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RESEARCH ARTICLE

Driving Competitiveness: How E-Marketplace Utilization Enhances SME Performance in Tanzania's Digital Economy

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ABSTRACT

Small and Medium Enterprises (SMEs) are of great importance to Tanzania in employment, income, and poverty reduction. Nevertheless, the utilization of e-marketplaces by SMEs remains limited, constraining their capacity to compete in the digital economy. This study examines the influence of technological, organizational, and environmental factors on e-marketplaces usage, the impact of such usage on SMEs' performance, and the mediating effect of e-marketplace utilization between these factors and performance. Drawing upon the Technology-Organization-Environment (TOE) framework, Diffusion of Innovations (DOI) theory, and Resource-Based View (RBV), this study validates an integrated model to explain the determinants of e-marketplace utilization and SME performance. Primary data were collected from 654 SME owners, CEOs, and managers across six regions of Tanzania using a structured questionnaire. The study employed the Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the measurement and structural research models. The findings reveal that technological, organizational, and environmental factors significantly and positively influence e-marketplaces utilization. E-marketplace use also positively affects SMEs' performance, and mediation analysis confirms that e-marketplace utilization is an important mechanism through which these contextual factors influence business performance. Theoretically, the study broadens the application of DOI, TOE, and RBV within the African SME context. Practically, the study provides policymakers, development agencies, and SME leaders with insights into how to help SMEs leverage e-marketplace platforms. The results reinforce the importance of investments in ICT infrastructure, digital skills, and institutional support to enhance e-marketplace utilization and strengthen SME competitiveness.

Contribution/Originality: This study is one of very few studies which have investigated how technological, organizational, and environmental conditions shape e-marketplace use and SME performance through an integrated TOE–DOI–RBV framework, providing rare empirical evidence from Tanzania and deepening understanding of digital adoption in resource-constrained economies.

1. Introduction

E-marketplace adoption in Tanzania remains underdeveloped compared to global trends (Shahid et al., 2023). Most electronic businesses are conducted informally through social networking platforms such as Facebook, Instagram, and WhatsApp, where customers pay via mobile money or upon delivery (Tongora, 2022). The outlook for e-marketplaces remains promising, driven by increasing internet penetration and evolving market forces (The United Republic of Tanzania, 2024). However, the sector face limited regulation and investment in payment systems and digital marketing (Osakwe, 2023). Advances in information and communication technology (ICT) have transformed global business practices (Ahi et al., 2022). The e-commerce market has become a $26.7 trillion industry, represents about 30% of global GDP and reflecting the centrality of digital trade in today's economy (UNCTAD, 2022). In contrast, Tanzania's digital economy remains in its early stage of development (The United Republic of Tanzania, 2024), indicating both an opportunity for Tanzanian small and medium enterprises (SMEs) to leverage e-marketplaces for growth.

SMEs are considered the backbone of economic growth, with a significant contribution to job creation, income generation, and poverty reduction in developing countries (Loo et al., 2025). In the Tanzanian context, SMEs have played a significant role across trade, manufacturing, and service sectors, promoting entrepreneurship and innovation (Mushi, 2024). Currently, SMEs account for over 90% of businesses in Tanzania and contribute about 35% of the national GDP, underscoring their vital role in economy (TanzaniaInvest, 2024). Nonetheless, Tanzanian SMEs face persistence challenges in adopting digital technologies and e-marketplaces, despite their potential to enhance competitiveness and market reach (Shahid et al., 2023; Tongora, 2022). Barriers to adoption include poor internet penetration, low digital literacy, and inadequate ICT infrastructure, as well as weak institutional support (Ismail, 2023; Mwighusa et al., 2022). At the firms level, budgetary constraints, skills shortages, and cybersecurity concerns further restrict adoption (Lwesya & Achanta, 2023; Matari, 2024). Moreover, environmental challenges, such as weak institutional support, ineffective regulatory frameworks, lack of competitive markets, corruption, and socio-cultural resistance, also hinder the diffusion of e-commerce across the country (Matari, 2024; Tongora, 2022).

Globally, e-marketplaces have become significant drivers of digital and economic development; however, their utilization remains limited in Tanzania (Shahid et al., 2023). Empirical evidence shows that e-marketplaces enhance SMEs' performance by reducing transaction costs, expanding customer bases, and fostering innovation (Hokmabadi et al., 2024; Mushi, 2024). Despite this potential, most existing research on SME e-marketplace adoption focuses on emerging economies, with little evidence from Africa, particularly Tanzania (Loo et al., 2025; Mushi, 2024). Exiting studies mostly focuses on ICT adoption in the general without analyzing how technological, organizational, and environmental factors interact to shape SMEs e-marketplaces

utilization in Tanzania. Moreover, while prior research identifies barriers to digital transformation, few studies examine how e-marketplaces usage mediates the relationship between these contextual factors and SME performance (Matari, 2024; Mushi, 2024). This gap limits both developing theory and development of evidence-based policy appropriate to Tanzania's context. To address these gaps, this study integrates the TOE framework, DOI, and RBV perspectives to examine how e-marketplace usage mediates the relationship between contextual factors and SME performance.

This study contributes to both theory and practice on SMEs development in Tanzania. Theoretically, it integrates the TOE framework, DOI theory, and RBV to explain how technological, organizational, and environmental factors influence e-marketplace utilization and SMEs' performance, addressing gaps that single-theory approaches overlook. Practically, the study informs policymakers, development agencies, and SME stakeholders by identifying key barriers for e-marketplace utilization, and by proposing measures to increase e-marketplace utilization. The findings further guide SME owners and managers on how to leverage e-marketplaces to improve operational efficiency, competitiveness, and market access.

1.1. Research Objectives

i. To examine the influence of technological, organizational, and environmental factors on e-marketplace usage among SMEs in Tanzania.
ii. To examine the impact of e-marketplace usage on SME performance.
iii. To examine the mediating role of e-marketplace usage in the relationship between technological, organizational, and environmental factors and SME performance outcomes.

