

Artificial Intelligence as an Enabler of Digital Economic Transformation toward Sustainable MSMEs: A Qualitative Literature Review

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ABSTRACT

This study aims to analyze the role of AI as an enabler of digital economic transformation and synthesize the mechanisms linking AI utilization with sustainable MSME development. The study employs a qualitative literature review approach with descriptive-thematic analysis. The literature was obtained from Google Scholar, Scopus, Web of Science, and academic publisher platforms, covering publications from 2019 to 2026. Of the 50 articles identified, 25 articles were selected based on relevance, publication quality, topic alignment, and availability of information for the final synthesis. The findings indicate that AI serves as an enabling technology that strengthens digital transformation through automation, data analysis, prediction, personalization, and decision-making support. These capabilities enhance efficiency and innovation, which subsequently strengthen adaptability, competitiveness, and resilience while contributing to economic, social, and environmental sustainability. The benefits of AI depend on AI literacy, human resources, organizational readiness, infrastructure, data quality, and responsible governance. This study emphasizes that AI is an organizational capability enabler that can support long-term value creation and MSME sustainability.

ABSTRAK

Penelitian ini bertujuan menganalisis peran AI sebagai enabler transformasi ekonomi digital dan mensintesis mekanisme yang menghubungkan pemanfaatan AI dengan pengembangan UMKM berkelanjutan. Penelitian menggunakan pendekatan qualitative literature review dengan analisis deskriptif-tematik. Literatur diperoleh melalui Google Scholar, Scopus, Web of Science, dan platform penerbit akademik dengan cakupan publikasi 2019–2026. Dari 50 artikel yang diidentifikasi, sebanyak 25 artikel diseleksi berdasarkan relevansi, kualitas publikasi, kesesuaian topik, dan ketersediaan informasi untuk sintesis akhir. Hasil menunjukkan bahwa AI berperan sebagai enabling technology yang memperkuat transformasi digital melalui otomatisasi, analisis data, prediksi, personalisasi, dan dukungan pengambilan keputusan. Kapabilitas tersebut mendukung efisiensi dan inovasi, yang selanjutnya memperkuat adaptabilitas, daya saing, dan resiliensi serta berkontribusi terhadap keberlanjutan ekonomi, sosial, dan lingkungan. Manfaat AI bergantung pada AI literacy, sumber daya manusia, kesiapan organisasi, infrastruktur, kualitas data, dan tata kelola yang bertanggung jawab. Penelitian ini menegaskan bahwa AI merupakan pengungkit pengembangan kapabilitas organisasi yang dapat mendukung penciptaan nilai jangka panjang dan keberlanjutan UMKM.

1. INTRODUCTION

Digital economic transformation has changed the way businesses create value, reach consumers, manage resources, and maintain business continuity. The development of digital technologies has driven a shift from conventional business models toward ecosystems that increasingly rely on data, connectivity, automation, and the ability to respond rapidly to market changes. For Micro, Small, and Medium Enterprises (MSMEs),

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digitalization provides opportunities to expand market reach, improve business process efficiency, and establish closer relationships with customers. However, the benefits of digital transformation are determined by the ability of MSMEs to integrate technology into business processes and organizational capability development. Studies on MSMEs in Indonesia indicate that digitalization can support competitive advantage and sustainability, making digital transformation increasingly important for developing the strategic capabilities of MSMEs (Budiarto et al., 2024; Firdaussiah et al., 2026).

MSMEs play an important role in digital economic transformation because of their relatively flexible characteristics and close proximity to consumer needs. On the other hand, limitations in capital, human resources, technological infrastructure, and managerial capabilities may constrain the ability of MSMEs to keep pace with rapidly evolving technologies. Digitalization through e-commerce, digital payments, social media, data analytics, and cloud-based services has helped overcome some of these limitations. The subsequent development of technology has led to the adoption of smarter and more adaptive technologies, particularly Artificial Intelligence (AI). AI is capable of processing data, identifying patterns, generating predictions, providing recommendations, automating activities, and supporting decision-making. With these characteristics, AI has the potential to expand the role of digitalization from merely supporting transactions and communication toward creating new capabilities in business management.

In the MSME context, AI can be applied to various activities, including generative AI for content creation, chatbots for customer service, predictive analytics for demand forecasting, recommendation systems for marketing, and the automation of various administrative tasks. Research on AI implementation in manufacturing SMEs indicates that value creation from AI requires the gradual management, integration, and utilization of organizational resources and capabilities (Peretz-Andersson et al., 2024). Mikalef & Gupta (2021) also demonstrate that AI capability is developed through a combination of technological, human, and organizational resources that can support creativity and firm performance. These findings suggest that AI should not be understood merely as a technology, but rather as an enabler capable of strengthening organizational capabilities and deepening the digital transformation process.

The role of AI as an enabler is particularly evident through improvements in efficiency, innovation, and adaptability. AI can help automate routine tasks, accelerate information processing, analyze customer behavior, forecast demand, optimize inventory, and support product development and marketing strategies. These capabilities can help MSMEs overcome resource constraints while creating greater opportunities for activities that require creativity and strategic decision-making. AI can also strengthen the ability of MSMEs to identify market changes and respond more rapidly to consumer needs. Literature on digitalization and AI indicates that enhanced capabilities can be associated with performance, innovation, competitiveness, and organizational ability to cope with changes in the business environment (Mikalef & Gupta, 2021; Soomro et al., 2025). Therefore, AI can be viewed as one of the enabling technologies that connects digital transformation with the development of MSME business capabilities.

