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Factors Influencing e-Commerce Adoption among Sri Lankan Small and Medium Enterprises (SMEs): An Empirical Study Using the Technology-Organization-Environment Framework

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ABSTRACT

This study examines the factors influencing e-commerce adoption among small and medium-sized enterprises (SMEs) in Sri Lanka using the Technology-Organization-Environment (TOE) framework. A quantitative cross-sectional survey was conducted among registered SMEs across all 25 districts of Sri Lanka. From 220 distributed questionnaires, 155 valid responses were obtained and analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The model explained 57.0% of the variance in e-commerce adoption. Competitive pressure, top management attitude, and perceived complexity significantly influence e-commerce adoption, while perceived benefits and government support are not significant predictors. SME e-commerce adoption in Sri Lanka is driven mainly by competitive dynamics and managerial commitment rather than perceived benefits or institutional support.

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1. INTRODUCTION

Small and medium-sized enterprises (SMEs) play an important role in economic activity, employment generation, and business development in many developing economies [1]. In the current digital economy, SMEs are increasingly expected to adopt electronic commerce because online platforms can help firms expand market reach, improve customer communication, reduce transaction costs, and strengthen competitiveness. However, despite improvements in digital access and online business opportunities, e-commerce adoption among Sri Lankan SMEs remains uneven. Many SMEs still depend on traditional business channels and have not fully adopted online marketing, online sales, digital payments, or integrated e-commerce systems.

Adoption of e-commerce is not determined by technology availability alone. It is influenced by a combination of technological, organizational, and environmental factors. The Technology-Organization-Environment (TOE) framework provides a useful theoretical lens for examining these factors because it explains technology adoption through three contexts: technological characteristics, internal organizational conditions, and external environmental pressures. This framework is suitable for SME studies because adoption decisions are often shaped by limited resources, managerial commitment, market competition, and institutional conditions [2, 3]. Previous studies have applied the TOE framework to examine e-commerce adoption in different developing and emerging-market settings. These studies commonly identify perceived benefits, complexity, top management support, competitive pressure, and government support as important adoption-related factors, although their influence differs across countries and sectors [4-9]. This variation suggests that e-commerce adoption is context-specific. Factors that encourage adoption in one country may not have the same effect in another because SMEs operate under different infrastructure, financial, managerial, and institutional conditions.

In Sri Lanka, e-commerce adoption among SMEs remains an important research issue. Sri Lankan SMEs face challenges related to digital readiness, infrastructure, financial capability, managerial commitment, and uncertainty about the value of digital systems [4, 5]. At the same time, competitive pressure has increased as customers and rival firms increasingly shift toward online channels. This situation creates a need to examine which technological, organizational, and environmental factors significantly influence e-commerce adoption among Sri Lankan SMEs.

This study examines five determinants of e-commerce adoption within the TOE framework: perceived benefits, complexity, top management attitude, competitive pressure, and government support. Perceived benefits refer to the expected improvements in productivity, efficiency, customer reach, and organizational performance. Complexity refers to the perceived difficulty of using and maintaining e-commerce systems. Top management attitude reflects leadership support and willingness to invest in digital adoption. Competitive pressure refers to the influence of competitors and changing market expectations. Government support refers to institutional encouragement, policy support, training, and incentives for SME digitalization.

The main objective of this study is to determine how these five factors influence e-commerce adoption among SMEs in Sri Lanka. By testing these relationships empirically, the study contributes to TOE-based technology adoption literature and provides practical insights for SME managers, policymakers, and digital service providers. The study focuses on

registered Sri Lankan SMEs in sectors such as retail and wholesale trade, services, manufacturing, agriculture, and financial services, with responses obtained from owner-managers and senior decision-makers familiar with their firms' digital activities. Based on the TOE framework and prior empirical findings, this study proposes the following hypotheses:

(i) H1: Perceived benefits positively influence e-commerce adoption among Sri Lankan SMEs.
(ii) H2: Complexity of e-commerce positively influences e-commerce adoption among Sri Lankan SMEs.
(iii) H3: Top management attitude positively influences e-commerce adoption among Sri Lankan SMEs.
(iv) H4: Competitive pressure positively influences e-commerce adoption among Sri Lankan SMEs.
(v) H5: Government support positively influences e-commerce adoption among Sri Lankan SMEs.

2. LITERATURE REVIEW

The TOE framework is widely used to explain organizational technology adoption. It classifies adoption factors into three main contexts: technological, organizational, and environmental. The technological context refers to the characteristics of the technology itself, such as perceived benefits, usefulness, compatibility, and complexity. The organizational context refers to internal firm conditions, including managerial support, resources, capabilities, and readiness. The environmental context refers to external influences such as competitive pressure, customer expectations, industry conditions, and government support. This framework is suitable for studying e-commerce adoption among SMEs because adoption decisions are shaped not only by technology characteristics but also by managerial commitment, limited organizational resources, market pressure, and institutional conditions [2, 3].

