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# Journal of Sustainable Economic and Business (JOSEB)

Vol. 2 No. 2 April 2025: 191-200

ISSN (Online): 3063-0207

<https://journal.arepublisher.com/index.php/joseb>

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## Optimizing Digital Technology and Innovation for SME Sustainability in the Digitalization Era: Lessons from Indonesia

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### ABSTRACT

**Objectives:** The goal of this paper is to explore lessons from existing literature on how technology and innovation can be used to help SMEs succeed in the digital age. By focusing on real-life experiences and practices from Indonesia, it aims to offer valuable insights that can guide the growth of more competitive and sustainable small businesses in an ever-changing global environment.

**Methodology:** The method used in this research is a literature review of publications from 2020 to 2024 related to SMEs, sustainability, technology, and innovation, using the keywords SMEs, sustainability, technology, and innovation. The literature search was conducted using the Crossref, Google Scholar, Web of Science, and Scopus databases. The collected literature is then mapped using Visualization of Similarity Viewer online software.

**Finding:** SMEs research in Indonesia increasingly focuses on external impacts and digital transformation strategies. Policies supporting sustainability, access to training, technology, and innovation are important for enhancing SMEs competitiveness. The strong link between technology, innovation, and digitalization confirms that optimizing digital technology helps SMEs survive and grow. Insights from Indonesia highlight the importance of digital transformation, training, policy implementation, and an innovation-driven ecosystem.

**Conclusion:** Research on SMEs in Indonesia has been growing with a more specific focus on the impact of external factors and digital transformation strategies. The strong connection between technology, innovation, and digitalization can enhance SMEs' competitiveness at both national and global levels.

**Keywords:** SME; Digitalization; Innovation; Sustainability; Technology.

**Article Doi:** <https://doi.org/10.70550/joseb.v2i2.75>

**How to Cite:** Sulistyanto, T. H., Cahya, W. A., Ismail, A. G., & Idawati, R. N. . (2025). Optimizing Digital Technology and Innovation for SME Sustainability in the Digitalization Era: Lessons from Indonesia. *Journal of Sustainable Economic and Business*, 2(2), 191-200. <https://doi.org/10.70550/joseb.v2i2.75>

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Submitted: 10-02-2025

Revised: 18-03-2025

Accepted: 09-04-2025

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### INTRODUCTION

In the rapidly growing era of digitalisation (Alam, 2022) Micro, Small, and Medium Enterprises (MSMEs) face both challenges and opportunities in improving their competitiveness and business sustainability (Sari & Kusumawati, 2022). Digital technology and innovation have become key factors in driving the transformation of MSMEs, enabling them to improve operational efficiency, expand markets (Brehaspati Adisasmito & Ghazali, 2023), and

accelerate the process of adapting to global economic changes (Gamage et al., 2020; Prasanna et al., 2019). However, there are still various obstacles that hinder the optimisation of technology in the MSME sector, such as limited resources, lack of access to technology, and low levels of digital literacy (Ollerenshaw et al., 2021).

Indonesia as one of the countries with a large number of MSMEs in the world has a unique business ecosystem (Aminullah et al., 2024). MSMEs play an important role in the national economy, contributing a large proportion of the labour force and Gross Domestic Product (GDP) (Taiwo et al., 2022). Therefore, the utilisation of digital technology is key in ensuring sustainable growth. This research seeks to examine how innovation and digitalisation can be optimised to improve the sustainability of MSMEs in Indonesia, by highlighting the various factors that contribute to the implementation of technology within the sector.

Through a bibliometric approach (Thaha et al., 2023), this study analyses research trends related to digital technology (Omrani et al., 2024), innovation (Chen et al., 2023), and sustainability (Patma et al., 2021) of SMEs. Using Visualisation of Similarity (VOSviewer) software, we identified the relationship between various keywords, namely SMEs, sustainability, technology, and innovation. The results of this analysis are expected to provide a deeper picture of how MSMEs in Indonesia can leverage digital technology and innovation to achieve business sustainability in the midst of digitalisation.