This perspective becomes increasingly important when AI is linked to MSME sustainability. Sustainability involves more efficient resource utilization, adaptability, innovation, and attention to social and environmental impacts. Research on digital transformation in SMEs indicates that digital technologies can support the economic, social, and environmental dimensions of sustainable development (Philbin et al., 2022). More recent literature has begun to indicate that AI can expand these contributions through data-driven efficiency, green innovation, resource optimization, and improved sustainable performance (Alwakid & Dahri, 2025; Soomro et al., 2025). Accordingly, the relationship between AI and sustainability can be understood through several mechanisms, particularly efficiency, innovation, adaptability, competitiveness, and resilience.

Despite its growing potential, AI adoption among MSMEs is not without challenges. Limitations in AI literacy, digital skills, data quality, infrastructure, financial capacity, organizational readiness, leadership, and governance may hinder the ability of MSMEs to derive benefits from the technology. Hussain & Rizwan (2024) indicate that cost, technical skills, user acceptance, and organizational readiness are factors that may influence AI adoption among SMEs. In addition, the use of AI raises concerns regarding privacy, data security, information accuracy, bias, intellectual property rights, and human oversight. These conditions indicate that AI-based transformation should not be understood merely as a process of technology adoption, but rather as a process of organizational capability development requiring alignment among technology, people, resources, and governance.

Based on these developments, a research gap remains in the literature regarding how AI functions

as an enabler of digital economic transformation toward sustainable MSMEs. Previous studies have largely examined digital transformation, AI adoption, AI capability, efficiency, innovation, competitive advantage, or sustainable performance separately. Although several studies have linked AI with sustainable performance, studies that comprehensively synthesize the relationships among AI, digital transformation, efficiency, innovation, adaptability, competitiveness, resilience, and MSME sustainability, particularly in developing-country contexts, remain limited. The emergence of generative AI also creates new research opportunities because this technology is increasingly expanding MSMEs' access to analytical, creative, communication, and decision-making support capabilities.

Therefore, this study aims to analyze and synthesize the literature on the role of Artificial Intelligence as an enabler of digital economic transformation toward sustainable MSMEs. Specifically, this study identifies how AI contributes to MSME efficiency, innovation, adaptability, competitiveness, and resilience, as well as how these capabilities are associated with economic, social, and environmental sustainability. Through a qualitative literature review of relevant studies, this research develops a conceptual perspective that positions AI as an enabling technology in the digital economic transformation process rather than as a single determinant of sustainability. This study is expected to contribute theoretically by integrating the literature on AI, digital transformation, and MSME sustainability, while also providing practical implications for MSMEs and policymakers in developing adaptive, responsible, and long-term value-oriented AI utilization strategies.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

2.1 Artificial Intelligence in the Digital Economy

Artificial Intelligence (AI) is one of the key technologies driving the development of the digital economy because it enables computational systems to perform functions that previously required human cognitive capabilities, such as learning from data, pattern recognition, prediction, classification, language processing, recommendation, and decision-making support. The development of machine learning, deep learning, natural language processing, computer vision, and generative AI has expanded the use of AI from analytical activities to organizational operational and strategic activities (Dwivedi et al., 2021). In the digital economy, AI has characteristics that distinguish it from conventional digital technologies because it can process data rapidly and generate predictions, recommendations, automation, and information that can be repeatedly utilized in business processes. Its applications include marketing, customer service, market analysis, demand forecasting, inventory management, and product development. Therefore, AI can serve as a source of capability that expands organizational capacity to create and capture value.

This capability perspective is developed by Mikalef & Gupta (2021), who explain that AI capability refers to an organization's ability to provide, develop, and utilize AI resources to generate organizational benefits. Thus, the benefits of AI are not determined solely by the availability of technology but also by the organization's ability to integrate technology with data, human resources, and business processes. This perspective is particularly relevant to MSMEs because resource constraints require them to utilize technology effectively without necessarily increasing organizational resources proportionally. AI in the digital economy can therefore be understood as a technology that expands organizational capabilities in information processing, activity automation, knowledge generation, and value creation. This understanding provides a basis for viewing AI not merely as an adopted technology but as a capability that can strengthen organizational transformation processes.

2.2 Digital Economic Transformation and AI as an Enabler

Digital transformation is a broader organizational change process than merely the use of digital technologies. It encompasses changes in business processes, strategies, organizational structures, customer interactions, and mechanisms for creating and delivering value. Verhoef et al. (2021) explain that digital transformation evolves from digitization and digitalization toward more comprehensive organizational changes that require the development of new capabilities. In the MSME context, digital transformation can occur through the use of e-commerce, social media, digital payments, cloud computing, digital marketing, digital platforms, and data analytics. The use of these technologies generates connectivity, data, and digital infrastructure that provide a foundation for the development of more advanced technologies. AI can subsequently be positioned as an enabler that deepens digital economic transformation. While digitalization enables business activities to be conducted and recorded digitally, AI allows the resulting data and information to be utilized to generate

predictions, recommendations, automation, and more data-driven decisions. Thus, AI extends the function of digital technologies from merely supporting business activities toward developing organizational analytical and adaptive capabilities.