2. Literature Review

2.1. Theoretical Foundation

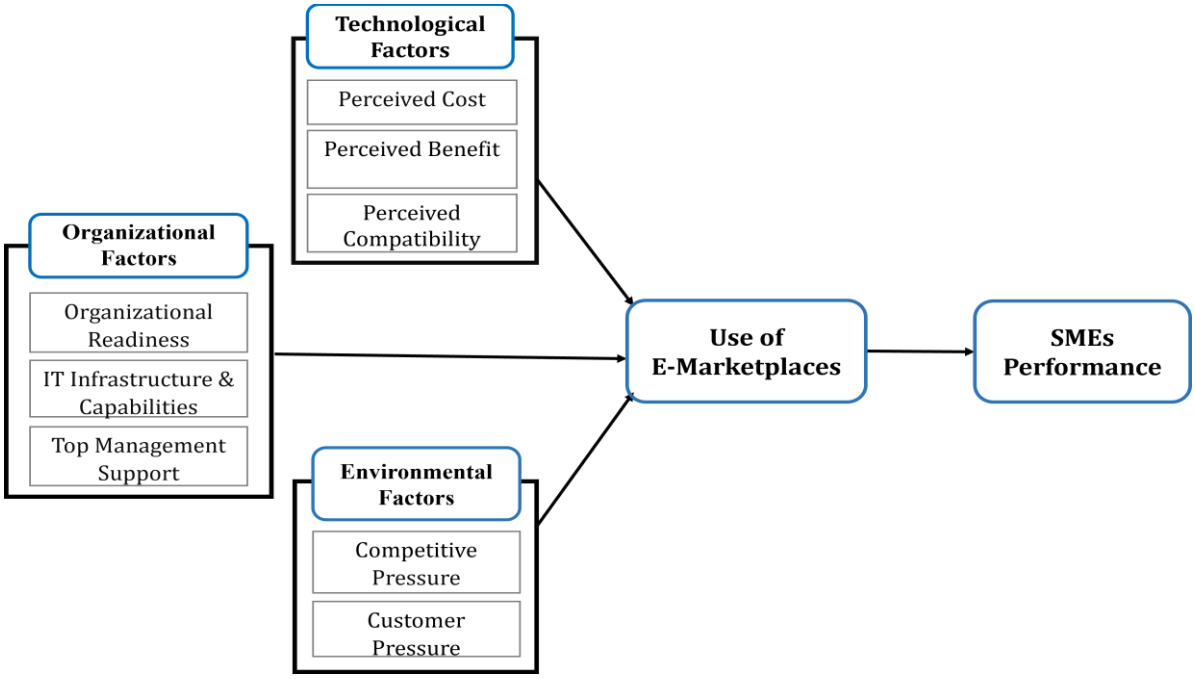
The study employed three key theories: the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990), Diffusion of Innovation (DOI) (Rogers, 1995; Rogers, 2003), and the Resource-Based View (RBV) (Barney, 1991) to examine SME performance in relation of e-marketplace utilization. Each theory contributes a distinct complementary perspective, collectively providing a comprehensive foundation for analyzing how technological, organizational, and environmental factors influence e-marketplace usage and performance outcomes. The DOI theory explains the how technological characteristics such as perceived cost, perceived benefit, and perceived compatibility influence SME's adoption decisions (Hussain et al., 2022; Hussain et al., 2021; Lutfi et al., 2022). The TOE framework extends this by incorporating organizational and environmental contexts. In this study organizational readiness, IT infrastructure, and top management support define the organizational dimension, while customer demands and competitive pressures represent the environmental dimension (Omrani et al., 2022; Qalati et al., 2022; Qalati et al., 2021). Thus, TOE enables a multi-contextual understanding of adoption beyond innovation characteristics. The RBV theory complements these perspectives by emphasizing internal resource as sources of sustained competitive advantage. In this regard, e-marketplace constitute valuable and strategic resources that SMEs can leverage to enhance their competitiveness and improve performance (Elia et al., 2021; Mushtaq et al., 2022).

Collectively, the three theories provide a holistic basis: DOI accounts for the characteristics of technology adoption, TOE situates adoption in organizational and environmental perspectives, and RBV ties adoption with organizational resources and competitive advantage. Therefore, combining TOE, DOI, and RBV increases the explanatory quality of the research by mitigating the disadvantages of treating each framework separately (Hussain et al., 2022). DOI theory, on the one hand, is very powerful at explaining characteristics of innovation, but it neglects broader organizational and environmental contexts. TOE builds on this gap by combining organizational preparedness, managerial support, and external pressures, thus extending the analysis (Mushtaq et al., 2022; Omrani et al., 2022). Similarly, TOE is criticized for overlooking the extensive role of managerial and resource-based capabilities (Qalati et al., 2022); therefore, RBV adds strength to the framework by correlating adoption decisions with sustained performance outcomes from internal resources (Mushtaq et al., 2022; Qalati et al., 2021). This incorporation is necessary since SMEs' engagement with e-marketplaces is not determined by one dimension (Cano et al., 2023). Jointly employing these theories, this study not only elucidates "why" SMEs embrace e-marketplaces but also clarifies "how" these decisions lead to performance enhancement that can be quantified (Hossain et al., 2021). Moreover, this holistic perspective is compatible with the intricate nature of SMEs' role in Tanzania's digital economy context, where both environmental pressures and resource capacities combine to influence the SMEs' performance (Mushi, 2024; Ringo et al., 2023).

2.2 Extended Conceptual Model of TOE, DOI, and RBV Theories

This study expands the prior theoretical model by proposing an extended conceptual model, illustrated in Figure 1, which maps lower-order constructs (LOCs) into higher-order constructs (HOCs) based on the TOE, DOI, and RBV theories.

Figure 1: Extended TOE Model into Conceptual Framework



Perceived cost, perceived benefit, and perceived compatibility reflect technological influences, aligning with DOI's innovation characteristics. Organizational factors include

organizational readiness, IT infrastructure and capability, and top management support, consistent with TOE's focus on readiness and management positions. External factors encompassing competitive and customer pressures align with TOE's external influences. These three HOCs (technological, organizational, and environmental factors) shape e-marketplace, which mediates between contextual TOE factors and SME performance.

The RBV model contributes to this understanding by situating e-marketplace adoption as a strategic resource that improves SME competitiveness and long-term performance. E-marketplaces serve as a mediator because they transform TOE factors' inputs into tangible performance outcomes. From the perspective of the RBV, e-marketplace adoption functions as a strategic capability that enables SMEs to leverage resources more efficiently and gain a competitive advantage (Elia et al., 2021; Mushtaq et al., 2022). By facilitating access to wider markets, improving operational efficiency, and lowering transaction costs, e-marketplaces bridge the gap between internal capacities and external pressures, ultimately driving financial and non-financial performance improvements (Cano et al., 2022; Deng et al., 2020; Jayanti & Darma, 2024). Thus, adoption is mediated by converting contextual readiness into sustainable organizational performance (Hatammimi & Purnama, 2022; Jayanti & Darma, 2024). Thus, the model extends theory, showing that adoption is not merely a reaction to technology and environment but also a resource-based approach for increasing performance.

2.3. Constructs' Literature Review

2.3.1. SMEs Performance

SME performance refers to the pursuit of financial and non-financial outcomes in a competitive market (Ahinful et al., 2023; Youssef et al., 2023). Quantitative benchmarks include earnings, profitability, liquidity, productivity, and market share, while qualitative benchmarks include innovation, customer satisfaction, employee behavior, and leadership effectiveness (Ngoc Khuong et al., 2022). Performance is considered not only as an output but also as an indication of the organization's level of resources, resilience, and adaptability (Li et al., 2023; Zhou et al., 2023). In developing economies like Tanzania, SMEs are essential for job generation and poverty reduction (Mushi, 2024; TanzaniaInvest, 2024), making their performance a crucial area of investigation. SMEs use digital tools like e-marketplaces to improve efficiency, reduce operational costs, and increase market reach, resulting in enhanced performance (Budisusila et al., 2024; Gilton et al., 2023). Consequently, SME performance is conceptualized in this study as a multidimensional construct linking operational, financial, and innovative outputs with long-term competitiveness.