## LITERATURE REVIEW

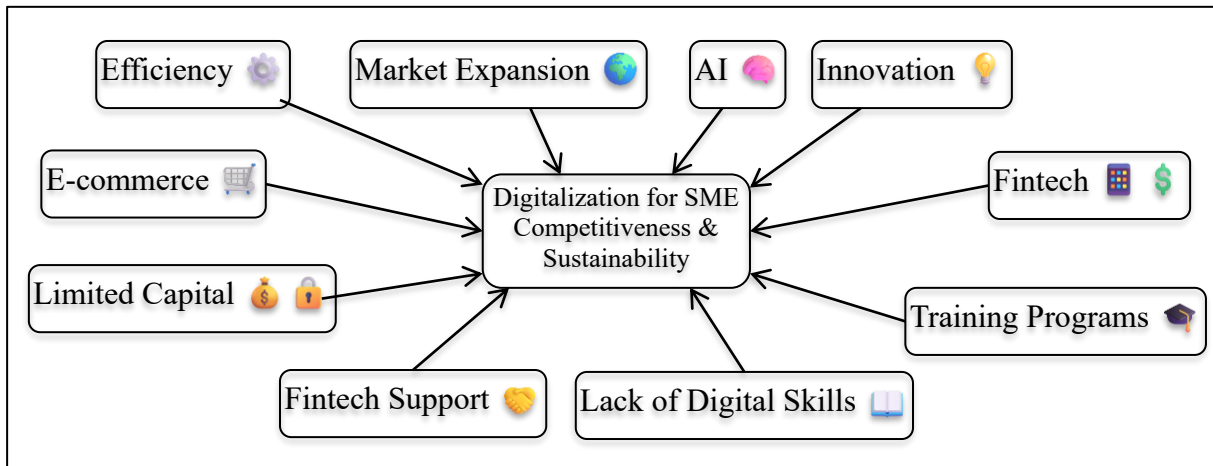
According to Patma et al. (2021) and Brahmana & Shiratina (2024) digital technology has become a key element in improving the competitiveness and sustainability of SMEs (Hidayat & Akbar, 2024). Digitalisation allows SMEs to improve operational efficiency (Mondal et al., 2023), expand market access (Fachrullah & Permana, 2024; Suratman et al., 2023), and develop business models (Strilets et al., 2022) that are more adaptive to economic changes. Some of the technological innovations commonly applied in MSMEs include the use of e-commerce (Tolstoy et al., 2022), big data analytics (Willettts & Atkins, 2024), artificial intelligence (Sharma et al., 2024), and the Internet of Things (Muridzi, 2024) to improve supply chain efficiency and customer interaction.

Previous research shows that the implementation of digital technology is highly dependent on the readiness of human resources in the organisation. Factors such as digital literacy (Pfister & Lehmann, 2024), employee training, as well as support from stakeholders (Rubio-Andrés et al., 2023) play an important role in the successful adoption of technology in SMEs. The sustainability of MSMEs is determined by digital technology, and by the innovations implemented in their business models. Innovation can take the form of product, process, marketing, or organisational innovation. Innovation is a major factor in driving economic growth and creating competitive advantage for businesses (Bintara et al., 2023) including MSMEs.

In the context of MSMEs in Indonesia, innovation is often affected by limited access to capital (Herwiyanti & Rafinda, 2021) and resources (Kumalaningrum et al., 2023). Therefore, collaboration with academic institutions, government, and technology companies is an effective strategy in supporting SMEs innovation. Several studies (Ganlin et al., 2021) have also highlighted that more innovative MSMEs tend to be higher levels of sustainability.

Digitalisation contributes significantly to the sustainability of MSMEs by improving operational efficiency (Yilmaz et al., 2023), reducing transaction costs (ESCAP, 2018), and

opening up access to wider markets . Some study (Gao et al., 2023) show that MSMEs that adopt digital strategies have better resilience to economic challenges compared to those that still use conventional methods. In addition, other research confirms that the use of digital technology can help MSMEs to implement more environmentally friendly business practices, more efficient supply chain optimisation, more efficient use of resources and reduction of production waste (Telukdarie et al., 2022). Thus, digitalisation can improves competitiveness in SMEs business, and encourages more sustainable business practices as illustrated below.



Source: Research Data (2025)

Figure 1. Conceptual Framework

The successful digitalisation of MSMEs in Indonesia is also influenced by factors such as the adoption of e-commerce , the use of social media as a marketing tool (Beck et al., 2020; Le, 2023; Matosas-López, 2024), and increased cooperation with fintech platforms to facilitate access to funding. Therefore, lessons from Indonesia can be an important reference for other countries in developing policies and strategies that support the sustainability of MSMEs through digital technology and innovation.