Peretz-Andersson et al. (2024) demonstrate that AI-based transformation in SMEs requires the integration of various resources and capabilities through a process of resource orchestration. AI technology needs to be connected with human resources, data, infrastructure, organizational processes, and strategies to generate business benefits. This indicates that the success of AI-based transformation is not determined by technology in isolation but by the organization's ability to integrate technology into its value creation system. AI-enabled digital economic transformation can therefore be understood as a process that evolves from the digitalization of activities toward the utilization of intelligent technologies to enhance organizational capabilities. This perspective is important for understanding how AI can contribute to the efficiency, innovation, adaptability, and sustainability of MSMEs.

2.3 AI, Efficiency, Productivity, and Innovation Capability

One of the primary benefits of AI for MSMEs is its ability to improve efficiency and productivity. AI can be used to automate routine activities, accelerate information processing, forecast demand, optimize inventory, and support customer service. In marketing, AI can help analyze consumer behavior, conduct market segmentation, generate content, and provide recommendations that are better aligned with customer characteristics. The efficiency generated by AI includes time savings, improved information quality, faster responses, and reduced errors in business processes. For MSMEs with limited labor and managerial resources, these capabilities can increase business capacity without requiring a proportional expansion of the organizational structure. The literature on digital transformation also indicates that the utilization of digital technologies can improve efficiency while supporting data-driven decision-making and innovation (Costa Melo et al., 2023).

In addition to improving efficiency, AI has the potential to strengthen innovation capability. AI's ability to analyze data and information enables organizations to identify market trends, understand customer needs, generate alternative ideas, and evaluate various options more rapidly. These capabilities can support product, process, marketing, and business model innovation. Isa et al. (2024) demonstrate that innovation capability is a strategic resource associated with the ability of SMEs to create value and respond to market changes. The development of generative AI further expands these functions because it can assist in generating alternative content, designs, product ideas, marketing concepts, and business solutions. However, the use of AI still requires human knowledge and evaluation to ensure relevance, accuracy, and alignment with organizational objectives. Therefore, AI is more appropriately understood as a technology that enhances human and organizational capabilities rather than merely as an automation tool. The relationship between AI, efficiency, and innovation indicates that the value of AI does not end with productivity improvement. These capabilities can serve as a foundation for developing broader organizational capabilities, particularly the ability to create new solutions and respond to changes in the business environment.

2.4 AI, Adaptability, Competitiveness, and MSME Resilience

The digital economy creates an increasingly dynamic business environment because changes in consumer needs, technological developments, and competitive intensity occur rapidly. These conditions require MSMEs to possess the ability to acquire information, make decisions, and adjust business activities in a timely manner. AI can support these capabilities through customer behavior analysis, market trend identification, demand forecasting, and the provision of decision-making recommendations. The ability to process information rapidly enables MSMEs to adjust their products, marketing strategies, services, and resource utilization in response to changing market conditions. These capabilities are associated with adaptability and organizational agility. Troise et al. (2022) demonstrate that digital transformation can strengthen the ability of SMEs to respond to environmental changes. Under conditions of uncertainty, digital capabilities can also support business resilience by helping organizations maintain business activities and adjust strategies in response to changing circumstances (Winarsih et al., 2020).

AI is also relevant to competitiveness. However, the use of AI does not automatically create sustainable competitive advantage. AI applications that are widely available can be utilized by many businesses. More difficult-to-imitate advantages emerge when organizations are able to combine AI with high-quality data, business knowledge, human resources, organizational processes, and decision-making capabilities.

Peretz-Andersson et al. (2024) emphasize the importance of resource integration and orchestration in generating strategic benefits from AI. Therefore, AI-based competitiveness should be understood as the outcome of an organization's ability to transform technology into capabilities that improve efficiency, innovation, responsiveness, adaptability, and resilience. AI functions as an enabler of strategic capabilities, whereas competitive advantage and resilience emerge through the development and utilization of these capabilities.

2.5 AI and MSME Sustainability

MSME sustainability encompasses the ability to maintain economic viability while creating social value and managing environmental impacts over the long term. From this perspective, MSME success is determined not only by sales growth or short-term profitability but also by the ability to manage resources, maintain competitiveness, adapt to change, and create value sustainably. Digital transformation has the potential to support sustainability through improved efficiency, innovation, data-driven decision-making, and resource optimization (Costa Melo et al., 2023). AI expands this potential through its analytical and predictive capabilities. The technology can help forecast raw material requirements, optimize inventory and distribution, reduce waste, and improve resource-use efficiency.

Recent literature has also begun to connect AI capability with green innovation and sustainable performance. Alwakid & Dahri (2025) demonstrate a relationship between AI capabilities, green innovation, and sustainable SME performance. These findings indicate that AI can support sustainability not only through efficiency but also through an organization's ability to generate innovations that are better aligned with economic and environmental demands. Conceptually, several mechanisms connect AI with sustainability. Efficiency can reduce waste and improve productivity; innovation can support the development of new products, processes, and business models; while adaptability, competitiveness, and resilience can help MSMEs maintain business continuity in a changing environment. AI should therefore be understood as an enabler of sustainability rather than as a single determinant. The benefits of AI for sustainability depend on the ability of MSMEs to integrate technology with human resources, data, infrastructure, business processes, and organizational strategy.

