

Exploring the Impact of Digital Technology Adoption on SME Performance: A Systematic Literature Review

Dewi Sartika

Business and Management, Universiti Muhammadiyah Malaysia, ds106@umtk.ac.id

Abstract

Purpose: This study aims to systematically review the existing literature on the impact of digital technology adoption on small and medium-sized enterprise (SME) performance. Specifically, it identifies the dominant digital technologies, theoretical frameworks, research methodologies, and empirical evidence that explain how digital technology adoption contributes to SME performance.

Design/methodology/approach: A systematic literature review (SLR) was conducted by examining empirical studies published between 2011 and 2024. Relevant articles were identified through major academic databases, including ScienceDirect, Emerald, and Mendeley, using predefined search strategies and selection criteria. Following the screening process, ten peer-reviewed studies that directly examined the relationship between digital technology adoption and SME performance were selected for qualitative synthesis.

Findings: The review demonstrates that digital technologies, including cloud computing, e-commerce, social media, big data analytics, blockchain, digital accounting systems, and the Industrial Internet of Things (IIoT), positively influence SME financial and operational performance. The Technology–Organization–Environment (TOE) framework emerged as the most frequently adopted theoretical framework, often integrated with the Diffusion of Innovation (DOI), Technology Acceptance Model (TAM), and Resource-Based View (RBV). The findings further indicate that quantitative approaches, particularly questionnaire-based surveys analyzed using Structural Equation Modeling (SEM), dominate the existing literature, whereas qualitative and longitudinal studies remain limited.

Practical implications: The findings provide valuable insights for SME owners, policymakers, and digital transformation practitioners regarding the strategic role of digital technology adoption in enhancing business performance, improving competitiveness, and supporting digital economic development.

Originality/value: This review offers a comprehensive synthesis of the current literature by integrating technological, theoretical, methodological, and empirical perspectives on digital technology adoption and SME performance. It also identifies important research gaps and proposes directions for future research.

Paper type: Review paper

Keywords: Digital technology adoption, SME performance, systematic literature review, TOE framework, digital economy.

1. Introduction

Small and medium-sized enterprises (SMEs) play a pivotal role in driving economic growth, employment generation, and poverty alleviation, particularly in developing countries. As one of the main contributors to national economies, SMEs stimulate entrepreneurial activities, create employment opportunities, and support industrial development (Beck & Demircuc-Kunt, 2006; Abdullah et al., 2022). Given their significant economic contribution, improving SME performance has become a major concern for governments, policymakers, and researchers. In recent years, the rapid advancement of digital technologies has created new opportunities for SMEs to improve productivity, competitiveness, and long-term business performance.

Digital technology adoption has become an essential strategy for SMEs seeking to remain competitive in an increasingly dynamic business environment. The adoption of technologies such as cloud computing, e-commerce, social media, big data analytics, blockchain, and the Industrial Internet of Things (IIoT) enables SMEs to improve operational efficiency, enhance customer relationships, facilitate data-driven decision-making, and expand market access (Chavez et al., 2020; Samsudeen et

al., 2021; Pervin & Sarker, 2021; Tiwari et al., 2023). Consequently, digital technology adoption is increasingly recognised not merely as technological innovation but as a strategic organisational capability that supports business growth and competitiveness.

Recognising these strategic benefits, research on digital technology adoption has expanded considerably over the past decade. Previous studies have examined digital technology adoption across various organisational contexts, particularly SMEs, and reported diverse findings regarding its determinants and organisational outcomes (Setiowati et al., 2015; Asiaei & Rahim, 2019; Salah et al., 2019; Henao-Ramírez & López-Zapata, 2022; Al-Swidi et al., 2023; Kwarteng et al., 2024). Technology adoption research generally focuses on the organisational level rather than individual users, recognising that organisational decisions are influenced by technological, organisational, and environmental conditions (Abbasi et al., 2022; Bag et al., 2022; Shahzad et al., 2023). Consequently, the Technology–Organization–Environment (TOE) framework proposed by Tornatzky and Fleischer (1990) has become one of the most widely adopted theoretical frameworks for explaining digital technology adoption in SMEs (Asiaei & Rahim, 2019; Sivathanu, 2019; Abed, 2020; Lin et al., 2020; Mukherjee et al., 2024). Alongside the increasing adoption of digital technologies, numerous empirical studies have demonstrated that digital technology positively influences SME performance. Technologies such as e-commerce (Octavia et al., 2020; Akbar et al., 2022; Harini et al., 2023), fintech (Kurniasari et al., 2023), big data analytics (Lutfi et al., 2023), cloud computing (Khayer et al., 2021), digital accounting systems (Lutfi et al., 2022), and IIoT (Mukherjee et al., 2024) have consistently been associated with improvements in financial and non-financial performance, including operational efficiency, productivity, innovation capability, and market competitiveness. These findings suggest that digital technology adoption has become an important strategic resource for SMEs operating in the digital economy.

