

THE EFFECT OF TECHNOLOGY-ORGANIZATION-ENVIRONMENT FACTORS ON SMES' PERFORMANCE: A CONCEPTUAL PAPER

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Abstract: *This study proposes a framework based on the Technological, Organizational, and Environmental (TOE) framework in examining the performance of small and medium-sized enterprises (SMEs) in Malaysia. Using this framework, the study will assess the impact of ICT infrastructure, relative advantage, top management support, and government support on Malaysian SME performance. These variables were selected based on their relevance to Malaysia's current digital transformation agenda and their demonstrated significance in prior studies on innovation adoption and SME development. The findings aim to contribute to the limited literature on SME performance in emerging markets and provide practical insights into how TOE-related factors can enhance business outcomes.*

Keywords: *TOE framework, SMEs, firm performance, technological factors, organizational factors, environmental factors.*

Introduction

Small and Medium-sized Enterprises (SMEs) are recognized as critical contributors to economic development, particularly in developing nations. Globally, SMEs account for around 90% of businesses and over 50% of employment, contributing up to 40% of GDP in emerging economies (World Bank, 2019). In Malaysia, SMEs play an increasingly vital role, with more than 1.15 million SMEs contributing 38.2% to national GDP and employing over 48% of the workforce as of 2021 (DOSM, 2020; 2021). According to SME Corp Malaysia (2020), Malaysian SMEs are defined as manufacturing firms with annual sales under RM 50 million and fewer than 200 full-time employees, and services firms with sales under RM 20 million and fewer than 75 employees, as per Table 1:

Table 1: Definition of Malaysian SMEs by Category.

Classification	Sector			
	Manufacturing		Service and Other Sectors	
	Annual Sales	Number of Employees	Annual Sales	Number of Employees
Micro	< RM300,000	< 5 people	< RM300,000	< 5 people
Small	RM300,000 < RM15 mil	From 5 to < 75 people	RM300,000 < RM3 mil	From 5 to < 30 people
Medium	RM15 mil ≤ RM50 mil	From 75 to ≤ 200 people	RM3 mil ≤ RM20 mil	From 30 to ≤ 75 people

Source: SME Corp Malaysia. (2020).

SMEs face growing challenges in maintaining competitiveness amid rapid digital transformation (Rajala et al., 2023), yet many continue to struggle with digital transformation despite its proven impact on performance (Verhoef et al., 2021). Despite significant national efforts to advance the ICT sector in Malaysia, including infrastructure improvements and regulatory reforms, digital adoption among SMEs remains limited. Although broadband penetration and e-commerce contributions reached 11.5% of GDP in 2020 (DOSM, 2021), about 77% of SMEs still lack adequate ICT tools, with only 53.9% maintaining an online presence as of 2019 (SME Corp Malaysia, 2021). Advanced technologies like cloud computing and analytics are used mainly by firms in urban areas, while many others continue to rely on traditional operations.

According to the Department of Statistics Malaysia (DOSM, 2022), SMEs contributed 37.4% to the national GDP in 2021, a slight decrease from 38.1% in 2018. However, their nominal GDP increased from RM547.3billion in 2020 to RM572.6billion in 2021. Despite their significance, the sector suffered during the COVID-19 pandemic, especially in 2020, when economic activities were heavily affected by the Movement Control Order (Ramdan et al., 2022). This led to a sharper GDP contraction of 7.3% for SMEs, surpassing the overall national decline of 5.6% and the 4.6% drop among non-SMEs (DOSM, 2021).

Literature Review

Performance is essential for SMEs to remain competitive (Efrat et al., 2018). It generally refers to an organization's ability to achieve its goals effectively (Laitinen, 2002). Both financial and non-financial metrics are used to assess business performance, with financial indicators often

highlighting competitive advantage (Chen, Tsou, & Huang, 2009). According to Sarkees et al. (2010), performance evaluation can involve objective data, subjective judgments, or both.

Evaluating firm performance effectively involves both financial and non-financial indicators, as the latter often play a crucial role in shaping strategic decisions (e.g., Houck et al., 2012). Financial performance is commonly evaluated using indicators such as sales turnover, transaction volume, and operating profit. In this study's proposed framework, financial performance is assessed with an emphasis on sales volume, drawing on the approach used by Galeazzo (2021). Non-financial performance measures performance that does not involve monetary terms and it includes measures related to innovation, employee performance, operational efficiency, and marketing effectiveness. Specifically, it evaluates aspects such as customer satisfaction, customer loyalty, and brand equity, according to Kyazze et al. (2020). Following Ghobakhloo and Azar (2017), this study will evaluate SMEs' non-financial performance using indicators like customer satisfaction and brand equity.