2.3.2. E-marketplace

An e-marketplace is a digital platform on which buyers and sellers exchange goods, services, and information, transforming traditional commerce into effective digital transactions (Deng et al., 2020; Jayanti & Darma, 2024). For SMEs, the benefits of using e-marketplaces include reduced transaction costs, improved access to new markets, and better customer relationships (Cano et al., 2023; Noviaristanti & Huda, 2022). SMEs' use of e-marketplaces demonstrates how deeply digital platforms are integrated into core value activities such as sales, marketing, logistics, and payments (Costa & Castro, 2021). E-marketplaces enable smaller firms to compete with larger firms by offering them real-time information and enhanced visibility (Hatammimi & Purnama, 2022). This study

conceptualizes the use of e-marketplaces as a mediating variable and a digital capability that links contextual factors to SME performance outcomes.

2.3.3. Technological Factors

Technological factors refer to the perceived attributes of innovations that affect SMEs' decision technology adoption (Rogers, 2003). Key factors include perceived benefits such as cost savings, efficiency, and market expansion (Hussain et al., 2022; Qalati et al., 2022); compatibility with existing systems and practices leading to smoother integration and less resistance (Low et al., 2022; Qalati et al., 2022); and perceived costs, which remain a major constraint given SMEs' limited resource (Huang et al., 2025). Collectively, these perceptions guide how SMEs assess digital opportunities and influence their willingness to adopt e-marketplaces. In this study, they are conceptualized as the technological higher-order construct (HOC) influencing e-marketplace adoption and, indirectly, SME performance.

2.3.4. Organizational Factors

Organizational factors include the internal resources and conditions that affect SMEs' ability to adopt new technologies (Huang et al., 2025). These include top management support, which reflects leadership commitment and resource allocation toward innovation, both of which are essential for business performance (Hussain et al., 2020; Low et al., 2022); organizational readiness, reflected in financial, human, and supportive infrastructure to facilitate technological transformation (Ramdani et al., 2022); and IT capability, which strengthens internal expertise and digital skills, thereby reducing dependence on external specialists (Shakina et al., 2021). Collectively, these factors represent the strategic orientation and operational capacity of SMEs to embrace digital transformation, directly influencing e-marketplace adoption and indirectly enhancing business performance.

2.3.5. Environmental Factors

Environmental factors represent the external conditions shaping the extent to which SMEs adopt e-marketplaces (Akbar et al., 2022; Qalati et al., 2022). Key factors include competitive pressures that reflect the extent to which rival strategies compel SMEs to innovate and embrace digital platforms (Noviaristanti & Huda, 2022). Similarly, customer pressures, as modern consumers expect digital engagement, improved service quality, and swift responsiveness (Chau et al., 2020; Fitriani et al., 2023; Miao et al., 2022). These forces create both opportunities for growth and risks of exclusion, compelling SMEs to adapt quickly to remain competitive (Chabalala et al., 2024). In this study, environmental factors are conceptualized as external drivers that directly influence e-marketplace usage and indirectly shaping SME performance by aligning institutional and market demands with technological strategies (Minjie et al., 2025).

2.4. Hypothesis Development

2.4.1. Technological, Organizational, and Environmental Factors and E-marketplace Usage

Technological factors are fundamental in shaping the decision of SMEs to adopt e-marketplaces. According to the DOI theory (Rogers, 2003), factors such as relative advantage, compatibility, and perceived costs strongly affect adoption behavior. Relative advantage captures the perceived benefits of adopting e-marketplaces, including

improved efficiency, cost savings, and access to new markets (Deng et al., 2020; Rachmad et al., 2022). Compatibility emphasizes the alignment of new technologies with existing organizational practices and norms, which makes adoption smoother and less disruptive (Chege & Wang, 2020). On the other hand, high adoption costs act as barriers, particularly for SMEs in resource-constrained contexts like Tanzania. Empirical studies are inconclusive: some report strong effects of technological attributes, while others demonstrate weak or insignificant relationships (Jayanti & Darma, 2024; Noviaristanti & Huda, 2022). Thus, technological readiness remains a decisive but context-dependent determinant of e-marketplace usage. Thus, it is hypothesized that this study:

H1: Technological factors influence the use of e-marketplaces.

Organizational factors represent the internal conditions, resources, and managerial orientations that determine SMEs' ability to adopt and implement e-marketplaces (Huang et al., 2025). Support from top management is particularly critical as it signals commitment, aligns digital transformation with strategic goals, and ensures resource allocation (Deng et al., 2020; Shree et al., 2021). Organizational readiness, defined by financial strength, skilled personnel, and infrastructure, directly influences adoption, while firms lacking such resources often delay or avoid adoption (Osakwe, 2023; Ramdani et al., 2022). Evidence suggests that firms with IT infrastructure and competent staff adapt more effectively, whereas those without face inefficiency and low adoption rates (Hussain et al., 2022). Thus, organizational factors act as crucial drivers of e-marketplace adoption.

H2: Organizational factors influence the use of e-marketplaces.

Environmental factors capture the external pressures, such as competitive pressure and customer demands, that shape SME adoption of e-marketplaces (Akbar et al., 2022). Competitive pressures compel SMEs to innovate and adopt digital platforms to remain relevant in crowded markets (Ocloo et al., 2020). Similarly, customer expectations for fast, digital, and reliable services act as a catalyst for e-marketplace participation (Fitriani et al., 2023). Comparative studies show variations across contexts, suggesting that environmental factors exert a stronger influence in competitive, digitally mature markets (Noviaristanti & Huda, 2022; Deng et al., 2020). Overall, environmental conditions create both opportunities and pressures that accelerate or hinder e-marketplace usage.

H3: Environmental factors influence the use of e-marketplaces.

2.4.2. Use of e-marketplaces and SME performance

E-marketplace usage directly impacts SME performance across both financial and non-financial dimensions (Cano et al., 2022). Beyond traditional indicators such as profit and turnover, contemporary performance measures emphasize customer satisfaction, innovation, and operational efficiency (Hossain et al., 2021). Participation in e-marketplaces allows SMEs to overcome geographical barriers, expand their client base, and reduce transaction costs, which collectively enhance competitiveness and sustainability (Noviaristanti & Huda, 2022). Evidence from Kenya, Nigeria, and South Africa confirms that adoption fosters growth, resilience, and innovation (Gilton et al., 2023; Osakwe, 2023; Tongora, 2022). For Tanzanian SMEs, where structural barriers

and high attrition rates persist (Mushi, 2024), e-marketplaces provide a strategic avenue for survival and long-term competitiveness. Accordingly, this study hypothesizes:

H4: E-marketplaces influence the performance of SMEs.