Despite the growing body of empirical evidence, the existing literature remains fragmented. Most previous studies have concentrated on specific digital technologies or particular industrial contexts, while relatively limited attention has been devoted to synthesising the overall evidence regarding how different digital technologies influence SME performance. Furthermore, previous studies have primarily emphasised empirical hypothesis testing, with limited discussion comparing the theoretical frameworks, methodological approaches, analytical techniques, and empirical findings employed across studies. As a result, there remains a need for a comprehensive synthesis that integrates existing knowledge and identifies research gaps to guide future research.

Therefore, this study conducts a systematic literature review to synthesise the existing literature on the impact of digital technology adoption on SME performance. Specifically, this review aims to identify the dominant digital technologies investigated in previous studies, examine the theoretical frameworks, methodological approaches, and analytical techniques employed by researchers, synthesise the empirical evidence regarding the relationship between digital technology adoption and SME performance, and identify research gaps that provide directions for future studies. By integrating previous empirical evidence, this study contributes to the literature in two important ways. First, it provides a comprehensive understanding of the current state of knowledge regarding digital technology adoption and SME performance from technological, theoretical, methodological, and empirical perspectives. Second, it offers practical insights for SME owners, policymakers, and researchers in developing more effective digital transformation strategies to enhance SME competitiveness and performance in the digital economy.

1.1. SMEs Performance

SMEs performance is widely recognised as a critical indicator of an enterprise's success in achieving its strategic and operational objectives. It encompasses both financial dimensions, such as sales growth, return on investment, and profitability, and non-financial aspects, including customer satisfaction, innovation capability and operational efficiency (Harini et al., 2023). According to Lutfi et al. (2022), the performance of SMEs is intricately linked to their capacity to leverage digital technologies, particularly in enhancing the accuracy of accounting information, improving decision-making processes, and streamlining business operations.

Octavia et al. (2020) further emphasised that SMEs performance is not only reflected through financial metrics but also through the firm's agility in responding to market dynamics, driven by entrepreneurial orientation and market orientation in the digital landscape. In a similar, Mahakittikun et al. (2021)

conceptualised firm performance as a multifaceted construct influenced by the adoption of technological innovations, where factors such as relative advantage innovativeness, and external support directly shape SMEs' ability to achieves superior performance outcomes.

1.2. *Digital Technology Adoption and SMEs Performance*

The adoption of digital technologies is not just a trend, but a necessity for businesses that want to meet the challenges of the modern economy and seize opportunities for growth and efficiency (Saad et al., 2022). SMEs tend to adopt digital technologies at varying levels, with some focusing on basic network technologies and others on more advanced data-processing technologies. The extent of adoption often depends on the perceived benefits and the specific needs of the business (Zhou & Zheng, 2023). Adopting digital technology in small and medium-sized enterprises (SMEs) is a strategic move that can significantly enhance their operational efficiency and market reach (Pervin & Sarker, 2021). SMEs must overcome several challenges in adopting digital technologies, including financial constraints, lack of skilled personnel, and inadequate IT infrastructure (Shahzad et al., 2023). Organisations are increasingly seeking to improve their performance through the use of digital technologies that facilitate and improve the exchange of information, transactions and coordination with trading partners (Marci, 2022). Some previous researchers have not measured the performance of SMEs after technology adoption (Ali Abbasi et al., 2022; Asiaei & Ab. Rahim, 2019; Kwarteng et al., 2024; Ramdani et al., 2013; Setiowati et al., 2015).