Previous studies have applied the TOE framework to e-commerce adoption in various developing and emerging-market contexts. Research in Sri Lanka, Malaysia, Tanzania, Indonesia, and Thailand shows that the influence of TOE factors differs across countries, sectors, and institutional environments [4-9]. The e-commerce adoption is context-specific. A factor that strongly supports adoption in one setting may have a weaker or insignificant effect in another because SMEs operate under different levels of infrastructure, digital literacy, financial capacity, customer readiness, and policy implementation [10].

Perceived benefits are one of the most frequently discussed technological factors in e-commerce adoption studies. They refer to the extent to which SMEs believe that e-commerce can improve business performance through cost reduction, wider market access, faster customer communication, improved productivity, and greater organizational efficiency. This concept is closely related to perceived usefulness and relative advantage in technology adoption literature [11]. SMEs are more likely to adopt e-commerce when online platforms can create clear business value and improve competitiveness [12-14]. However, perceived benefits may not always lead to adoption, particularly when SMEs face limited digital readiness, weak infrastructure, financial constraints, or uncertainty about implementation outcomes [15, 16].

Complexity refers to the perceived difficulty of understanding, implementing, and maintaining e-commerce systems. Traditionally, complexity is viewed as a barrier because complicated systems may increase cost, training needs, uncertainty, and resistance among users [17, 18]. SMEs may hesitate to adopt e-commerce when they perceive online systems as confusing, time-consuming, or requiring technical expertise that is not available within the firm. However, complexity may not always discourage adoption. In some contexts, SMEs that adopt more advanced systems involving online payments, logistics, inventory management, and integrated platforms may perceive complexity as part of strategic digital transformation rather than merely as an obstacle [16, 19]. Therefore, the role of complexity requires empirical testing in the Sri Lankan SME context.

Top management attitude is an important organizational factor because decision-making in SMEs is often concentrated in the owner-manager or senior leadership team. Top management determines whether the firm will allocate resources, train employees, invest in digital systems, and integrate e-commerce into the overall business strategy. Leadership support is a strong predictor of technology adoption because it shapes organizational readiness, employee acceptance, and implementation commitment [6, 20, 21]. In SMEs, a positive managerial attitude can reduce uncertainty and strengthen the legitimacy of digital initiatives.

Competitive pressure is a key environmental factor influencing e-commerce adoption. It refers to the extent to which SMEs feel pressured by competitors, customers, suppliers, or market trends to adopt online business systems. When competitors begin using online sales, digital payments, and online marketing, other SMEs may feel compelled to adopt similar systems to avoid losing customers or market relevance [14, 22, 23]. This pressure became more visible after the COVID-19 pandemic, when many consumers shifted toward online channels. From an institutional perspective, firms may adopt e-commerce not only because of calculated benefits but also to maintain legitimacy and competitive parity within their industry [24].

Government support refers to policy initiatives, digital infrastructure, training programs, incentives, legal protection, and institutional encouragement that help SMEs adopt e-commerce. In developing economies, government support can reduce adoption barriers by improving awareness, lowering implementation costs, and strengthening trust in online transactions [25, 26]. However, prior studies report mixed findings. Government initiatives may have limited effects when SMEs are unaware of available programs, when support is too generic, or when bureaucratic procedures make access difficult [15]. Therefore, the influence of government support on e-commerce adoption should be examined empirically rather than assumed.

The e-commerce adoption among SMEs is influenced by multiple technological, organizational, and environmental factors. However, there is still limited quantitative evidence on how these factors operate among Sri Lankan SMEs. Sri Lankan SMEs face challenges related to digital readiness, infrastructure, financial capability, managerial commitment, and uncertainty about e-commerce value [4, 5]. This study addresses this gap by empirically testing the influence of perceived benefits, complexity, top management attitude, competitive pressure, and government support on e-commerce adoption among Sri Lankan SMEs.

3. METHODS

This study used a quantitative cross-sectional survey design to examine factors influencing e-commerce adoption among Sri Lankan SMEs. The study was guided by the TOE framework and tested the effects of perceived benefits, complexity, top management attitude, competitive pressure, and government support on e-commerce adoption.

The target population consisted of 14,035 registered SMEs across Sri Lanka. A proportionate stratified sampling technique was applied to ensure representation from all 25 districts. A total of 220 questionnaires were distributed to SME owner-managers and senior decision-makers, and 155 valid responses were obtained, representing a response rate of 70.45%.

