saudi Vision 2030. (2021). National Digital Transformation Strategy. Kingdom of Saudi Arabia.
- Setiyani, L., & Rostiani, Y. (2021). Analysis of E-commerce adoption by SMEs using the technology-organization-environment (TOE) model: A case study in karawang, Indonesia. *International Journal of Science, Technology & Management*, 2(4), 1113-1132.
- Sila, I. (2013). Factors affecting the adoption of B2B e-commerce technologies. *Electronic Commerce Research* 2013 13:2, 13(2), 199–236.
- Small and Medium Enterprises General Authority (Monsha'at). 2020. Available online: <https://www.monshaat.gov.sa/> (accessed on 24 January 2023).
- Teo, T. S., Lin, S., & Lai, K. H. (2009). Adopters and non-adopters of e-procurement in Singapore: An empirical study. *Omega*.
- Thong, J.Y.L. (1999) An integrated model of information systems adoption in small business, *Journal of Management Information Systems*, 15, 4, 187-214.
- Todd, P. R., & Javalgi, R. G. (2007). Internationalization of SMEs in India: Fostering entrepreneurship by leveraging information technology. *International Journal of Emerging Markets*, 2(2), 166–180.
- Tornatzky, Louis G.; Fleischer, Mitchell (1990). *The Processes of Technological Innovation. Issues in organization and management series.* Lexington, Massachusetts: Lexington Books. ISBN 9780669203486.
- Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 157-178.
- Walker, J. H., Saffu, K., & Mazurek, M. (2016). An empirical study of factors influencing e-commerce adoption/non-adoption in Slovakian SMEs. *Journal of Internet Commerce*, 15(3), 189-213.
- Wamba, S. F., Queiroz, M. M., & Trinchera, L. (2020). Dynamics between blockchain adoption determinants and supply chain performance: An empirical investigation. *International Journal of Production Economics*, 229, 107791.
- Wang, J. C., & Tsai, K. H. (2002). Factors in Taiwanese firms' decisions to adopt electronic commerce: An empirical study. Available at SSRN 330916.
- Wang, Y., Li, H., & Wu, Z. (2020). E-commerce adoption in SMEs: A multi-theoretical perspective on the drivers and barriers. *Journal of Business Research*, 113, 27-41.
- World Bank. (2022). *Small and Medium Enterprises (SMEs) Finance: Improving SMEs' access to finance and finding innovative solutions to unlock sources of capital.* World Bank Group.
- Zhang, H., & Liu, R. (2022). Government support for SME digitalization: A comparative study of Asian economies. *Asian Development Bank Institute Working Paper Series*, No. 1289.
- Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research*.
- Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of e-business assimilation in organizations: A technology diffusion perspective. *Management Science*, 52(10), 1557-1576.
- Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: A technology diffusion perspective on e-business. *Management Science*.
- Zhu, K., Kraemer, K., & Xu, S. (2002). A Cross-Country Study of Electronic Business Adoption Using the Technology-Organization-Environment Framework. *ICIS 2002 Proceedings*. <https://aisel.aisnet.org/icis2002/31>

Zhu, K., Kraemer, K., & Xu, S. (2003). Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. *European journal of information systems*, 12(4), 251-268.