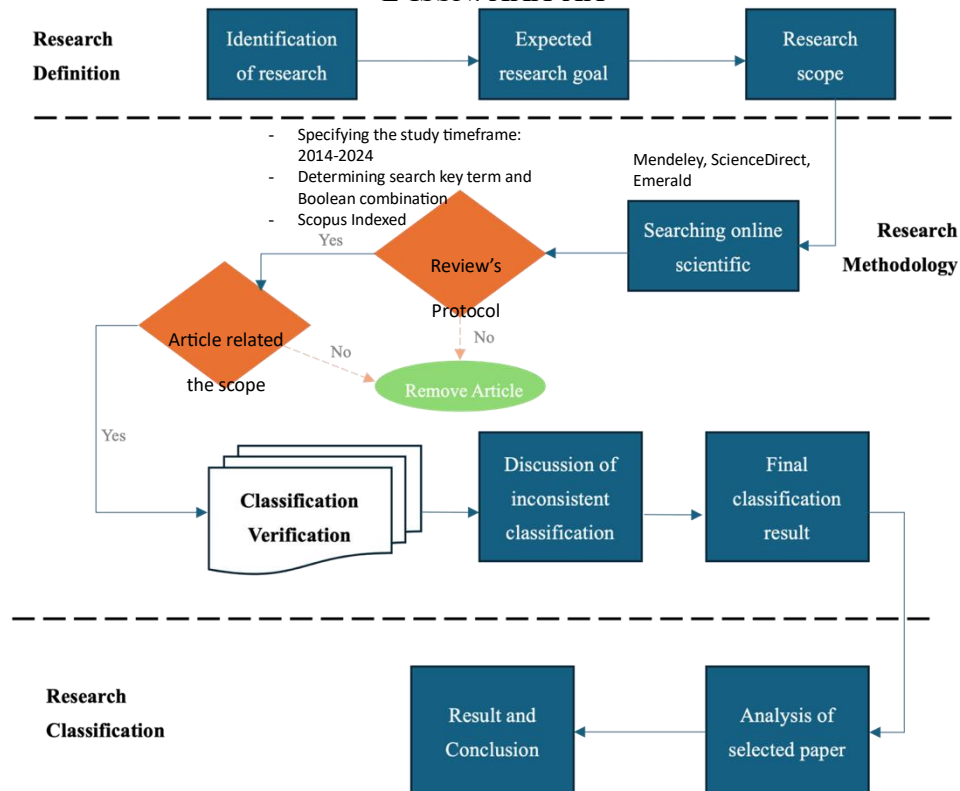
The TOE and DOI theories also do not seem to add measures of changes in SME performance after technology adoption. Recently, studies have been done analyses relationship digital technology adoption and SMEs performance (Lutfi et al., 2023; Mukherjee et al., 2024). Akbar et al., (2022) claimed that the usage of e-commerce has a significant and positive influence on firm performance, which includes better sales, increased efficiency, productivity, and improved coordination and collaboration. Similarly, Qalati et al., (2021) found a significant mediating role of SM adoption between technological impact and SME performance.

2. Research methodology

This systematic literature review used divided into three essential phases: research definition, research methodology, and research analysis, as depicted in Fig. 1. The first step has been started by determine the research area, the expected research goal, and the research scope (Ngai et al., 2011). Next phase is research methodology. In this phase we used for searching for and selecting articles and create a framework to classify the selected articles. The literature search process began with the creation of criteria to determine the articles to include in, or exclude from, our analysis. The systematic search was carried out on various online scientific database were selected: ScienceDirect, Emerald, Mendeley. Each article was carefully examined to ensure that it met the criteria.

For the final step "research classification and analysis" we analysed the selected articles to draw some conclusions and identify some future research directions. The guided question used were as follows:

- a. What theories are used?
- b. What kind of methods are used most often for research digital technology adoption and SMEs performance?
- c. What were the analysis technique used to evaluate the findings?
- d. What were the most analysis technique used?
- e. Which journal is the most significant?

**Figure 1. Systematic Literature Review Process**

Source(s): Authors' own creation

3. Literature search and review method

The literature search we employed Boolean expressions based on the descriptors (“digital adoption” AND “technology adoption” OR “digital technology adoption”) AND (“firm performance” OR “business performance” OR “SMEs performance”). From the result of the search, we identified 167 articles that met the criteria of being published between 2011-2024, open access, and indexed in Scopus and exclude the duplicate. However, this study only utilized 10 articles that discuss the direct correlation between digital technology adoption and SME performance.

4. Literature review

This section describes the literature review regarding the theories used, the methods used, and the analysis techniques used.

Table 1. Theories Used

<i>Theory Used</i>	<i>Frequency</i>	<i>Studies Conducted</i>
TOE	3	Nguyen et al. (2022) ; Mukherjee et al. (2024); Harini et al. (2023)
UTAUT, TOE	1	Khayer et al. (2019)
TOE, RBV	3	Lutfi et al. (2022); Marei (2022); Lutfi et al. (2023)
DOI, TOE, RBV	1	Akbar et al. (2022)
CT	1	Yu et al. (2017)

Source(s): Authors' own creation

4.1. DOI Theory

Diffusion is a type of social change, defined as the process by which changes occur in the structure and function of a social system. Social change occurs when new ideas are invented, disseminated, and accepted or rejected, leading to certain consequences. An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. A technology is a

design for an instrumental action that reduces the uncertainty in the cause and effect relationships that are involved in the achievement of a desired outcome (Rogers, 2003).