## METHOD

The method used in this research is a literature review of publications from 2020 to 2024 related to SMEs, sustainability, technology, and innovation, using the keywords SMEs, sustainability, technology, and innovation. The literature search was conducted using the Crossref, Google Scholar, Web of Science, and Scopus databases. The collected literature is then mapped using Visualization of Similarity Viewer. To ensure the quality and relevance of the literature reviewed in this study, several inclusion criteria were established to obtain sources that are truly relevant to the research. This screening process also aims to select publications that focus on sustainability, technology, and innovation in SMEs in Indonesia. The following criteria were applied during the literature review process: (1) Publications must not be from repositories; only complete research articles were included in this study (2) Publications must have a PDF file available to allow detailed reading (3) Only peer-reviewed journal articles were included to ensure their credibility (4) Only publications written in English or with an English abstract were selected to ensure global accessibility of the literature (5) Publications must be available in full text, either through open access or institutional access (6) Publications must focus on SMEs in Indonesia, discussing topics related to sustainability, technology, and innovation.

All results were compiled into a single file in the Research Information Systems (.ris) format, followed by a similarity analysis using Visualization of Similarities software. The mapping method employed in this study is text-based mapping, utilizing data from Research Information Systems (.ris) files to visualize the relationships or connections between terms (words or phrases) that appear in the textual data from the prepared abstracts. Titles and abstracts were selected for analysis using the binary counting method to calculate the occurrence of words or phrases in each document used in this study. The minimum occurrence of words or phrases was set at 10 times, which was then used to create the similarity map.

## RESULTS AND DISCUSSION

### Results

From the results of the literature search, 523 articles were obtained from various regions in Indonesia, dating from 2020 to 2024 as shown in the following table. There is a significant increase in the number of literatures from 2020 (6 publications) to 2023 (68 publications). The analysis using the Visualization of Similarity software can categorize key terms into two main clusters (1 and 2), highlighting the relationships between concepts that frequently appear together in the literature, as shown in the following table.

**Table 1.** Word Cluster-1 and word Cluster-2

| Cluster-1 |                |    |     |    | Cluster-2 |                   |    |     |    |
|-----------|----------------|----|-----|----|-----------|-------------------|----|-----|----|
| ID        | Label          | L  | LS  | Oc | ID        | Label             | L  | LS  | Oc |
| 1         | Covid          | 31 | 169 | 15 | 1         | Ability           | 31 | 122 | 11 |
| 2         | Data           | 32 | 317 | 28 | 2         | Business          | 32 | 337 | 30 |
| 3         | Effect         | 30 | 206 | 18 | 3         | Challenge         | 32 | 214 | 18 |
| 4         | Factor         | 32 | 231 | 20 | 4         | Competitiveness   | 31 | 158 | 14 |
| 5         | Impact         | 32 | 309 | 28 | 5         | Development       | 32 | 224 | 22 |
| 6         | Indonesia      | 32 | 328 | 30 | 6         | Digitalization    | 31 | 141 | 13 |
| 7         | Influence      | 30 | 182 | 17 | 7         | Economy           | 32 | 210 | 17 |
| 8         | Innovation     | 32 | 203 | 19 | 8         | Implementation    | 29 | 134 | 13 |
| 9         | Pandemic       | 31 | 174 | 15 | 9         | Medium Enterprise | 32 | 395 | 35 |
| 10        | Performance    | 32 | 246 | 25 | 10        | Micro             | 32 | 223 | 19 |
| 11        | Questionnaire  | 29 | 174 | 15 | 11        | MSME              | 32 | 347 | 33 |
| 12        | Research       | 32 | 510 | 48 | 12        | Small             | 32 | 337 | 30 |
| 13        | Respondent     | 31 | 135 | 12 | 13        | Strategy          | 32 | 338 | 32 |
| 14        | Role           | 32 | 310 | 27 | 14        | Technology        | 32 | 396 | 37 |
| 15        | SME            | 32 | 499 | 50 | 15        | Training          | 26 | 116 | 12 |
| 16        | Study          | 32 | 583 | 55 | 16        | Use               | 32 | 145 | 12 |
| 17        | Sustainability | 32 | 437 | 40 |           |                   |    |     |    |