2.6 Conceptual Framework

Based on the literature review, this study positions Artificial Intelligence as an enabling technology in the digital economic transformation of MSMEs. Digital transformation provides a foundation consisting of data, connectivity, platforms, and digital systems, while AI expands these capabilities through analytics, prediction, automation, and generative capabilities. The capabilities strengthened through AI can subsequently improve efficiency and productivity while enhancing innovation capability. These efficiency and innovation capabilities then support MSMEs' ability to adapt to change, maintain competitiveness, and build resilience. At a broader level, these capabilities contribute to MSME sustainability across economic, social, and environmental dimensions. Conceptually, this process is illustrated in Figure 1.

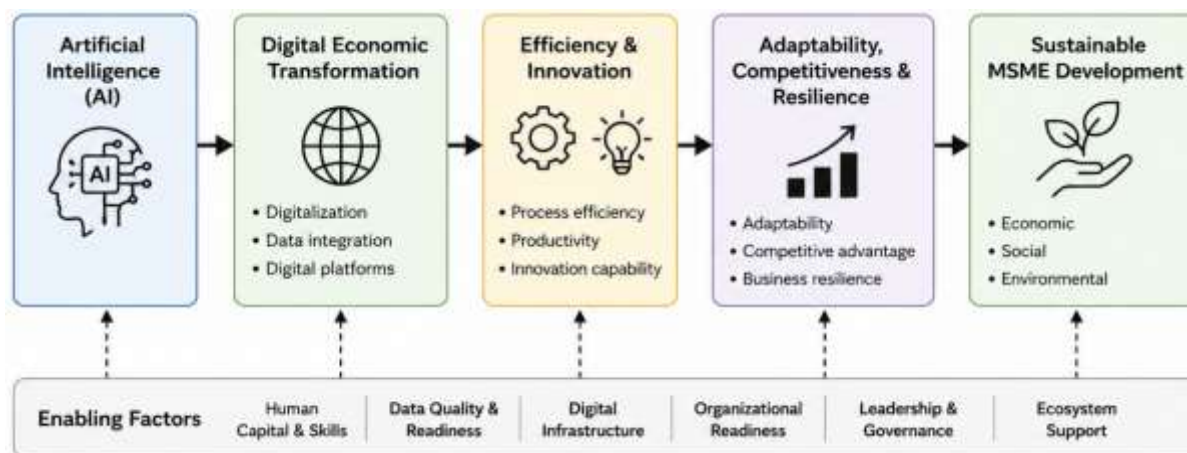


Figure 1. Conceptual Framework

This process does not occur automatically. MSMEs' ability to transform AI into organizational capabilities is influenced by supporting conditions, including AI literacy, human capability, data readiness, digital infrastructure, organizational readiness, leadership, ecosystem support, and AI governance. Accordingly, the conceptual framework positions AI not as the ultimate goal of digitalization but as an enabling technology that can strengthen digital economic transformation and MSME capability development. This framework provides the basis for synthesizing the literature analyzed in the results and discussion sections.

3. RESEARCH METHOD

3.1 Research Design

This study employs a qualitative literature review approach to analyze the role of Artificial Intelligence (AI) as an enabler of digital economic transformation toward sustainable Micro, Small, and Medium Enterprises (MSMEs). This approach was selected because the study aims to identify, compare, interpret, and synthesize findings from previous research rather than statistically test relationships among variables. The review focuses on how AI supports the digital transformation of MSMEs, particularly through improvements in efficiency, innovation, adaptability, competitiveness, and business sustainability. The review process consists of literature searching, screening, eligibility assessment, information extraction, descriptive analysis, thematic analysis, and conceptual synthesis. Transparency in the identification and selection of literature follows the principles of PRISMA 2020 reporting, particularly regarding literature sources, selection criteria, screening stages, and the number of articles included in the analysis (Page et al., 2021).

3.2 Data Sources and Literature Search Strategy

The literature was obtained through Google Scholar, Scopus, and Web of Science as the primary sources for searching scholarly publications. Google Scholar was used to obtain broad literature coverage, while Scopus and Web of Science were used to strengthen the search for indexed scientific articles. Publication information and full-text access were verified through reputable academic publisher platforms, including ScienceDirect, SpringerLink, Emerald Insight, Wiley Online Library, Taylor & Francis Online, and MDPI. The literature search covered publications from 2019 to 2026 to capture developments in MSME digital transformation and the increasing application of AI in business activities. The search was conducted using combinations of the following keywords: "artificial intelligence," "AI adoption," "AI capability," "digital transformation," "digital economy," "digitalization," "MSMEs," "SMEs," "sustainability," "sustainable performance," "innovation," "business efficiency," "competitive advantage," and "digital capability." The keywords were combined using the Boolean operators AND and OR to identify articles relevant to the focus of the study.