Diffusion of Innovation (DOI) theory by Rogers (2003) is a broad psychological or sociological theory used to explain patterns of adoption, describe the mechanism, and help predict whether and how a new technological invention will be successful (Ghobakhloo & Tang, 2013; Shahadat et al., 2023). The DOI introduces five innovation characteristics, such as innovation itself, adopters, communication channels, time and a social system that play an essential role in users' attitudes towards innovation adoption. This theory suggests that technology adoption is influenced by innovation characteristic factors such as relative advantage, compatibility, complexity, trialability and observability. These factors determine how quickly and effectively a new technology is adopted by potential users (Tiwari et al., 2023).

4.2. TOE Theory

The Technological-Organisational-Environmental (TOE) framework is a comprehensive model that examines technology adoption through three lenses: technological, organisational, and environmental contexts (Tiwari et al., 2023; Mahakittikun et al., 2021). This framework was developed by (Tornatzky & Fleischer, 1990) explained the innovation process in the context of an enterprise. This framework helps in understanding the multifaceted nature of technology adoption, considering not just the technology itself but also the organizational readiness and the external environment. In technology context the factor include of data security, technology readiness and cost saving. The technological context in the context of technology adoption comprises the adopter's view of the features of the technology. This view may have a big influence on whether or not to use the technology (Tiwari et al., 2023). Top management support, organizational readiness and innovativeness are the factors of organizational context.

4.3. RBV Theory

The Resource-Based View (RBV) theory, originally formulated by Barney (1991), has become one of the most influential frameworks in understanding the strategic management of organizational resources. Across different contexts including retail, traditional markets, and digital accounting RBV provides a coherent explanation of how internal resources and capabilities serve as enablers of performance enhancement.

In recent years, the RBV framework has been widely adopted to examine how firms leverage digital technologies to enhance performance and innovation. For instance, Lutfi et al. (2023) applied the RBV theory in conjunction with the Technology-Organization-Environment (TOE) framework to explore the adoption of big data analytics (BDA) in the retail sector. Their study revealed that the integration of BDA technologies as valuable and often inimitable resources contributes significantly to firm performance by enabling enhanced decision-making, operational efficiency, and innovation. Similarly, the work of Kurniasari et al. (2023) explored digital adoption among SMEs in Indonesia's traditional markets and grounded their analysis in RBV theory. These resources empower SMEs to overcome external pressures and remain competitive amidst rapid digital transformation. According to the authors, digital capabilities allow traditional SMEs to improve both performance and sustainability. In another application of RBV, Lutfi et al. (2022) examined the influence of digital accounting systems (DAS) on SME performance. The study concludes that effective DAS implementation significantly enhances decision-making and operational performance.

Table 2. Method utilised

<i>Method Used</i>	<i>Frequency</i>	<i>Studies Conducted</i>
Questionnaire	7	Octavia et al. (2020); Lutfi et al. (2022); Akbar et al. (2022); Nguyen et al. (2022); Mukherjee et al. (2024); Kurniasari et al. (2023); Harini et al. (2023)
Experiment	0	
Interviews	0	

Source(s): Authors' own creation

Previous studies used quantitative as their research method and questionnaire were the most commonly used data collection method. In contrast, no studies utilized experimental or interview

methods. This indicates a strong preference for quantitative approaches, particularly through the use of questionnaires, in the studies under review.

Table 3. Analysis techniques

<i>Techniques</i>	<i>Frequency</i>	<i>Studies Conducted</i>
SEM	7	Octavia et al. (2020); Lutfi et al. (2022); Akbar et al. (2022); Nguyen et al. (2022); Mukherjee et al. (2024); Kurniasari et al. (2023); Harini et al. (2023)
Multiple regression	0	
Logistic regression	0	

Source(s): Authors' own creation

As shown, Structural Equation Modeling (SEM) was the predominant analytical method, utilized in seven studies, namely those conducted by Octavia et al. (2020); Lutfi et al. (2022); Akbar et al. (2022); Nguyen et al. (2022); Mukherjee et al. (2024); Kurniasari et al. (2023); Harini et al. (2023). The study by Kurniasari et al. (2023) justified the use of SEM due to its capability to accommodate complex theoretical models that integrate multiple constructs from the Technology-Organization-Environment (TOE) framework and Resource-Based View (RBV). Given the exploratory nature of their research and the emphasis on predictive accuracy, SEM was identified as the most appropriate analytical method. Lutfi et al. (2022) highlighted the appropriateness of PLS-SEM in handling models that involve moderating variables and a relatively small sample size, which would not meet the assumptions required by covariance-based SEM approaches. In contrast, no studies were found to have used multiple regression or logistic regression.