2.4.3. Mediating Role of E-Marketplace Usage Between TOE Factors and SME Performance

E-marketplaces serve as crucial mediators linking technological factors to SME performance (Jayanti & Darma, 2024). While technological readiness shapes adoption decisions, the real impact on performance emerges once SMEs actively engage in e-marketplace transactions (Hossain et al., 2021). For instance, perceived benefits such as efficiency, cost reduction, and better customer engagement only translate into measurable outcomes when firms utilize digital platforms (Deng et al., 2020; Hossain et al., 2021). Empirical studies confirm that e-marketplaces provide SMEs with market access, data analytics, and improved decision-making capacity, all of which enhance competitiveness and profitability (Gilton et al., 2023; Misra et al., 2022). However, barriers such as high costs and inadequate ICT infrastructure constrain Tanzanian SMEs, limiting adoption and reducing performance outcomes (Hendricks & Mwapwele, 2024; Tongora, 2022). Thus, while technological factors create the foundation, it is through e-marketplace usage that SMEs realize improvements in efficiency, market reach, and survival, making the mediating role of e-marketplaces essential.

H5: E-marketplace usage mediates the relationship between technological factors and SMEs' performance.

Organizational factors, such as managerial support, readiness, and IT infrastructures and capability, strongly influence whether SMEs adopt e-marketplaces, and this adoption mediates their eventual impact on firm performance (Koe & Sakir, 2020). For instance, management commitment signals resource allocation and lowers resistance to change, but the benefits of these efforts are realized only when firms actively use e-marketplaces (Deng et al., 2020; Islam et al., 2020). Through e-marketplace participation, SMEs gain operational efficiencies, reduce costs, enhance customer relationships, and improve strategic flexibility (Misra et al., 2022). Empirical evidence shows that firms with innovation and resource readiness adopt faster and achieve better performance, while those lacking capacity or IT skills struggle to translate readiness into results (Hussain et al., 2022; Qalati et al., 2022). In Tanzania, where financial and human resources are often limited, e-marketplaces provide a means of leveraging organizational strengths into measurable performance outcomes, highlighting their vital mediating role (Tongora, 2022).

H6: E-marketplace usage mediates the relationship between organizational factors and SMEs' performance.

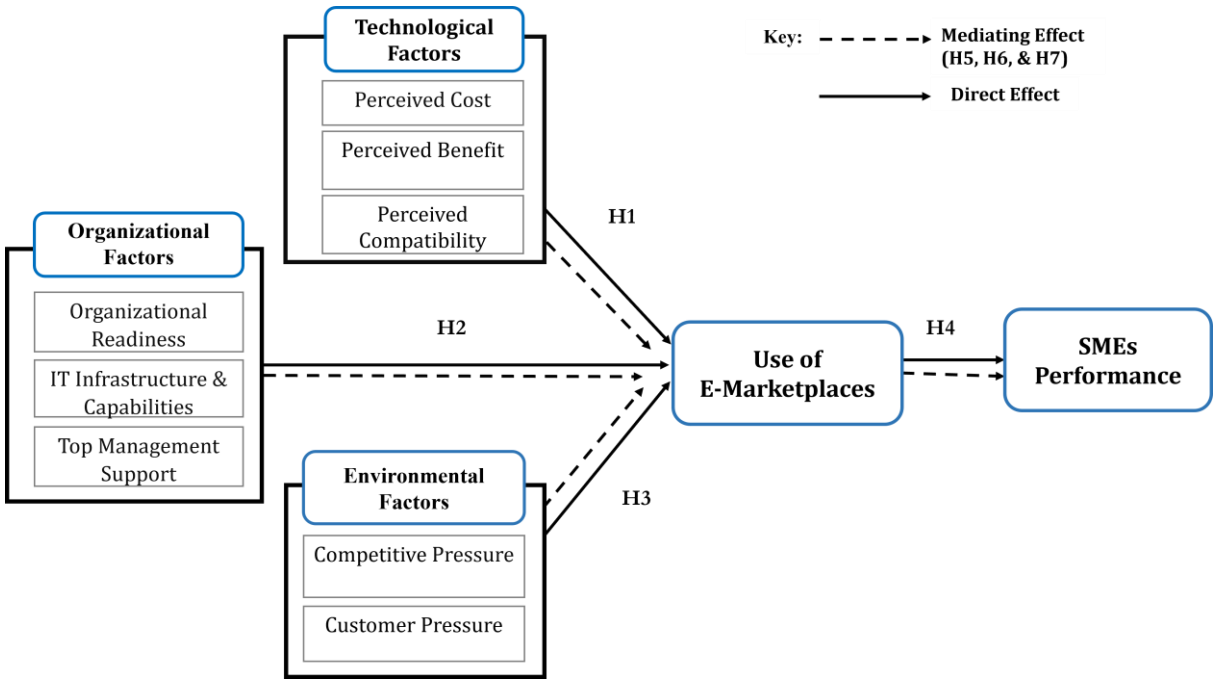
Environmental conditions exert a significant indirect influence on SME performance through e-marketplace usage (Hossain et al., 2021). External pressures, such as competitive pressure and customer demands, encourage SMEs to adopt e-marketplaces (Cano et al., 2022). However, the tangible effects, such as expanded market reach, improved efficiency, and enhanced customer satisfaction, are realized only through active participation in these platforms (Costa & Castro, 2021; Hossain & Azam, 2023). For instance, supportive policies and incentives lower barriers to entry, but without adoption, SMEs cannot leverage these opportunities. Similarly, competitive and customer

pressures push firms towards innovation, but performance outcomes depend on actual engagement in digital trade (Misra et al., 2022). In Tanzania, challenges like weak regulation and infrastructural gaps impede adoption, reducing the positive impact of external pressures (Moshi et al., 2023). Nevertheless, when adoption occurs, SMEs are able to diversify income streams, expand customer bases, and reduce transaction costs (Budisusila et al., 2024). Thus, e-marketplace usage acts as a critical mediator, converting environmental opportunities into improved performance outcomes (Hossain & Azam, 2023).

H7: E-marketplace usage mediates the relationship between environmental factors and SMEs' performance.

Figure 2 illustrates the conceptual framework depicting the hypothesized relationships.

Figure 2: Conceptual Framework – Hypotheses



3. Research Methods

This study employs the quantitative research design approach. The reason for selecting the quantitative method is based on its advantages in measuring the relationship between variables and testing hypotheses generated by existing theories (Wambugu & Njoroge, 2022). The study is based on a deductive approach, where hypotheses are inductively developed based on the TOE, DOI, and RBV models, which are then tested. A cross-sectional design is appropriate since it facilitates data gathering at a single point, which will be used to investigate SMEs' adoption behaviors and performance consequences within the context of Tanzania's digital economy. This method is effective for examining cause-and-effect relationships and is popular for technology adoption models. These dimensions of the research, including its objectivity and generalizability, enable findings to contribute to the advancement of theoretical models, academic literature, and policy measures (Nardi, 2018). The research design maintains construct validity via systematic evaluation and aligns effectively with the study objectives of theory testing and operational application. A structured questionnaire was used to

collect data from SMEs across six regions of Tanzania: Dar es Salaam, Mwanza, Mbeya, Morogoro, Arusha, and Dodoma. These regions were selected based on high economic activities, population size, and availability of digital infrastructure (Diao et al., 2020; Ministry of Finance, 2023). The study targeted SME owners, CEOs, and senior managers as respondents, given their authority in strategic decision-making related to digital adoption and organizational performance.