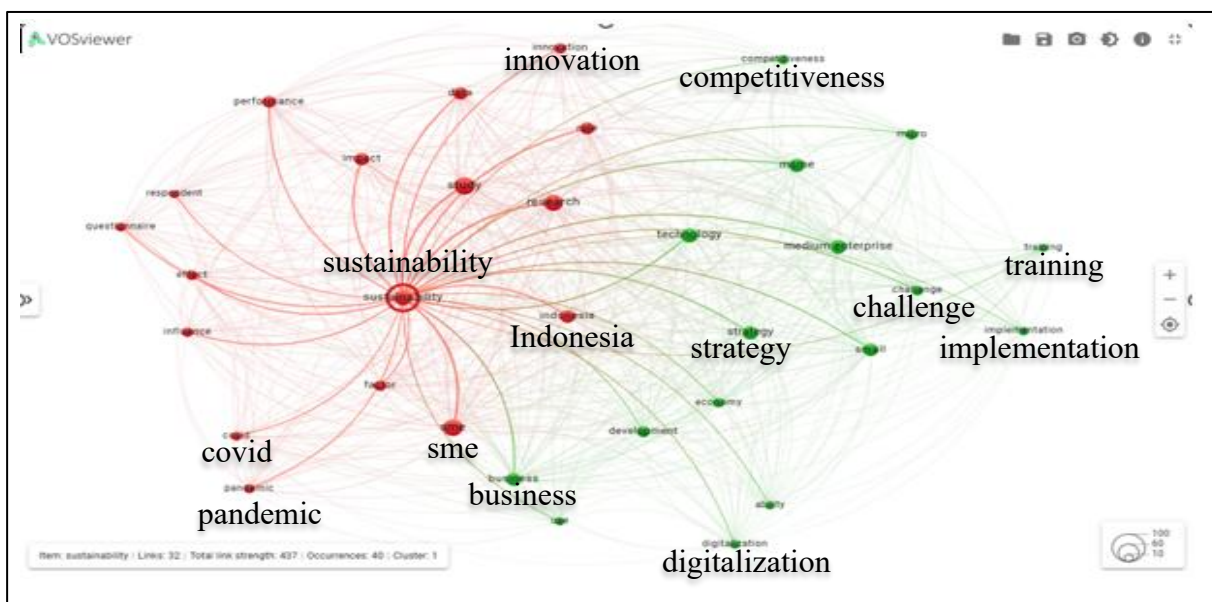
L: Links; LS: Link Strength;Oc: Occurrences Cluster-1: Impact of External Factors on SMEs' Sustainability and Performance Cluster-2: Strategic Development and Digital Transformation in SMEs

**Source:** Research Data (2025)

This table presents a list of keywords included in Cluster-1, based on the analysis using the Visualization of Similarities software. This first cluster focuses on research discussing external impacts (such as the pandemic), sustainability factors, as well as the performance and innovation of SMEs. Sustainability and innovation emerge as primary concerns in SME research, with external factors such as the pandemic and economic policies playing a crucial role. The first cluster also includes terms that are closely related to research on SMEs, sustainability, innovation, and external impacts such as the COVID-19 pandemic. This

reinforces the notion that research on SMEs, sustainability, and external impacts such as the pandemic is widely conducted in the context of developing countries like Indonesia. In the Cluster-2, the aspects of business strategy, competitiveness, digitalization, and SME development are key factors in the sustainability and growth of SMEs. The keywords in this group reflect the role of technology, innovation, and managerial strategies in improving the performance of micro, small, and medium enterprises (SMEs). Several key terms, such as "technology," "digitalization," "strategy," and "competitiveness," indicate that research in this cluster focuses on how SMEs can adapt to global economic changes and leverage technology to enhance their competitiveness. Keywords such as "training" and "development" emphasize the importance of capacity building and human resource skill enhancement in supporting SME business transformation.

Between 2020 and 2024, research on SMEs in Indonesia has evolved, particularly concerning sustainability, external impacts, and technology-based development strategies. The following figure presents the network visualization results using Visualization of Similarity software, with "sustainability" as the main keyword in SMEs research. This visualization categorizes keywords into several clusters based on their interconnections and frequency of occurrence in academic literature. The figure below illustrates the visualization from the literatures.



Source: Research Data (2025)

**Figure 2.** Network Visualization of Sustainability of SMEs

The figure above presents a visualization result from Visualization of Similarity software with the keyword "sustainability" in SMEs research. The keyword "sustainability" has 32 links, a total link strength of 437, and 40 occurrences, indicating that sustainability is a central theme in studies related to SMEs and technology. This visualization categorizes frequently co-occurring keywords in Indonesian SME research into two main clusters, represented by red and green colors. The "sustainability" keyword has strong connections with various terms in the red cluster, highlighting that SME research in Indonesia is closely linked to external factors and academic studies. Meanwhile, "technology" and "strategy" in the green cluster have multiple connections to terms in the red cluster, suggesting a relationship between sustainability factors

and digital business strategies. The presence of "pandemic" and "COVID" keywords indicates that the pandemic remains a significant part of academic discussions regarding SMEs.

The figure also highlights "Technology" as a central keyword, strongly connected to both clusters. This indicates that technology plays a crucial role in SME sustainability research and development. In the red cluster, keywords like "sustainability" and "innovation" reflect a research focus on the impact of technology on SME business sustainability. The "Technology" keyword exhibits high connectivity, with 32 links, a total link strength of 396, and 37 occurrences. These values confirm that technology is a key concept in SME and sustainability research. On the other hand, in the green cluster, keywords such as "digitalization," "strategy," and "implementation" indicate that studies also explore how technology is applied in SMEs to enhance competitiveness and efficiency.