Table 4. Result of Weight Analysis

<i>Author</i>	<i>Significant</i>	<i>Result</i>
Khayer et al. (2021)	Yes	The direct relationship of cloud computing adoption with FP is supported
Qalati et al. (2020)	Yes	This study describes the influence of social media (SM) adoption on SME performance in Pakistan
Akbar et al. (2022)	Yes	The integration of RBV and DOI within the TOE framework has provided valuable insights into how technology adoption particularly e-commerce can significantly enhance SMEs' performance
Marei, (2022)	Yes	The results indicate that relative advantage and organizational support play an important role in e-procurement adoption, which in turn enhances firm performance
Nguyen et al. (2022)	Yes	Online retailing (ORE) usage would make firms more productive and advantageous than other firms
Mukherjee et al. (2024)	Yes	The findings indicate that adopting IIoT in SMEs can significantly enhance organizational performance
Lutfi et al. (2023)	Yes	Digital technology adoption is positively linked to performance gains in SMEs, confirming its strategic relevance for sustained growth
Kurniasari et al. (2023)	Yes	The findings confirm that digital adoption enhances SME performance, contributing to business sustainability
Lutfi et al. (2022)	Yes	The findings demonstrate that compatibility, organizational readiness, top management support, and government support significantly influence DAS usage, which positively impacts performance
Octavia et al. (2020)	Yes	The result of data processing indicates there is a significant influence among e-commerce adoption to SME's business performance
Harini et al. (2023)	Yes	The results showed that e-commerce adoption positively affect SME performance

Source(s): Authors' own creation

The reviewed studies collectively demonstrate that digital technology adoption plays a critical role in enhancing the performance of small and medium-sized enterprises (SMEs). The consistency of significant findings across diverse technological domains, including cloud computing, social media, e-commerce, e-procurement, online retailing, Industrial Internet of Things (IIoT), and digital accounting systems (DAS), highlights the pervasive value of digital integration in the SME context. These results confirm that digital technologies are not limited to specific business models or sectors but represent a universal catalyst for organizational improvement.

A substantial body of empirical evidence underscores the significant and positive relationship between digital technology adoption and SMEs performance. Digital technologies function as critical enablers, enhancing operational efficiency, expanding market reach, fostering customer engagement, and facilitating data-driven decision-making process. Khayer et al. (2021) established that cloud computing adoption directly contributes to improved financial performance in SMEs, while Qalati et al. (2020) demonstrated that social media usage significantly enhances SMEs performance.

The adoption of e-commerce has also been consistently identified as a key driver of performance improvement as evidence by Akbar et al. (2022); Harini et al. (2023); and Octavia et al. (2020). Notably Akbar et al. (2022) integrated the TOE framework with RBV and DOI theories to elucidate how e-commerce adoption substantially elevated SMEs performance. Nguyen et al. (2022) further noted that online retailing utilisation increases productivity and competitive advantage among SMEs. Similarly, Mukherjee et al. (2024) demonstrated that the adoption of Industrial Internet of Things (IIoT) technologies significantly improves organisational performance in the SMEs sector. Lutfi et al. (2023) corroborated these findings by evidencing that big data analytics adoption enhances operational efficiency and strategic decision-making capabilities.

Kurniasari et al. (2023) emphasised that digital adoption serves as a critical enabler for business sustainability, while Lutfi et al. (2022) identified compatibility, organisational readiness, top management support, and government assistance as key determinants in the successful adoption of digital accounting systems (DAS) which positively impacts SMEs performance.

5. Conclusion and future works

The findings of this study offer several practical implication for SMEs practitioners, policymakers, and digital service providers. SMEs must recognise digital technology adoption not merely as a supportive tool but as a strategic necessity to enhance business performance and sustain competitiveness in the digital economy. The empirical evidence underscores that technologies such as cloud computing, e-commerce platforms, social media, big data analytics, and digital accounting systems significantly contribute to improving operational efficiency, financial performance and customer engagement. SMEs owners and managers are therefore goals and market positioning.

This systematic literature review presents a comprehensive synthesis of empirical studies examining digital technology adoption and its influence on the performance of Small and Medium-sized Enterprises (SMEs) between 2014 and 2024. A total of 10 peer-reviewed articles were selected through a rigorous screening process from reputable academic databases (including Scopus, ScienceDirect, Mendeley, and Emerald). This review reveals several significant theoretical and practical insights.

First, there is a discernible upward trend in scholarly interest regarding the role of specific digital technologies such as cloud computing, social media marketing, e-commerce platforms, blockchain, big data analytics, and Industrial IoT in enhancing the performance of SMEs across diverse geographical contexts, including Asia, Africa, Europe, and the Middle East. The majority of studies consistently report that digital technology adoption contributes positively to both financial performance (e.g., profitability, revenue growth) and non-financial outcomes (e.g., operational efficiency, service quality, innovation, and market expansion).