Data were collected using a structured questionnaire adapted from validated instruments in previous TOE-based studies. All constructs were measured using multi-item reflective scales on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The questionnaire covered e-commerce adoption, perceived benefits, complexity, top management attitude, competitive pressure, and government support.

Data were analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM) through SmartPLS. The analysis followed two stages. First, the measurement model was assessed using indicator reliability, composite reliability, convergent validity, and discriminant validity. Second, the structural model was examined using collinearity, path coefficients, significance values, explanatory power, predictive relevance, and effect sizes. Bootstrapping with 5,000 subsamples was used to test hypothesis significance.

Ethical considerations were observed throughout the study. Participation was voluntary, and respondents were informed about the purpose of the research. Anonymity and confidentiality were maintained during data collection, analysis, and reporting.

4. RESULTS AND DISCUSSION

The results present the demographic profile, measurement model assessment, structural model assessment, and hypothesis testing for e-commerce adoption among Sri Lankan SMEs. The study obtained 155 valid responses from 220 distributed questionnaires, representing a response rate of 70.45%. The respondents came from SMEs across all 25 districts of Sri Lanka, covering sectors such as retail and wholesale trade, services, manufacturing, agriculture, financial services, and other business categories. This distribution supports the relevance of the data for examining e-commerce adoption among registered Sri Lankan SMEs.

Most respondents represented firms in retail and wholesale trade, followed by services, manufacturing, agriculture, and financial services. Firm sizes varied across SME categories, while respondents included managers, assistant managers, owners, senior executives, finance executives, and directors. The responses were provided by individuals who were familiar with business operations and digital adoption decisions. The geographic spread of responses also reflected major SME-concentrated districts, including Colombo, Gampaha, Kurunegala, Kandy, and Puttalam.

The measurement model was assessed before testing the structural relationships. Items with outer loadings below the recommended threshold were removed to improve measurement quality. The retained indicators were then evaluated using Cronbach's alpha, rho_A, composite reliability, and average variance extracted. The construct reliability and

convergent validity results are presented in **Table 1**. Most constructs achieved acceptable reliability and convergent validity. Competitive pressure, complexity, government support, and top management attitude recorded strong composite reliability values. Although the composite reliability of e-commerce adoption was slightly below 0.70, it remained close to the acceptable level for exploratory research. All AVE values exceeded 0.50, indicating adequate convergent validity. The measurement model was sufficiently reliable for further structural model assessment [27].

Table 1. Construct reliability and convergent validity.

CONSTRUCT	CRONBACH'S A	RHO_A	COMPOSITE RELIABILITY	AVE
Competitive Pressure	0.939	0.945	0.954	0.805
Complexity of E-commerce	0.875	0.904	0.908	0.665
E-Commerce Adoption	0.498	0.870	0.686	0.679
Government Support	0.887	0.682	0.865	0.579
Perceived Benefits	0.664	0.572	0.726	0.572
Top Management Attitude	0.893	0.905	0.921	0.701

Discriminant validity was assessed using the Heterotrait-Monotrait ratio. The HTMT results are presented in **Table 2**. all HTMT values were below the conservative threshold of 0.85. The highest value was 0.78. The constructs were empirically distinct from one another. Collinearity was also not problematic because the inner and outer VIF values were below the recommended threshold of 5.0. Therefore, the model was suitable for hypothesis testing.

Table 2. Heterotrait-Monotrait ratios.

CONSTRUCT	CP	COMP	ECOM	GOV	PB	TMA
Competitive Pressure	—					
Complexity	0.74	—				
E-Commerce Adoption	0.77	0.71	—			
Government Support	0.08	0.11	0.15	—		
Perceived Benefits	0.18	0.16	0.18	0.21	—	
Top Management Attitude	0.74	0.70	0.78	0.08	0.23	—

The structural model explained 57.0% of the variance in e-commerce adoption, with an R^2 value of 0.570. The model also demonstrated predictive relevance, with a Q^2 value of 0.327. The TOE-based model has strong explanatory and predictive power in explaining e-commerce adoption among Sri Lankan SMEs. The structural model results and hypothesis testing are presented in **Table 3**. Three of the five hypotheses were supported. Competitive pressure had the strongest positive effect on e-commerce adoption, followed by top management attitude and complexity. Sri Lankan SMEs are more likely to adopt e-commerce when they face pressure from competitors, when business leaders are supportive, and when they are willing to engage with more advanced or demanding digital systems. In contrast, perceived benefits and government support did not significantly influence e-commerce adoption. Competitive pressure emerged as the strongest predictor of e-commerce adoption. SMEs adopt e-commerce mainly because they face market pressure from competitors and changing customer behavior. When competitors move into online sales, digital marketing, and online payment systems, SMEs may feel compelled to adopt e-commerce to avoid losing market share. The e-commerce adoption in Sri Lankan SMEs is often reactive and survival-driven

rather than purely opportunity-driven. Similar findings have been reported in prior studies showing that market pressure and competitor actions can strongly influence SME digital adoption [14, 22, 23].