The TOE Framework (Technology–Organization–Environment)

This study is guided by the Technology-Organization-Environment (TOE) framework developed by Tornatzky and Fleischer (1990), which outlines three core dimensions influencing a firm's innovation adoption: technological, organizational, and environmental. The technological dimension involves both current and emerging tools relevant to the business. The organizational component includes internal elements such as firm size, structure, and resource capacity, while the environmental context accounts for external forces like regulatory frameworks, competitive dynamics, and market trends.

Unlike models such as the Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI), the TOE framework provides a more comprehensive organizational perspective for understanding how firms adopt innovation (Rogers, 1995; Qalati et al., 2022). Its broad applicability has been demonstrated across sectors and countries. For instance, Mahakittikun et al. (2021) applied TOE to mobile payment adoption in Thai firms, linking improved operations and customer engagement to technological and environmental enablers.

The TOE model is especially pertinent to SMEs. Prior studies have validated its utility in examining innovation uptake in small businesses (Eze et al., 2021). Skafi et al. (2020), for example, integrated TOE with DOI to explore cloud technology adoption in Lebanese SMEs, accounting for contextual constraints. Even in volatile environments, the TOE framework has proven valuable for offering strategic insight into SME innovation behaviors (Sethi et al., 2020). Moreover, Qalati et al. (2020) demonstrated its effectiveness in linking social media use to SME performance, emphasizing the importance of technological attributes, internal leadership, and environmental competitiveness. Based on its versatility and empirical relevance, this study adopts the TOE framework to investigate how technological, organizational, and environmental factors affect SME performance in the Malaysian context.

ICT infrastructure is widely recognized as a strategic technology asset that supports digital transformation and enhances firm competitiveness. In terms of technology context, AlBar and Hoque (2019) emphasized the importance of ICT infrastructure and technological competencies in influencing technology adoption among SMEs and large enterprises. Similarly, Bin-Obaidellah et al. (2023) highlighted ICT infrastructure as a critical driver of

organizational performance. Other scholars, such as Awamleh and Ertugan (2021) and Li et al. (2020), echoed this view, with Li et al. (2020) specifically noting its role in unlocking growth opportunities for micro and small enterprises in developing nations.

Organizational characteristics such as workforce structure, revenue, and leadership style are key drivers of business performance, with top management support playing a central role in promoting innovation (Qalati et al., 2021). Within the TOE framework, top management support is often used as a key indicator of the organizational dimension (Chatterjee & Kar, 2020; Maroufkahni et al., 2023). Specifically, studies in Malaysia highlight that leadership commitment and entrepreneurial orientation are essential for improving SME performance (Abu Bakar et al., 2019). Ali Qalati et al. (2020) further confirmed a strong link between leadership involvement and firm performance.

External environmental factors play a crucial role in shaping the performance of small and medium-sized enterprises (SMEs) by influencing the broader challenges and opportunities they face. This study focuses on government support as the primary environmental variable affecting SME performance. Government initiatives are vital in fostering innovation and facilitating technology adoption among firms. El-Haddadeh et al. (2021) noted that government support increases managerial awareness and readiness to adopt data-driven technologies like big data analytics. Studies by Qalati et al. (2020) and Ali et al. (2020) also demonstrated that a supportive external environment, including government facilitation, positively impacts SME performance. This aligns with broader research emphasizing the environmental context as a key determinant of SME success (Asad et al., 2020).

Research Gap

Digital transformation holds significant potential to boost SME performance, yet challenges such as inadequate infrastructure, limited resources, and resistance to change remain (Matarazzo et al., 2021). The TOE framework, introduced by Tornatzky and Fleischer (1990), categorizes adoption influences into technological, organizational, and environmental contexts. It has been widely used to study innovation across sectors, including SMEs (Iranmanesh et al., 2023; Effendi et al., 2020). However, limited research has examined how specific TOE factors—such as relative advantage, ICT infrastructure, top management support, and government assistance—impact Malaysian SMEs performance. This study addresses that gap by focusing on Selangor-based SMEs, where digital infrastructure is stronger, but adoption remains inconsistent. Targeting strategic-level respondents (CEOs and top managers), it offers timely insights into digital strategies and performance outcomes. Although national initiatives like the Digital Economy Blueprint (Economic Planning Unit, 2021) promote digitalization, disparities in adoption may risk widening the digital divide if not addressed.