Second, from a theoretical standpoint, the reviewed studies adopt a variety of conceptual frameworks. The Technology-Organization-Environment (TOE) framework emerges as the most prevalent, followed by the Diffusion of Innovation (DOI) theory and the Technology Acceptance Model (TAM). These models primarily highlight external and organizational factors such as technological readiness, competitive pressure, top management support, and perceived complexity. Among the examined determinants, relative advantage consistently stands out as the most influential factor driving technology adoption decisions in SMEs.

In addition, several studies incorporate the Resource-Based View (RBV) as a complementary theoretical lens. RBV underscores the strategic importance of internal organizational resources such as digital capabilities, human capital, innovation potential, and technological infrastructure as unique and inimitable assets that can generate sustained competitive advantage. From this perspective, digital technology is conceptualized not merely as a functional tool, but as an integral part of a firm's strategic resource bundle that enhances value creation and long-term performance. Collectively, the reviewed literature affirms the relevance and robustness of RBV theory in understanding digital transformation within both large firms and SMEs.

Third, in terms of methodology, the majority of the reviewed studies employ quantitative approaches, predominantly utilizing surveys as the primary data collection method. Structural Equation Modeling (SEM) is the most commonly used analytical technique, followed by multiple and logistic regression analyses. However, there remains a notable methodological gap, particularly the scarcity of qualitative and longitudinal studies, which limits the contextual depth and temporal understanding of technology adoption dynamics.

Fourth, while digital adoption is broadly associated with improved SME performance, the extent and nature of its impact are contingent upon various factors including the type of technology adopted, industrial sector, and institutional environment. Moreover, several studies identify mediating and moderating variable such as organizational culture, external support, managerial capability, and digital literacy that shape the strength and direction of the adoption and performance relationship. However, there are only a few previous studies that link digital technology adoption to SMEs performance. The small number of articles from other authors can create opportunities to study it more.

Going forward, scholars are encouraged to expand the scope of literature sources, adopt more diverse analytical framework, and conduct comparative studies across different industries and institutional settings. Such efforts will not only enrich the academic discourse but also provide actionable insights for practitioners and policymakers striving to accelerate digital adoption among SMEs, particularly in emerging economies.

6. Limitation of study

This study is subject to certain limitation that should be acknowledged. Primarily, the literature selection process was constrained by accessibility factors, whereby only open-access articles indexed in Scopus were eligible for inclusion. Although the initial search strategy retrieved 167 articles within the timeframe of 2011 to 2024, a substantial portion of these publications were included due to restricted access or thematic misalignment with the focus of this review, which emphasizes the direct relationship between digital technology and adoption and SMEs performance. Consequently, the final analysis was conducted on a narrowed corpus of 10 articles that fully met established inclusion criteria. The filtering process, while necessary, may have in advert. The filtering process, while necessary, may have inadvertently omitted pertinent studies published in subscription-based journals databased, potentially limiting the comprehensiveness and generalizability of the findings.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work generative artificial intelligence (AI) has been used. The service ChatGPT-4, developed by OpenAI, has been used for brainstorming. After utilizing this tool/service, the author(s) thoroughly reviewed and edited the content as necessary and take full responsibility for the final content of the published article.

Declaration statement

We have no conflicts of interest to disclose. All authors declare that they have no conflicts of interest.

Reference

Akbar, A., Hussain, A., Shahzad, A., Mohelska, H., & Hassan, R. (2022). Environmental and technological factor diffusion with innovation and firm performance: Empirical evidence from manufacturing SMEs. *Frontiers in Environmental Science*, 10, 960095. <https://doi.org/10.3389/fenvs.2022.960095>