3.3 Literature Selection Criteria and Process

Articles were selected based on predetermined inclusion and exclusion criteria. The inclusion criteria were: (1) publications from 2019 to 2026; (2) peer-reviewed scientific articles or relevant academic publications; (3) studies addressing AI, digital transformation, digitalization, or the digital economy; (4) studies related to MSMEs, SMEs, or small and medium-sized business contexts; (5) studies associated with efficiency, innovation, adaptability, competitiveness, performance, or sustainability; and (6) studies providing sufficient information for analysis. Articles were excluded if they were not relevant to the research focus, were duplicate publications, were non-scientific publications, mentioned AI only superficially, or did not provide sufficient research information for analysis. The initial search identified 50 articles. After title and abstract screening, 10 articles were excluded because they were not relevant to the research focus. Subsequently, 5 articles were excluded because they were duplicate publications, leaving 35 articles for full-text assessment. At the full-text assessment stage, 10 additional articles were excluded. These consisted of 6 articles that did not substantively discuss AI and digital transformation in MSMEs, 2 articles that did not have sufficient relevance to sustainability, and 2 articles that did not provide sufficient research information for analysis. The selection process resulted in 25 articles being included in the final synthesis (see Figure 2).

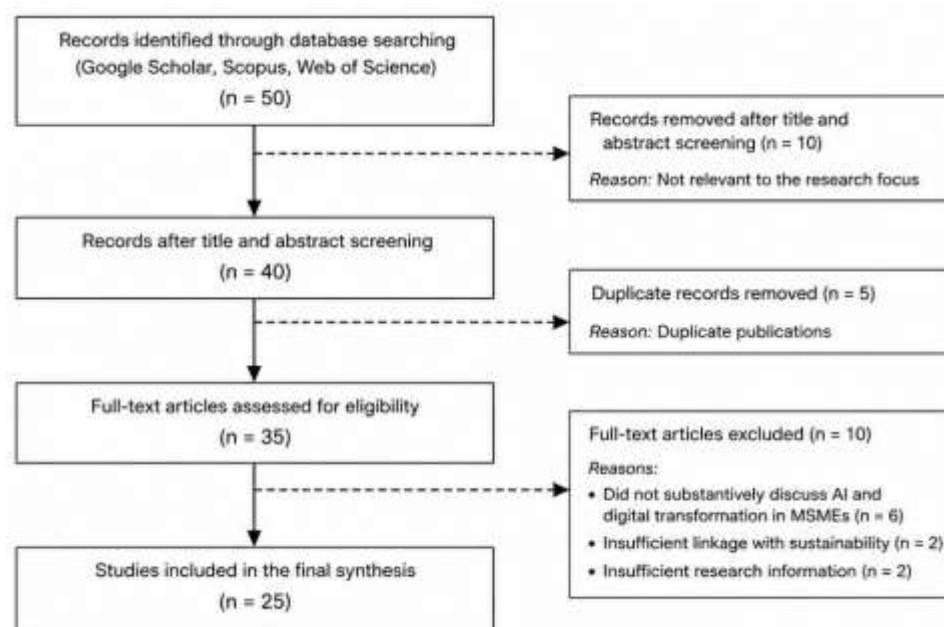


Figure 2. PRISMA 2020 Flow Diagram of Literature Identification and Selection

3.4 Literature Analysis and Synthesis Technique

The 25 selected articles were analyzed using descriptive and thematic analysis. Descriptive analysis was employed to map the characteristics of the literature based on publication year, research focus, MSME context, technologies examined, and sustainability-related aspects. Subsequently, thematic analysis was conducted to identify the main patterns and themes emerging from the literature. The identified themes included AI as an enabler of digital transformation, AI for efficiency and productivity, AI and innovation, AI for adaptability and competitiveness, AI and MSME sustainability, as well as barriers and risks associated with AI utilization. The findings were then synthesized narratively and conceptually to obtain a more comprehensive understanding of the role of AI in the digital economic transformation of MSMEs. The synthesis was directed toward the conceptual pathway AI → digital transformation → efficiency and innovation → adaptability and competitiveness → MSME sustainability. This process was used to identify similarities, differences, developments in research findings, and gaps in previous studies. The resulting synthesis provides the basis for explaining how AI can function as an enabling technology for MSMEs in creating economic, social, and environmental value sustainably.

4. DATA ANALYSIS AND DISCUSSION

4.1 Characteristics of the Selected Literature

The literature search and selection process initially identified 50 articles. After title and abstract screening, duplicate removal, and full-text assessment based on the inclusion and exclusion criteria, 25 articles met the requirements for analysis. The selected literature was published between 2019 and 2026 and covered studies on Artificial Intelligence (AI), digital transformation, AI capability, digital capability, innovation, efficiency, adaptability, competitiveness, resilience, and sustainability in SME and MSME contexts. Chronologically, the literature indicates a development in research focus from digital transformation in general toward more specific studies on AI adoption, AI readiness, AI capability, and AI-enabled transformation. Earlier studies primarily examined how digital technologies transform business processes, organizational structures, and value creation. Vial (2019) and Verhoef et al. (2021), for example, positioned digital transformation as an organizational change process that extends beyond the mere use of technology.