The research population was approximately 65,274 SMEs across the six regions. Sample size determination was done using the proportionate sampling technique using Krejcie and Morgan (1970) formula. Due to the absence of a national SME registry, purposive and convenience sampling methods were utilized to include knowledgeable respondents. Data collection employed both physical distribution (drop-off and pick-up) and online surveys. A total of 1819 questionnaires were distributed to SMEs in the six regions, and 722 completed questionnaires were collected, resulting in an approximately 40% response rate. However, 68 questionnaires were omitted due to concerns regarding biased responses that could undermine the integrity of this study. Therefore, a total of 654 valid questionnaires were retained for analysis following the screening process.

The research instrument was adapted from validated scales measuring technological factors, organizational factors, and environmental factors; e-marketplace usage; and SME performance (Chau et al., 2020; Deng et al., 2020; Gibbs & Kraemer, 2004; Mohtaramzadeh et al., 2018; Nguyen et al., 2022; Odoom et al., 2017; Qalati et al., 2022; Soto-Acosta et al., 2016), using a 7-point Likert scale. Expert review and pilot testing ensured content validity and clarity. Reliability was confirmed through Cronbach's alpha and Composite Reliability (CR), both above 0.70, while convergent and discriminant validity were established using AVE, Fornell–Larcker, and HTMT criteria.

Data preparation involves several stages to ensure accuracy and usability. Completed questionnaires are first screened for completeness, and missing responses are handled through data cleaning procedures. Inconsistent or outlier responses are identified and addressed to prevent distortions in the analysis. As data relies on self-reported surveys, common method bias (CMB) is a potential concern (Podsakoff et al., 2024). To mitigate this, the questionnaire was carefully designed to reduce ambiguity and avoid leading or socially desirable responses. Anonymity was assured to encourage honest participation, and items were randomized to limit response patterns. Statistically, Harman's (1967) single-factor test is applied to check whether a single factor accounts for the majority of variance, with results confirming no significant CMB. Additionally, full collinearity variance inflation factor (VIF) checks are performed, with all values below the conservative threshold of 3.3. These steps ensure that CMB does not compromise the study's validity (Hair et al., 2019; Polas, 2025).

Coded responses are then entered into statistical software, where preliminary checks for normality, reliability, and validity are performed. The data is further transformed into formats compatible with SmartPLS 4 for Structural Equation Modeling (SEM). These steps guarantee robust and reliable datasets for meaningful analysis. The study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4 to analyze data. PLS-SEM is appropriate for this study because it supports exploratory models and accommodates non-normal data distributions (Hair et al., 2019). The analysis proceeds in two stages. First, the measurement model is evaluated by assessing reliability, convergent validity, and discriminant validity. Indicators such as Cronbach's alpha, Composite Reliability, and Average Variance Extracted (AVE) are used, along with

Fornell–Larcker (1981) and HTMT criteria (Sarstedt et al., 2023). Second, the structural model is assessed through path coefficients, R^2 values, effect sizes (f^2), and predictive relevance (Q^2). Mediation analysis tests the role of e-marketplace usage between TOE factors and SME performance. This method provides a rigorous framework for testing hypotheses and drawing meaningful conclusions (Hair et al., 2019; Sarstedt et al., 2023).

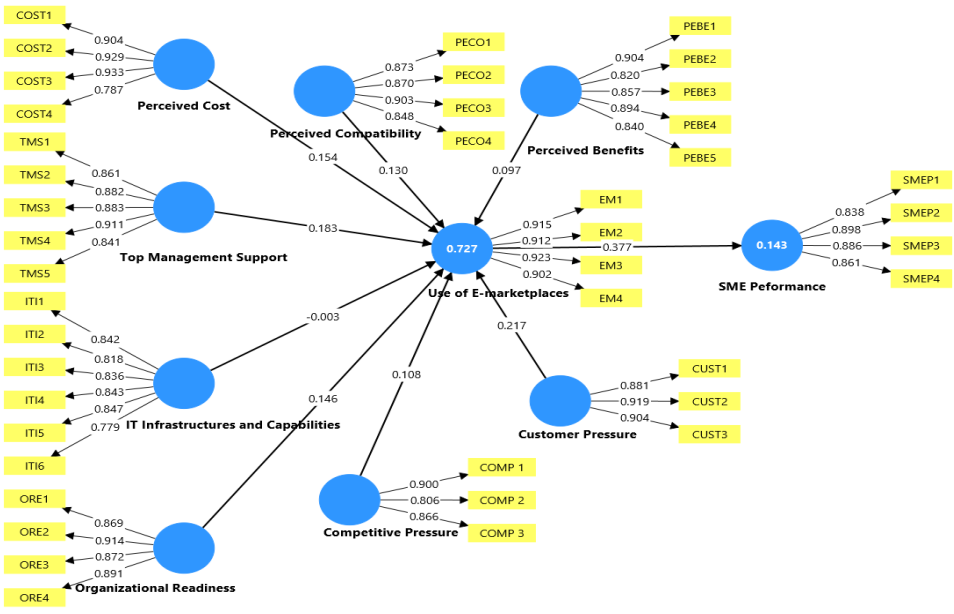
4. Results

The PLS-SEM analysis was conducted to evaluate both the measurement and structural models for understanding the determinants of SMEs' use of e-marketplaces and their subsequent performance. In this process, both higher-order constructs (HOCs) and their corresponding lower-order constructs (LOCs) were analyzed to ensure that the multidimensional nature of the TOE framework was properly captured (Sarstedt et al., 2019). The measurement model assessment established construct reliability, validity, and discriminant validity through factor loadings, Cronbach's alpha, composite reliability, and AVE values (Hair et al., 2019). The structural model was then examined using path coefficients, t-statistics, and R^2 values to test hypotheses. Results confirmed significant direct and indirect relationships among environmental, organizational, and technological factors, e-marketplace usage, and SME performance (Hair et al., 2019; Sarstedt et al., 2023).

4.1. Lower Order Constructs (LOCs) Analysis

The assessment of the lower-order constructs (LOCs); perceived cost, perceived benefit, and perceived compatibility under technological factors (HOC); organizational readiness, IT infrastructure/capabilities, and top management support under organizational factors (HOC); and competitive pressure and customer pressure under environmental factors (HOC) confirmed that the foundational measures of the study were reliable and valid. As shown in Figure 3, all outer loadings exceeded the 0.70 threshold (Hair et al., 2019), indicating that items contributed meaningfully to their respective constructs. Reliability indicators were likewise strong, demonstrating internal consistency across all dimensions.

Figure 3: LOC – Outer Loadings Assessment Model



Cronbach's alpha values (as shown in Table 1) ranged from 0.823 to 0.933, exceeding the recommended threshold of 0.70 and confirming internal consistency across constructs (Hair et al., 2019). Moreover, composite reliability (CR) values ranged from 0.893 to 0.952, further supporting measurement reliability. In addition, the average variance extracted (AVE) values for each LOC were above 0.685, satisfying the 0.5 criteria and confirming convergent validity (Hair Jr et al., 2017). Collinearity statistics indicated no multicollinearity issues, with VIF values ranging between 1 and 5 (Hair et al., 2019). Furthermore, effect size (f^2) analysis revealed small but meaningful effects for customer pressure (0.065) and top management support (0.041), while IT infrastructure and capabilities and organizational innovativeness exhibited negligible effects. The largest effect size was observed for e-marketplace usage (0.166), indicating its central role in linking antecedents with SME performance.