- Ali Abbasi, G., Abdul Rahim, N. F., Wu, H., Iranmanesh, M., & Keong, B. N. C. (2022). Determinants of SME's Social Media Marketing Adoption: Competitive Industry as a Moderator. *Sage Open*, 12(1), 21582440211067220. <https://doi.org/10.1177/21582440211067220>
- Ali Qalati, S., Li, W., Ahmed, N., Ali Mirani, M., & Khan, A. (2020). Examining the Factors Affecting SME Performance: The Mediating Role of Social Media Adoption. *Sustainability*, 13(1), 75. <https://doi.org/10.3390/su13010075>
- Asiaei, A., & Ab. Rahim, N. Z. (2019). A multifaceted framework for adoption of cloud computing in Malaysian SMEs. *Journal of Science and Technology Policy Management*, 10(3), 708–750. <https://doi.org/10.1108/JSTPM-05-2018-0053>
- Beck, T., & Demirguc-Kunt, A. (2006). Small and medium-size enterprises: Access to finance as a growth constraint. *Journal of Banking & Finance*, 30(11), 2931–2943. <https://doi.org/10.1016/j.jbankfin.2006.05.009>
- Chavez, Z., Baalsrud Hauge, J., Bellgran, M., Gullander, P., Johansson, M., Medbo, L., Medbo, P., & Ström, M. (2020). Digital Tools and Information Needs Assessment for Efficient Deviation Handling in SMEs. In K. Säfsten & F. Elgh (Eds.), *Advances in Transdisciplinary Engineering*. IOS Press. <https://doi.org/10.3233/ATDE200140>
- Ghobakhloo, M., & Tang, S. H. (2013). The role of owner/manager in adoption of electronic commerce in small businesses: The case of developing countries. *Journal of Small Business and Enterprise Development*, 20(4), 754–787. <https://doi.org/10.1108/JSBED-12-2011-0037>
- Harini, S., Pranitasari, D., Said, M., & Endri, E. (2023). Determinants of SME performance: Evidence from Indonesia. *Problems and Perspectives in Management*, 21(1), 471–481. [https://doi.org/10.21511/ppm.21\(1\).2023.40](https://doi.org/10.21511/ppm.21(1).2023.40)
- Henao-Ramírez, A. M., & López-Zapata, E. (2022). Analysis of the factors influencing adoption of 3D design digital technologies in Colombian firms. *Journal of Enterprise Information Management*, 35(2), 429–454. <https://doi.org/10.1108/JEIM-10-2020-0416>
- Khayer, A., Jahan, N., Hossain, Md. N., & Hossain, Md. Y. (2021). The adoption of cloud computing in small and medium enterprises: A developing country perspective. *VINE Journal of Information and Knowledge Management Systems*, 51(1), 64–91. <https://doi.org/10.1108/VJIKMS-05-2019-0064>
- Kurniasari, F., Lestari, E. D., & Tannady, H. (2023). Pursuing Long-Term Business Performance: Investigating the Effects of Financial and Technological Factors on Digital Adoption to Leverage SME Performance and Business Sustainability—Evidence from Indonesian SMEs in the Traditional Market. *Sustainability*, 15(16), 12668. <https://doi.org/10.3390/su151612668>
- Kwarteng, M. A., Ntsiful, A., Diego, L. F. P., & Novák, P. (2024). Extending UTAUT with competitive pressure for SMEs digitalization adoption in two European nations: A multi-group analysis. *Aslib Journal of Information Management*, 76(5), 842–868. <https://doi.org/10.1108/AJIM-11-2022-0482>
- Lin, C.-Y., Alam, S. S., Ho, Y.-H., Al-Shaikh, M. E., & Sultan, P. (2020). Adoption of Green Supply Chain Management among SMEs in Malaysia. *Sustainability*, 12(16), 6454. <https://doi.org/10.3390/su12166454>
- Lutfi, A., Alkelani, S. N., Al-Khasawneh, M. A., Alshira'h, A. F., Alshirah, M. H., Almaiah, M. A., Alrawad, M., Alsyouf, A., Saad, M., & Ibrahim, N. (2022). Influence of Digital Accounting System Usage on SMEs Performance: The Moderating Effect of COVID-19. *Sustainability*, 14(22), 15048. <https://doi.org/10.3390/su142215048>
- Lutfi, A., Alrawad, M., Alsyouf, A., Almaiah, M. A., Al-Khasawneh, A., Al-Khasawneh, A. L., Alshira'h, A. F., Alshirah, M. H., Saad, M., & Ibrahim, N. (2023). Drivers and impact of big data analytic adoption in the retail industry: A quantitative investigation applying structural equation modeling. *Journal of Retailing and Consumer Services*, 70, 103129. <https://doi.org/10.1016/j.jretconser.2022.103129>
- Mahakittikun, T., Suntrayuth, S., & Bhatiasavi, V. (2021). The impact of technological-organizational-environmental (TOE) factors on firm performance: Merchant's perspective of mobile payment from Thailand's retail and service firms. *Journal of Asia Business Studies*, 15(2), 359–383. <https://doi.org/10.1108/JABS-01-2020-0012>