Conceptual Framework

Although individual studies have focused on specific tools—such as social media (Qalati et al., 2020), e-commerce (Hanifah et al., 2022), and blockchain (Bag et al., 2022)—few have adopted a holistic framework like TOE to study how multiple contextual factors together shape performance outcomes in Malaysian SMEs. By doing so, this research not only contributes to academic knowledge but also offers practical insights for policymakers and business leaders aiming to foster more inclusive digital growth.

Empirical evidence supports the claim that robust ICT infrastructure improves organizational efficiency and decision-making capabilities. According to Mwantimwa (2019), firms with strong ICT systems are better equipped to interpret environmental data for strategic decisions. However, as per Bin-Obaidellah et al. (2023), multiple studies confirmed the positive relationship between ICT infrastructure and firm performance. Additionally, Mushtaq, Gull, and Usman (2022) observed that SMEs using ICT tools intensively experience higher productivity and improved access to financial resources.

The concept of relative advantage—defined as the perceived benefit of a new technology over existing alternatives—is another key technological factor. Firms are more likely to adopt innovations when they perceive clear advantages (Ali Abbasi et al., 2022). Chatterjee et al. (2020) supported this, finding that positive perceptions of innovation drive adoption among SMEs. In developing contexts, relative advantage plays a critical role, as shown by Qalati et al. (2022). Supporting examples include Wong et al.'s (2020) study on blockchain adoption in Malaysian SMEs and Effendi et al.'s (2020) research on social media use in Indonesia. As cited by Fu et al. (2024), Eze et al. (2021) also stressed the role of both internal and external experiences in shaping SMEs' innovation perceptions. Based on these insights, hypothesis H1 is proposed:

H1: Technological factors positively influence the performance of SMEs.

The role of top management is widely recognized as a key driver of firm performance, particularly in SMEs where decision-making authority is often centralized with senior leaders (e.g., Amoako et al., 2024; Teh et al., 2024). In these settings, strategic orientation and a positive perception of innovation at the leadership level can significantly influence business outcomes. According to Hiran and Henten (2019), top management engagement in innovation signals a strong commitment to improving firm performance. Their involvement includes resource allocation, aligning innovation with long-term goals, and fostering adaptability—a critical approach for SMEs aiming to remain competitive in fast-changing markets. Therefore, this study focuses on top management support as the key organizational factor, leading to hypothesis H2:

H2: Organizational factors positively influence SMEs' performance.

In terms of government support's effect on SMEs, findings are mixed, as reviewed by Nugroho et al. (2024). Meanwhile, research by Park et al. (2020) and Alkahtani et al. (2021) found a positive correlation between government assistance and SME performance. Other studies report that inadequate or ineffective support remains a significant barrier for many SMEs (Hanggraeni, 2021). Despite these challenges, government initiatives have been recognized as critical in driving digital transformation, particularly in enabling SMEs to adopt e-commerce and related technologies (Chang & Wong, 2010). Such support is essential for SMEs to adapt to rapidly changing markets and technological advances. Overall, evidence suggests that well-designed and effectively implemented government support can substantially improve SME performance (Park et al., 2020). Based on this, the study formulates hypothesis H3:

H3: Environmental factors positively influence SMEs' performance.