Table 3. Structural model results and hypothesis testing.

NO	PATH	β	t-STATISTIC	p-VALUE	f^2	DECISION
H4	Competitive Pressure → ECOM	0.389	3.049	0.002	0.187	Supported
H3	Top Management Attitude → ECOM	0.258	2.656	0.008	0.117	Supported
H2	Complexity → ECOM	0.211	2.913	0.003	0.072	Supported
H5	Government Support → ECOM	0.099	0.929	0.354	0.013	Not supported
H1	Perceived Benefits → ECOM	-0.032	0.330	0.741	0.001	Not supported

Top management attitude also had a significant positive effect on e-commerce adoption. This confirms the importance of leadership commitment in SME digital transformation. In many SMEs, the owner-manager or senior management team controls strategic direction, resource allocation, employee support, and technology investment. When top management views e-commerce as important, adoption is more likely to occur and be sustained. This result is consistent with previous studies showing that leadership support is a key organizational driver of technology adoption in SMEs [6, 20, 21].

Complexity showed a significant positive effect on e-commerce adoption. This finding is noteworthy because complexity is often treated as a barrier in technology adoption studies. In this study, however, complexity appears to indicate strategic depth rather than resistance. SMEs that are willing to adopt more complex systems may be more serious about digital transformation, especially when e-commerce involves online payments, logistics, integrated platforms, and customer management systems. Some SMEs may interpret complexity as part of the investment required to compete effectively in digital markets [16, 19].

Perceived benefits did not significantly influence e-commerce adoption. This result challenges the assumption that SMEs adopt e-commerce mainly because they recognize its expected advantages. One possible explanation is that Sri Lankan SMEs may already understand the general benefits of e-commerce, but benefits alone are not enough to drive adoption when firms face financial, infrastructural, or capability constraints. Another explanation is that adoption may be driven more by competitive necessity than by rational benefit calculation. In such a context, firms adopt because they must remain competitive, not necessarily because they have fully evaluated expected gains.

Government support also did not significantly influence e-commerce adoption. Existing government initiatives may not be sufficiently visible, accessible, or relevant to SME needs. Although policy support, training, and digital infrastructure are important in principle, their effect may be limited if SMEs are unaware of available programs or if support mechanisms are difficult to access. Government support should be redesigned to be more practical, targeted, and easier for SMEs to use.

The e-commerce adoption among Sri Lankan SMEs is shaped primarily by environmental and organizational factors. Competitive pressure and top management attitude were more influential than perceived benefits and government support. This indicates that SME e-commerce adoption in Sri Lanka is not merely a technology decision but a strategic response

to market pressure and leadership commitment. The findings contribute to the TOE literature by showing that the relative strength of technological, organizational, and environmental factors may differ in developing-economy contexts.

5. CONCLUSION

This study examined the factors influencing e-commerce adoption among Sri Lankan SMEs using the TOE framework. Based on data from 155 SMEs and analysis using PLS-SEM, competitive pressure, top management attitude, and complexity significantly influence e-commerce adoption. In contrast, perceived benefits and government support do not show significant effects. The e-commerce adoption among Sri Lankan SMEs is driven mainly by market pressure and managerial commitment. SMEs appear to adopt e-commerce not only because of expected benefits, but because competitors and customers increasingly move toward digital channels. The significant effect of top management attitude also confirms that leadership support is essential for allocating resources, encouraging employees, and sustaining digital initiatives. The positive effect of complexity suggests that more demanding e-commerce systems may reflect strategic commitment rather than adoption resistance. SMEs that are serious about digital transformation may be willing to deal with complex systems because such systems provide stronger digital capability. Meanwhile, the insignificant effects of perceived benefits and government support suggest that awareness of benefits and institutional assistance alone may not be enough to encourage adoption. The study contributes to TOE-based e-commerce adoption literature by showing that environmental and organizational factors may be more influential than technological perceptions in a developing-economy SME context. Practically, SME managers should monitor competitive trends, strengthen leadership commitment, and invest in scalable digital systems. Policymakers should improve the visibility, accessibility, and relevance of government support programs for SME digitalization. Future studies may use longitudinal designs to examine how e-commerce adoption develops over time. Further research may also include additional factors such as digital literacy, financial capacity, cybersecurity readiness, customer readiness, and IT infrastructure quality. Comparative studies across sectors or countries may also provide deeper understanding of SME e-commerce adoption in developing economies.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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