The relationship between "technology" and "sustainability," "strategy," and "digitalization" suggests that technological adoption in SMEs is linked to digital tools and contributes to business sustainability strategies. The strong connection between "technology" and "medium enterprise," "training," and "competitiveness" highlights that the use of technology in SMEs requires capacity-building strategies and training programs for business owners.

The figure above presents a Visualization of Similarity software analysis, where "Innovation" serves as the central keyword in the red cluster. It has 32 links, a total link strength of 203, and appears 19 times across various studies related to SMEs in Indonesia. Innovation is frequently linked to "sustainability" in research, indicating that the application of innovation can support more environmentally friendly business practices. Within the SME context, innovation in supply chain management, energy efficiency, and waste management plays a crucial role in sustainability efforts. The visualization also highlights a strong connection between SMEs and innovation, reinforcing the idea that adopting innovation in small and medium-sized businesses is essential for enhancing competitiveness and business growth.

Digitalization and technological transformation are also crucial factors that enable SMEs to access wider markets and improve operational efficiency. In the innovation network visualization shown above, the keyword "Indonesia" is closely connected to "Innovation", indicating that research on innovation is widely examined in the Indonesian context. This highlights the importance of innovation in driving economic growth and business competitiveness in Indonesia, particularly in addressing global challenges and digitalization. The keyword "competitiveness" is strongly linked to "innovation", signifying that innovation is a key factor in enhancing the competitiveness of organizations, businesses, and the economy. Additionally, the presence of the keyword "challenge" suggests that innovation is often associated with the obstacles encountered in its implementation—whether in business, technology, or sustainability. The strong relationship between innovation and SMEs reinforces the idea that small and medium-sized enterprises heavily rely on innovation to survive and grow in a globally competitive environment. Furthermore, the presence of "business" as a target keyword indicates that innovation plays a crucial role in business strategy—both in developing new business models and improving operational efficiency.

Innovation plays a central role in competitiveness, digitalization, business, and sustainability, particularly in the context of SMEs and economic development in Indonesia. The keywords "sustainability" and "development" indicate that innovation is often associated with sustainable development goals. Research on innovation largely focuses on how innovation can be utilized to enhance environmentally friendly and efficient business practices. The connection with

"Indonesia" suggests that innovation is frequently examined within the country's economic and business context, highlighting its significance in driving growth and competitiveness in Indonesia.

## Discussion

The strong connection between SMEs, the economy, innovation, and Indonesia highlights the critical role of SMEs in driving economic growth. In the digitalization era, the sustainability and competitiveness of SMEs are increasingly linked to their ability to adopt digital technologies and implement innovative business strategies. Digital transformation has become a key enabler for SMEs to expand market access, improve operational efficiency, and enhance resilience (Trieu et al., 2023) in an evolving business landscape. Research focusing on the impact of digitalization on SMEs in Indonesia underscores the urgency for this sector to continuously adapt to technological advancements. Lessons from Indonesia demonstrate that SMEs leveraging digital tools, such as e-commerce platforms and AI-driven analytics are better positioned to sustain their growth and competitiveness. However, challenges such as limited digital literacy or financial constraints remain barriers to full adoption (Liu et al., 2024). As SME research evolves, a greater emphasis on external factors and digital transformation strategies is emerging. To optimize digital technology and innovation for sustainable SME development, it is essential to establish supportive policies, enhance digital skills training, and provide technology-driven incentives. Strengthen these aspects will empower SMEs to navigate the complexities of digitalization, drive innovation, and contribute to Indonesia's long-term economic resilience.

## CONCLUSION

Based on these findings, it can be concluded that research on SMEs in Indonesia has been growing with a more specific focus on the impact of external factors and digital transformation strategies. The results of this study highlight the need for policies that support SME sustainability, including access to training, technology, and incentives for small business owners to innovate and better prepare for future challenges. The strong connection between technology, innovation, and digitalization with SMEs reinforces the idea that optimizing digital technology can help SMEs survive and enhance SMEs' competitiveness at both national and global levels. This paper also provides lessons from Indonesia, where factors such as training play a crucial role in strengthening SMEs competitiveness and sustainability. These findings support the idea that digital technology transformation and innovation are not merely options but necessities for SMEs to remain competitive in the digitalization era. Therefore, a comprehensive approach is needed, including policy strengthening, easier access to technology, and capacity development for SME owners to ensure long-term sustainability.

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