Table 1: Lower-Order Construct Statistical Evaluation

Construct/Variables (LOCs)	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	VIF Values	f^2
Perceived Benefits	0.915	0.936	0.746	2.832	0.012
Perceived Compatibility	0.896	0.928	0.763	2.719	0.023
Perceived Cost	0.912	0.938	0.793	2.640	0.033
Top Management Support	0.924	0.943	0.767	3.010	0.041
Organizational Readiness	0.909	0.936	0.786	2.203	0.035
IT Infrastructures and Capabilities	0.908	0.929	0.685	1.864	0.000
Competitive Pressure	0.823	0.893	0.736	1.748	0.024
Customer Pressure	0.884	0.929	0.812	2.641	0.065
Use of E-marketplaces	0.933	0.952	0.834	1.000	0.166
SME Performance	0.894	0.926	0.759		

These results collectively confirm the robustness of the LOC measurement model. Each construct exhibited strong psychometric properties, providing a solid basis for subsequent analyses at the higher-order construct (HOC) level. By establishing reliability, convergent validity, and the absence of multicollinearity at the LOC level, the study ensures a sound foundation for higher-order assessments (Sarstedt et al., 2019). This strengthens the credibility of the structural relationships tested later, as reliable indicators enhance confidence that observed effects are substantive rather than artefacts of measurement error (Hair et al., 2019).

4.2. Higher-Order Construct (HOC) Analysis

After the satisfactory assessment of the LOCs, the analysis proceeded to assess the higher-order constructs representing technological, organizational, and environmental factors. The reflective-reflective measurement method was used to create a model of the HOCs, allowing the aggregation of conceptually related LOCs into broader latent dimensions. This step was necessary for capturing the multidimensional nature of the TOE framework and ensuring that the second-order constructs adequately reflected their respective lower-order components. The results of the HOC evaluation further verified the reliability and validity of these overarching dimensions, thereby strengthening the structural integrity of the entire measurement model. Additionally, all indicators of reliability and validity satisfied the established thresholds. Cronbach's alpha

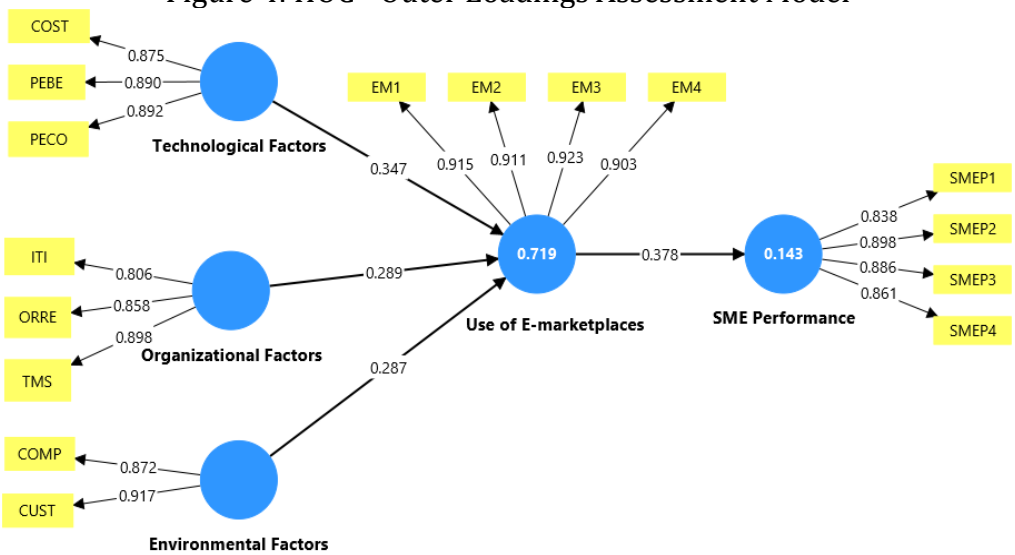
values ranged from 0.753 to 0.933, and composite reliability values ranged from 0.889 to 0.952, indicating strong internal consistency (Crocetta et al., 2021). Additionally, AVE values ranged from 0.680 to 0.834, supporting convergent validity. Collinearity statistics (VIFs 1.000–3.890) demonstrated the absence of multicollinearity issues, thereby affirming the robustness of the HOC measurement model (Hair et al., 2019; Sarstedt et al., 2023) (see Table 2).

Table 2: Higher-Order Construct Statistical Evaluation

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	VIF Values	R^2	f^2	Q^2
Environmental Factors	0.753	0.889	0.800	2.488		0.114	
Organizational Factors	0.842	0.894	0.680	3.890		0.078	
SME Performance	0.894	0.926	0.759		0.143		0.183
Technological Factors	0.863	0.916	0.785	3.801		0.108	
Use of E-marketplaces	0.933	0.952	0.834	1.000	0.719	0.166	0.713

The higher-order construct (HOC) model demonstrated robust and reliable outer loadings across all dimensions. As shown in Figure 4, technological, organizational, and environmental factors, as well as e-marketplace use and SME performance, exhibited loadings over 0.80, therefore confirming robust measurement and convergent validity for each construct (Hair et al., 2019).

Figure 4: HOC - Outer Loadings Assessment Model



Discriminant validity was examined using both HTMT ratios (Henseler et al., 2015) and Fornell-Larcker criteria (Fornell & Larcker, 1981). Table 3 results indicate that HTMT values were below the recommended threshold of 0.90, and the Fornell-Larcker results demonstrated that the square roots of AVE values (see Table 4) exceeded inter-construct correlations, supporting discriminant validity. These results confirm that the higher-order constructs are empirically different and credible representations of their

corresponding lower-order dimensions, providing a solid basis for subsequent structural model analysis.

Table 3: Heterotrait-Monotrait Ratio (HTMT) – Matrix Assessment

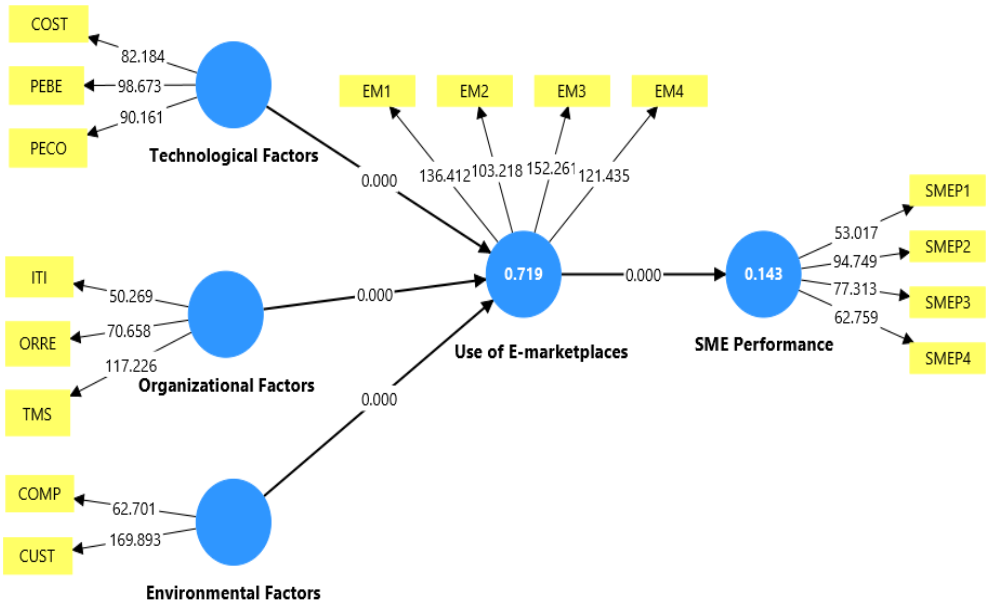
Constructs	Environmental Factors	Organizational Factors	SME Performance	Technological Factors
Organizational Factors	0.927			
SME Performance	*0.458*	*0.518*		
Technological Factors	0.907	0.986	*0.468*	
Use of E-marketplaces	*0.890*	*0.887*	0.413	*0.887*