Subsequent research has increasingly focused on organizations' ability to integrate AI with human resources, technology, data, and business processes. Mikalef & Gupta (2021) conceptualized AI capability as a combination of resources that enables organizations to derive benefits from AI technology, including improvements in creativity and performance. More recent literature has expanded the discussion toward the relationships between AI, innovation, green innovation, sustainable performance, and MSME sustainability.

Overall, the literature reflects a shift in perspective from technology adoption toward capability development and sustainable transformation. A summary of the 25 articles forming the basis of the synthesis is presented in Table 1.

Table 1. Summary of the Selected Literature

No.	Authors	Research Focus	Context	Main Findings	Relevance
1	Vial (2019)	Digital transformation and organizational change	Organizations	Digital transformation changes processes, structures, and value creation through digital technologies.	Provides the conceptual foundation for digital transformation.
2	Winarsih et al. (2020)	Digital transformation and business resilience	MSMEs	Digital transformation supports MSME resilience and business continuity in response to environmental changes.	Connects digitalization with MSME resilience.
3	Mikalef & Gupta (2021)	AI capability	Firms	AI capability is associated with creativity and performance and is developed through technological, human, and organizational resources.	Positions AI as an organizational capability.
4	Verhoef et al. (2021)	Digital transformation and business models	Firms	Digital transformation evolves from digitization and digitalization toward broader organizational change.	Explains the development of digital transformation.
5	Denicolai et al. (2021)	AI readiness and digitalization	SMEs	AI readiness and digitalization are associated with SME strategy development and performance.	Explains organizational readiness.
6	Roblek et al. (2021)	Digital transformation and innovation	Manufacturing SMEs	Digital transformation changes business processes and creates opportunities for innovation and competitiveness.	Connects digitalization with innovation.
7	Troise et al. (2022)	Digital transformation and agility	SMEs	Digital technologies enhance agility and the ability to respond to uncertainty.	Explains organizational adaptability.
8	Philbin et al. (2022)	Digital transformation and sustainable development	SMEs	Digital transformation supports economic, social, and environmental dimensions.	Provides a basis for linking digitalization and sustainability.
9	Rupeika-Apoga & Petrovska (2022)	Barriers to digital transformation	MSMEs	Resource, skills, and organizational readiness limitations hinder digital transformation.	Explains transformation barriers.
10	Costa Melo et al. (2023)	Digital transformation and sustainable performance	SMEs	Digital transformation supports economic, social, and environmental performance.	Strengthens the sustainability perspective.
11	Maharani (2023)	AI adoption readiness	Indonesian manufacturing SMEs	AI readiness is influenced by strategy, infrastructure, human capital, leadership, and organizational culture.	Provides an Indonesian context.
12	Peretz-Andersson et al. (2024)	AI implementation and capabilities	Manufacturing SMEs	AI implementation re-	Explains AI as a capability.

					quires resource integration and organizational capability development.	
13	Hussain & Rizwan (2024)	Strategic AI adoption	SMEs		Cost, technical skills, employee acceptance, and organizational readiness influence AI adoption.	Identifies AI adoption barriers.
14	Isa et al. (2024)	Innovation capability and performance	SMEs		Innovation capability supports performance and responsiveness to market changes.	Connects innovation with performance.
15	Sari & Sarumpaet (2025)	Digital transformation and sustainable innovation	Indonesian MSMEs		Digital transformation creates opportunities for sustainable innovation while also presenting implementation challenges.	Provides contextual evidence from Indonesia.
16	Soomro et al. (2025)	AI adoption and sustainable performance	SMEs		AI adoption and technological, organizational, and environmental factors are associated with sustainable performance.	Provides evidence linking AI and sustainability.
17	Alwakid & Dahri (2025)	AI capability, creativity, and green innovation	SMEs		AI capability supports creativity and green innovation, which are associated with sustainable performance.	Connects AI, innovation, and sustainability.
18	Ahmad et al. (2025)	AI capability and frugal innovation	Manufacturing SMEs		AI capability can support sustainable performance directly and through frugal innovation.	Strengthens the role of innovation.
19	Ayu Widiarti et al. (2025)	Digital platform capability and innovation	Indonesian SMEs		Platform and digital network capabilities support performance through innovation capability.	Connects digital capabilities and innovation.
20	Hamid & Artha (2026)	AI adoption in SMEs	SMEs		AI research increasingly addresses drivers, barriers, applications, and business impacts.	Demonstrates the development of AI research.
21	Fitriyanti et al. (2026)	AI and MSME sustainability	Indonesian MSMEs		AI has potential to support sustainability, while skills, infrastructure, costs, and readiness remain constraints.	Provides recent Indonesian evidence.
22	Utomo & Jaafar (2026)	AI, big data analytics, and green innovation	SMEs		AI and data-driven technologies support green innovation and sustainable performance.	Extends AI research toward sustainability.
23	Sawang & Sornlertlamvanich (2026)	AI maturity and SME capabilities	SMEs		AI maturity is a multidimensional capability influenced by organizational and ecosystem factors.	Supports the capability perspective.
24	Rajaram & Tinguely (2026)	Generative AI in SMEs	SMEs		Generative AI supports efficiency, creativity, scalability, and competitiveness but requires skills and governance.	Extends the discussion to generative AI.
25	Mumcu & Brieger (2026)	AI and sustainable business transformation	SMEs/MSMEs		Recent research increasingly integrates AI, digital	Supports the conceptual synthesis.