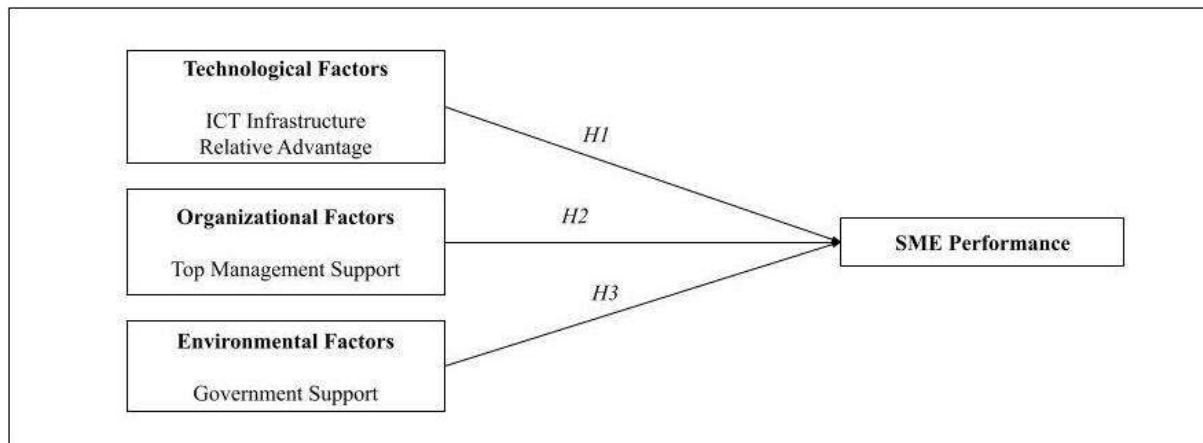


Figure 1: Proposed Model

Methodology

Guided by the TOE framework, the study focuses on technological (ICT infrastructure and relative advantage), organizational (top management support), and environmental (government support) factors to develop a comprehensive model of SME performance.

A quantitative research design is employed, targeting SMEs in Selangor, Malaysia—the region with the highest SME concentration, according to SME Corp Malaysia. Similar quantitative surveys have explored TOE factors and SME performance; for instance, Ali Qalati et al. (2021) studied TOE influences on social media adoption among Pakistani SMEs, and Bag et al. (2022) examined blockchain adoption factors in SMEs using a survey approach. These studies provide a foundation for the current framework.

Data collection will be carried out through a cross-sectional survey via self-administered questionnaires distributed online and offline to SMEs across all industries in Selangor. A minimum sample size of 66 was determined using G*Power software based on a power of 0.85 and an effect size of 0.20 (Cohen, 1992), compared to Structured Equation Modelling guidelines which recommend 100 to 400 respondents (Hair et al., 2021). Prior SEM-based studies on TOE adoption among SMEs used sample sizes between 205 and 381. A sample size of 66 participants may suffice for basic regression analysis with a power of 0.85 and a medium effect size, but is insufficient for SEM, where scholars recommend minimums ranging from 100 to 200+.

Therefore, this study is aiming to collect a robust sample size of 300 SMEs to ensure analytical reliability and comparability. CEOs and top managers were purposively sampled for their strategic roles and knowledge of firm performance, aligning with the study's objective to collect relevant insights. The sampling frame was derived from SME Corp Malaysia's official records and the SMEs Directory for Selangor. A screening question will be fielded to confirm respondents' eligibility; only CEOs or top managers are allowed to proceed, while others will be excluded during data cleaning. Constructs are measured using 7-point Likert scales ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree").

The research instrument will comprise two sections: the first section collects demographic and firm-related information such as gender, age, position, firm size, and primary industry sector;

the second section assesses the study's main constructs using 19 items adapted from validated literature. These include Relative Advantage (5 items) from Mamun (2018), ICT Infrastructure (3 items) from AlBar et al. (2019), Top Management Support (4 items) from Maroufkhani et al. (2023) and Maroufkhani et al. (2020), and Government Support (4 items) from Nguyen et al. (2022). SME performance is measured using three single-item indicators—Sales Volume, Brand Equity, and Customer Satisfaction—from Ahmad et al. (2019). A pilot test will be conducted to identify potential issues before full data collection.

Data will be analyzed using SPSS 29 for data cleaning and to perform descriptive analysis. Inferential data analysis will be carried out using SmartPLS 4. The reliability and validity of the measurement model will be determined together with data collinearity. The structural model's exploratory and predictive powers will be evaluated, and path coefficient analysis will be carried out to validate the proposed hypotheses of this study.

Conclusion

Discussion and findings from previous studies reveal that the Technology-Organization-Environment (TOE) framework offers a robust foundation for examining factors influencing SME performance. With the increasing demand for digital transformation in business operations, the expected findings from this study are anticipated to be valuable for academics, SME owners, and policymakers. The proposed framework aims to extend the TOE model beyond technology adoption to assess how technological, organizational, and environmental elements affect firm performance in the Malaysian SME context. These insights are expected to guide the development of strategic initiatives that support SME competitiveness and sustainability, ultimately contributing to broader economic development in Malaysia.

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