Table 4: Fornell-Larcker criterion Assessment

Constructs	Environmental Factors	Organizational Factors	SME Performance	Technological Factors	Use of E-marketplaces
Environmental Factors	0.895				
Organizational Factors	0.746	0.824			
SME Performance	0.384	0.450	0.871		
Technological Factors	0.739	0.842	0.412	0.886	
Use of E-marketplaces	0.754	0.791	0.378	0.797	0.913

As shown in Figure 5, the model demonstrates substantial explanatory power for e-marketplace usage, with an R^2 value of 0.719.

Figure 5: Structural Model – T-statistics



This indicates that technological, organizational, and environmental factors collectively explain about 72% of the variance in e-marketplace adoption, highlighting their strong influence in shaping SMEs' digital adoption decisions, consistent with the TOE

framework. In contrast, SME performance shows a lower explanatory power (R^2 = 0.143), suggesting that while contextual factors drive adoption, performance gains depend on firm-specific resources and capabilities. This finding aligns with the RBV theory, which posits that the competitive value of technology adoption is realized only when firms possess and leverage unique internal capabilities.

The results presented in Table 5 indicate that all hypothesized relationships were statistically significant and supported. Technological, organizational, and environmental factors exhibited significant positive effects on e-marketplaces utilization (β = 0.341, 0.293, and 0.284, respectively; $p < 0.001$), thereby confirming their importance in facilitating SMEs' digital adoption. Furthermore, the use of e-marketplaces significantly influenced SME performance (β = 0.378, $p < 0.001$). Mediation analysis indicated significant indirect effects of technological, organizational, and environmental factors on SME performance through e-marketplace usage (β = 0.129, 0.111, and 0.107; $p < 0.001$), highlighting the mediating role of e-marketplace adoption in linking contextual factors to firm performance.

Table 5: Direct and Indirect Effects Statistical Result

Constructs and Relationship	Path Coefficients (β)	Standard deviation	T statistics	P values
Technological Factors → Use of E-marketplaces	0.341	0.044	7.817	0.000**
Organizational Factors → Use of E-marketplaces	0.293	0.046	6.317	0.000**
Environmental Factors → Use of E-marketplaces	0.284	0.039	7.287	0.000**
Use of E-marketplaces → SME Performance	0.378	0.037	10.225	0.000**
Technological Factors → Use of E-marketplaces → SME Performance	0.129	0.020	6.320	0.000**
Organizational Factors → Use of E-marketplaces → SME Performance	0.111	0.021	5.225	0.000**
Environmental Factors → Use of E-marketplaces → SME Performance	0.107	0.019	5.774	0.000**

Significance level – *P*-value: <0.050**

5. Discussions

The structural model evaluation examined the proposed relationships between technological, organizational, and environmental factors and SME performance through e-marketplace utilization. The findings indicate that technical factors have a significant positive influence on the use of e-marketplaces (β = 0.341, t = 7.817, $p < 0.001$). This means that SMEs' use of e-marketplaces is greatly influenced by how they perceive benefits, costs, and compatibility with their existing operations. According to the TOE and DOI frameworks, perceived benefits such as increased efficiency and a wider market reach make the relative advantage of adoption more compelling (Sánchez et al., 2025; Truong, 2022). Conversely, perceived compatibility and reduced costs mitigate uncertainty and change resistance (Hossain & Azam, 2023). These results indicate that the utilization of e-marketplaces among SMEs is mostly influenced by perceived usefulness and contextual relevance, rather than the ownership of advanced technological resources. However, consistent with prior studies (Cano et al., 2022;

Hossain et al., 2021), perceptions alone may not ensure sustained use without supportive external conditions such as reliable digital infrastructure, favorable regulation, and institutional encouragement.

Table 5 shows that organizational factors significantly positively influence the use of e-marketplaces (β = 0.293, t = 6.317, $p < 0.001$). This finding highlights the central role of internal resources, especially top management support, organizational innovativeness, and internal organizational readiness, in enabling SMEs to utilize e-marketplaces. In line with the TOE framework and Resource-Based View (RBV), these factors represent valuable organizational capabilities that improve strategic alignment, experimentation, and readiness in integrating new technologies (Huang et al., 2025; Pratama, 2024; Sánchez et al., 2025). Consequently, SMEs characterized by proactive leadership, sufficient resources, and a culture that fosters innovation are more inclined to effectively use e-marketplaces. However, previous research (Hatta et al., 2025; UNCTAD, 2022) indicates that organizational readiness alone may not guarantee adoption without complementary external enablers such as supportive policies, infrastructure, and financial mechanisms. These findings confirm that organizational capabilities are necessary but insufficient for sustained digital adoption among SMEs.

Moreover, the findings indicate that environmental factors have a significant positive influence on the use of e-marketplaces (β = 0.284, t = 7.287, $p < 0.001$). This finding highlights the significance of external factors, such as competitive pressure and customer demand, in influencing SMEs' use of e-marketplaces. Consistent with the TOE framework, environmental readiness serves as a significant driver prompting firms to use e-marketplaces to maintain competitiveness and respond to market demands (Cano et al., 2023; Hatammimi & Purnama, 2022). In emerging economies like Tanzania, where SMEs often lack strong internal resources (Mushi, 2024), conducive market conditions are crucial for boosting e-marketplace utilization. Conversely, high market uncertainty, inadequate infrastructure, and weak institutional frameworks can constrain participation in digital platforms (International Trade Administration, 2024; International Trade Centre, 2023; UNCTAD, 2022). This finding indicates that while internal readiness is crucial, external enablers ultimately determine whether environmental pressures translate into digital opportunities or structural impediments for SMEs.