4.2 Thematic Findings and Discussion

The analysis of the 25 selected articles generated six major themes: (1) AI as an enabler of digital transformation; (2) AI for efficiency and productivity; (3) AI and innovation capability; (4) AI for adaptability, competitiveness, and resilience; (5) AI and MSME sustainability; and (6) barriers and enabling conditions for AI implementation. These six themes are interconnected and demonstrate the evolution of AI utilization from a technological function toward the development of strategic MSME capabilities.

4.2.1 Artificial Intelligence as an Enabler of Digital Transformation

The synthesis indicates that Artificial Intelligence (AI) should increasingly be understood as a strategic enabler of digital transformation rather than merely as an additional technological tool. Vial (2019) conceptualizes digital transformation as a process in which digital technologies trigger changes in organizational processes, structures, and mechanisms of value creation, while Verhoef et al. (2021) explain that transformation represents a broader evolutionary process that moves beyond digitization and digitalization toward fundamental organizational change. Within this progression, AI adds a higher level of intelligence to digital transformation by enabling organizations not only to digitize information and automate activities but also to interpret data, predict future conditions, personalize interactions, generate content, and support decision-making. Mikalef & Gupta (2021) demonstrate that AI capability is not determined solely by technological infrastructure but emerges from the combination of technological, human, and organizational resources. Similarly, Peretz-Andersson et al. (2024) emphasize the importance of resource integration and organizational capability development in successful AI implementation. This indicates that the transformation created by AI occurs when technological capabilities become embedded within organizational routines and decision-making processes. Consequently, AI can transform MSMEs from businesses that primarily respond to market information into organizations that can continuously collect, interpret, and utilize information to anticipate market changes.

For MSMEs, this transformation is particularly important because digitalization without intelligence may only improve the speed of existing activities without fundamentally improving the quality of managerial decisions. AI enables digital platforms, customer data, social media interactions, transaction records, and operational information to become strategic resources for business development. For example, customer analytics can identify changing consumer preferences, predictive tools can support demand forecasting, generative AI can accelerate content production, and automated systems can improve customer service and operational coordination. However, the synthesis also suggests that AI adoption itself should not be regarded as evidence of successful digital transformation. The strategic value of AI depends on the extent to which MSMEs can integrate AI with reliable data, employee capabilities, digital infrastructure, business processes, organizational strategy, and managerial knowledge. In this sense, AI functions as a transformation lever whose impact depends on the organizational capabilities surrounding it. MSMEs that merely adopt AI tools without restructuring their processes may obtain short-term efficiency gains but are less likely to achieve sustainable transformation. Therefore, AI capability, rather than simple AI adoption, represents the more meaningful basis for understanding AI-driven digital transformation.

4.2.2 Artificial Intelligence, Efficiency, and Productivity

The second theme demonstrates that AI can improve MSME efficiency and productivity by changing how businesses allocate time, labor, information, and other scarce resources. AI-based automation can reduce the amount of repetitive manual work, while machine learning and analytical functions can accelerate the processing of large amounts of information. In marketing, for example, AI can support customer segmentation, consumer behavior analysis, personalized communication, and content generation. In operational activities, AI can assist demand forecasting, inventory management, process monitoring, and resource planning. The importance of these capabilities is particularly evident in MSMEs because their managerial and financial resources are generally more constrained than those of larger organizations. AI can therefore partially compensate for resource limitations by allowing a relatively small number of employees to perform activities that previously required greater amounts of time and labor. More importantly, productivity improvement should not be interpreted only as doing the same activities at lower cost. AI can also improve the quality, speed,

consistency, and timeliness of managerial decisions, thereby creating a broader productivity effect.

The relationship between AI and efficiency also has important implications for the long-term sustainability of MSMEs. When AI enables businesses to forecast demand more accurately, optimize inventory, reduce unnecessary production, minimize resource waste, and identify inefficient processes, productivity improvements can simultaneously contribute to more efficient resource utilization. This suggests that economic efficiency and environmental sustainability may reinforce one another rather than operate as separate outcomes. Nevertheless, the efficiency benefits of AI are not automatic because the introduction of AI may itself require investment in software, infrastructure, employee training, data preparation, and organizational adaptation. Thus, the net productivity effect depends on whether the gains generated by AI exceed the costs associated with implementation and whether employees can effectively incorporate AI into their routines. The synthesis therefore positions AI as a mechanism for resource optimization and decision enhancement, rather than simply as a cost-cutting technology. For MSMEs, the most meaningful productivity gains are likely to emerge when AI is integrated into core business processes and used to augment human capabilities rather than merely replace individual tasks.

4.2.3 Artificial Intelligence and Innovation Capability

The third theme demonstrates that AI has an important relationship with organizational innovation capability because it expands the ability of MSMEs to acquire information, recognize opportunities, generate ideas, and experiment with alternative solutions. AI can support information search, customer-need identification, market-trend analysis, idea generation, product development, and evaluation of alternative business strategies. Mikalef & Gupta (2021) demonstrate that AI capability is associated with organizational creativity, suggesting that AI can contribute to the generation of new ideas and approaches. This relationship is particularly important because innovation does not emerge solely from the existence of new technology; it depends on the organization's ability to transform information and knowledge into commercially or operationally valuable outcomes. AI can accelerate this process by processing diverse sources of information and identifying patterns that may not be easily recognized through conventional analysis. Consequently, AI can expand the cognitive capacity of MSMEs by allowing entrepreneurs and employees to explore more alternatives, identify emerging customer needs, and make faster comparisons between potential strategies.