- Marei, A. (2022). The effect of e-procurement on financial performance: Moderating the role of competitive pressure. *Uncertain Supply Chain Management*, 10(3), 855–866. <https://doi.org/10.5267/j.uscm.2022.3.009>
- Mukherjee, S., Baral, M. M., Chittipaka, V., Nagariya, R., & Patel, B. S. (2024). Achieving organizational performance by integrating industrial Internet of things in the SMEs: A developing country perspective. *The TQM Journal*, 36(1), 265–287. <https://doi.org/10.1108/TQM-07-2022-0221>
- Nguyen, T. H., Le, X. C., & Vu, T. H. L. (2022). An Extended Technology-Organization-Environment (TOE) Framework for Online Retailing Utilization in Digital Transformation: Empirical Evidence from Vietnam. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(4), 200. <https://doi.org/10.3390/joitmc8040200>
- Octavia, A., Indrawijaya, S., Sriyudha, Y., . H., Hasbullah, H., & . A. (2020). Impact on E-Commerce Adoption on Entrepreneurial Orientation and Market Orientation in Business Performance of SMEs. *Asian Economic and Financial Review*, 10(5), 516–525. <https://doi.org/10.18488/journal.aefr.2020.105.516.525>
- Pervin, Most. T., & Sarker, B. K. (2021). Benefits and challenges in adopting social media for SMEs: A case from Bangladesh. *Journal of Sustainable Tourism and Entrepreneurship*, 2(3), 171–185. <https://doi.org/10.35912/joste.v2i3.783>
- Qalati, S. A., Yuan, L. W., Khan, M. A. S., & Anwar, F. (2021). A mediated model on the adoption of social media and SMEs' performance in developing countries. *Technology in Society*, 64, 101513. <https://doi.org/10.1016/j.techsoc.2020.101513>
- Ramdani, B., Chevers, D., & Williams, D. A. (2013). SMEs' adoption of enterprise applications: A technology-organisation-environment model. *Journal of Small Business and Enterprise Development*, 20(4), 735–753. <https://doi.org/10.1108/JSBED-12-2011-0035>
- Rogers, E. M. (2003). *Diffusion of Innovations*, 5th Edition. Free Press. <https://books.google.co.id/books?id=9U1K5LjUOWEC>
- Saad, M., Lutfi, A., Almaiah, M. A., Alshira'h, A. F., Alshirah, M. H., Alqudah, H., Alkhassawneh, A. L., Alsyouf, A., Alrawad, M., & Abdelmaksoud, O. (2022). Assessing the Intention to Adopt Cloud Accounting during COVID-19. *Electronics*, 11(24), 4092. <https://doi.org/10.3390/electronics11244092>
- Samsudeen, S. N., THELIJAGODA, S., & SANJEETHA, M. B. F. (2021). Social Media Adoption: Small and Medium-sized Enterprises' Perspective in Sri Lanka. *The Journal of Asian Finance, Economics and Business*, 8(1), 759–766. <https://doi.org/10.13106/JAFEB.2021.VOL8.NO1.759>
- Setiowati, R., Hartoyo, Daryanto, H. K., & Arifin, B. (2015). Understanding ICT Adoption Determinants among Indonesian SMEs in Fashion Subsector. *International Research Journal of Business Studies*, VIII(01), 47–57.
- Shahadat, M. M. H., Nekmahmud, Md., Ebrahimi, P., & Fekete-Farkas, M. (2023). Digital Technology Adoption in SMEs: What Technological, Environmental and Organizational Factors Influence in Emerging Countries? *Global Business Review*, 09721509221137199. <https://doi.org/10.1177/09721509221137199>
- Shahzad, A., Bin Zakaria, M. S. A., Kotzab, H., Makki, M. A. M., Hussain, A., & Fischer, J. (2023). Adoption of fourth industrial revolution 4.0 among Malaysian small and medium enterprises (SMEs). *Humanities and Social Sciences Communications*, 10(1), 693. <https://doi.org/10.1057/s41599-023-02076-0>
- Tiwari, A. K., Marak, Z. R., Paul, J., & Deshpande, A. P. (2023). Determinants of electronic invoicing technology adoption: Toward managing business information system transformation. *Journal of Innovation & Knowledge*, 8(3), 100366. <https://doi.org/10.1016/j.jik.2023.100366>
- Tornatzky, L. G., & Fleischer, M. (1990). *Technological Innovation as a Process*. Lexington Books.
- Yu, W., Ramanathan, R., & Nath, P. (2017). Environmental pressures and performance: An analysis of the roles of environmental innovation strategy and marketing capability. *Technological Forecasting and Social Change*, 117, 160–169. <https://doi.org/10.1016/j.techfore.2016.12.005>
- Zhou, B., & Zheng, L. (2023). Technology-pushed, market-pulled, or government-driven? The adoption of industry 4.0 technologies in a developing economy. *Journal of Manufacturing Technology Management*, 34(9), 115–138. <https://doi.org/10.1108/JMTM-09-2022-0313>