The finding indicates that e-marketplace usage has a strong and significant positive impact on SME performance (β = 0.378, t = 10.225, $p < 0.001$). This result suggests that SMEs leveraging e-marketplaces can enhance operational efficiency, reduce costs, and expand market reach, hence improving competitiveness (Budisusila et al., 2024; Truong, 2022). Consistent with the TOE and RBV frameworks, this relationship reflects how the use of technology, when aligned with internal capabilities, leads to enhanced organizational performance. The TOE framework contextualizes e-marketplaces within the broader environmental and organizational contexts that facilitate digital transformation, while RBV explains how firms convert technological utilization into valuable resources that generate competitive advantage (Liu et al., 2021; Wang et al., 2023). These findings align with previous research indicating that digital platform engagement fosters innovation, market diversity, and value creation (Cano et al., 2022; Deng et al., 2020; Li et al., 2022). However, evidence from emerging economies indicates that performance gains are contingent upon supplementary factors, such as digital skills, infrastructure, and strategic readiness (Larabi, 2025; Shakina et al., 2021). Thus, e-marketplace utilization may improve performance, but only if the firms can properly

integrate digital technologies effectively within their operational and strategic frameworks (Jayanti & Darma, 2024).

The mediation analysis revealed that the use of e-marketplaces significantly mediates the relationships between technological, organizational, and environmental factors and SME performance. Technological factors had a positive indirect effect on SME performance (β = 0.129, t = 6.320, p < 0.001). This suggests that SMEs that recognize greater technological benefits, lower costs, and enhanced compatibility are more likely to use e-marketplaces, thereby achieving efficiency improvements and market growth. Similarly, organizational factors demonstrated a positive indirect effect on SME performance (β = 0.111, t = 5.225, p < 0.001), indicating that top managerial support, internal organizational readiness, and capabilities contribute to performance through the use of e-marketplaces. Likewise, environmental factors also exhibited a significant mediating effect (β = 0.107, t = 5.774, p < 0.001), indicating that competitive pressures and customer demand drive firms toward e-marketplace utilization, thereby enhancing performance. The model was specified as fully mediated, indicating that contextual factors influence performance exclusively through e-marketplace use, which aligns with the theoretical assumption that digital adoption serves as the primary mechanism connecting contextual readiness to firm performance (Huang et al., 2025). This design aligns with the integrated perspective of the TOE, DOI, and RBV frameworks. TOE and DOI explain how perceived technological advantages and contextual pressures drive adoption, while RBV clarifies how firm-specific resources transform adoption into competitive advantage (Hussain et al., 2022; Hussain et al., 2020; Truong, 2022). Consistent with prior research (Huang et al., 2025; Wang et al., 2023), the findings emphasize that digital participation alone is insufficient; sustained performance necessitates the integration of technological readiness, organizational capability, and conducive environmental conditions to create value through e-marketplace utilization.

6. Conclusion

This study contributes to understanding the influence of technological, organizational, and environmental factors on e-marketplace utilization and the mediating role of such adoption on SMEs' performance in Tanzania. The results infer that SMEs' engagement with the e-marketplaces is not exclusively influenced by perceived technological benefits and compatibility but also organizational readiness, IT capability, and environmental pressures. The mediating effect of e-marketplace use indicates that digital platforms are strategic resources to change the SMEs' operations and competitiveness. The study theoretically contributes to literature that technological, organizational, and environmental factors influence SME performance indirectly through the support of digital adoption (e-marketplace usage), which extends the application of the combined theories. This study deepens understanding of SME performance in the digital economy. It further addresses the limitations of single theories and provides a broader perspective for technology acceptance in low-resource settings. This study highlights that technology adoption depends not only on organizational but also environmental factors. From a literature perspective, this study contributes to the limited body of research on digital adoption in Africa. Overall, this study validates an extended conceptual model and offers context-specific empirical insights into SME digital transformation.

5.1. Theoretical Implications

Theoretically, the study enhances the integration of the TOE, DOI, and RBV frameworks by demonstrating that technology adoption and performance improvement depend on both perceptual enablers and internal capabilities within supportive external conditions. This integrated model enhances understanding of digital transformation in resource-constrained contexts and expands the existing literature on technology adoption in Sub-Saharan Africa, especially Tanzania, where empirical evidence remains limited. Overall, the study provides a contextually grounded framework explaining how SMEs can convert digital adoption into competitive advantage and sustainable performance

5.2. Policy Implications

The study offers relevant implications for policymakers, development institutions, and SME stakeholders. The findings highlight several key measures: First, the findings indicate that technological, organizational, and environmental factors influence SME adoption of e-marketplaces and performance. Policymakers should prioritize building the enabling digital infrastructure. Cost-effective and reliable internet connections, along with efficient cybersecurity policies, can strengthen SMEs' trust in using e-marketplaces. This issue is especially significant in Tanzania, where SMEs face challenges including high expenses, threats to security, and inadequate ICT skills.

Development organizations should focus on the importance of SME-targeted capacity-building programs. Training in digital skills and e-marketplace management can enable SMEs to use these platforms for expanding market reach and competitiveness. Development partners could also encourage more extensive and effective collaboration initiatives between local SMEs and global e-marketplace operators, providing opportunities for cross-border trades. In addition, these initiatives support SME growth and contribute to the country's revenue and job creation. Industry associations should advocate for supportive policies and regulations. The outcome includes streamlined digital trade processes, improved payment systems, and legal frameworks that cover consumer protection and dispute resolution. Continued public and private sector collaboration is critical for building trust in digital platforms and for SMEs to access government help.

For managers, CEOs, and makers, the implications point towards a reorientation towards digital transformation. Business leaders need to mainstream e-marketplace adoption into core business models and invest in the latest IT infrastructure and cybersecurity technologies, all while ensuring employees on the frontlines can utilize e-marketplaces. CEOs need to instill a culture of digital readiness, that nurtures innovation and ability, so they can rapidly react to competitive and customer pressures. Entrepreneurs need to harness e-marketplaces for more than just selling, for better data, engaging the customer, and accessing broader markets. Businesses that proactively invest in these initiatives are effectively setting themselves up for consistent growth and long-term relevancy.

Finally, policy intervention should extend beyond infrastructure to strengthen organizational readiness. Governments and development partners can introduce financial incentives such as digital adoption grants or tax incentives to offset technology costs, alongside programs that enhance managerial and entrepreneurial capabilities.

Coordinated policy action can accelerate digital adoption and increase SMEs' contribution to inclusive economic growth

5.3. Limitations and Recommendations

Despite its contributions, this study has several limitations that could be further explored in future research. First, the cross-sectional design restricts causal interpretation; future studies could employ longitudinal designs to investigate how SME performance evolves with e-marketplace utilization over time. Second, the study focused on Tanzanian SMEs, which limits the generalizability of findings across different nationalities. Therefore, comparative studies across other African countries or other developing economies would help identify context-specific determinants of e-marketplace utilization in emerging economies, as institutional, infrastructural, and cultural differences often shape the technological, organizational, and environmental conditions influencing SME digital adoption. Therefore, addressing these limitations will enhance theoretical precision and offer broad perspectives on how SMEs sustain digital transformation and competitiveness in emerging markets.

Ethics Approval and Consent to Participate

Ethical clearance was obtained from Universiti Tunku Abdul Rahman (UTAR) and the Tanzania Commission for Science and Technology (COSTECH), and informed consent was secured from all participants.

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Conflict of Interest

The authors declare there are no conflicts of interest

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