Recent research further indicates that the relationship between AI and innovation extends beyond conventional product and process innovation toward sustainability-oriented innovation. Alwakid & Dahri (2025) link AI capability with creativity, green innovation, and sustainable performance, while Utomo & Jaafar (2026) demonstrate relationships involving AI, big data analytics, green innovation, and sustainable performance. These findings suggest that AI can become an important input into the development of innovations that simultaneously address economic and environmental objectives. However, AI should not be viewed as an independent source of innovation. AI may generate recommendations, patterns, alternatives, or content, but the selection and implementation of those outputs remain dependent on human judgment, organizational knowledge, entrepreneurial orientation, and the ability to understand market contexts. Therefore, the synthesis indicates a complementary relationship between AI-based intelligence and human-organizational creativity. AI expands the capacity to explore and process information, while organizational capabilities determine whether these possibilities are converted into meaningful products, processes, services, or business models. This distinction is important for MSMEs because technological access can be relatively easy to obtain, whereas the organizational capability to convert AI outputs into differentiated innovation is more difficult to develop and imitate.

4.2.4 Artificial Intelligence, Adaptability, Competitiveness, and Resilience

The fourth theme highlights the strategic role of AI in strengthening the ability of MSMEs to respond to environmental uncertainty and rapidly changing market conditions. Troise et al. (2022) demonstrate that digital transformation can strengthen organizational agility, while Winarsih et al. (2020) associate digital transformation with MSME resilience. Building on these findings, AI can strengthen adaptability through continuous data analysis, predictive capabilities, market-trend monitoring, and decision support. These functions allow MSMEs to detect changes in customer preferences, demand patterns, competitor behavior, and external market conditions more rapidly. Such capabilities are particularly valuable in uncertain environments because delayed information can lead to inappropriate inventory decisions, ineffective marketing

strategies, or missed market opportunities. AI therefore contributes to adaptability by reducing the time between environmental change, information acquisition, interpretation, and managerial response. In this respect, the value of AI is not limited to predicting what may happen but also to enabling MSMEs to respond more quickly when circumstances change.

The implications of adaptability extend directly to competitiveness and resilience. In highly digitalized markets, competitive advantage increasingly depends on the ability to respond faster and more accurately than competitors, rather than simply possessing more physical resources. AI can reduce information-processing delays and provide MSMEs with greater visibility of their markets, thereby supporting faster adjustments in products, pricing, promotion, inventory, and customer service. Nevertheless, AI adoption alone does not automatically produce sustainable competitive advantage. If the same AI tools are widely accessible to competitors, the technology itself may become relatively easy to imitate. More durable advantages are therefore likely to emerge from the organizational capability to deploy AI effectively, including the integration of AI with proprietary data, business knowledge, human expertise, organizational culture, and decision-making routines. This reinforces the distinction between AI adoption and AI capability identified by Mikalef & Gupta (2021). From this perspective, resilience represents not merely the ability to survive disruption but the organizational capacity to learn, adapt, and reconfigure resources continuously. AI can facilitate this process, but the ultimate source of competitive advantage remains the organizational capability to transform AI-enabled information into timely strategic action.

4.2.5 Artificial Intelligence and MSME Sustainability

The relationship between AI and sustainability represents an important development in the literature because the role of digital technologies is increasingly being examined beyond short-term productivity and financial performance. Earlier research largely emphasized how digital transformation could improve operational and organizational performance, whereas more recent studies increasingly connect digital transformation with broader economic, social, and environmental objectives. Philbin et al. (2022) and Costa Melo et al. (2023) demonstrate that digital transformation can contribute to sustainable development and performance, providing a foundation for understanding how digital capabilities may support sustainability. More recent AI-oriented research extends this perspective. Soomro et al. (2025) link AI adoption with sustainable SME performance, while Alwakid & Dahri (2025) connect AI capability, creativity, green innovation, and sustainable performance. Utomo & Jaafar (2026) further extend the relationship by examining AI, big data analytics, green innovation, and sustainable performance. Collectively, these findings indicate that AI can influence sustainability through multiple interconnected pathways rather than through a single direct relationship.

From an analytical perspective, AI may contribute to MSME sustainability through at least four mechanisms: resource efficiency, innovation, adaptability, and resilience. Economically, AI can improve productivity, decision-making, and competitiveness, strengthening the capacity of MSMEs to maintain financial viability. Environmentally, predictive analytics and optimization can support more efficient use of materials, energy, inventory, and production capacity, while AI-enabled innovation can facilitate the development of greener products and processes. Socially, AI can improve customer responsiveness, service accessibility, and information management, although these benefits must be balanced against concerns regarding privacy, data security, algorithmic bias, accuracy, and responsible technology use. Therefore, the relationship between AI and sustainability should not be interpreted as technologically deterministic. AI can also generate new risks if implemented without appropriate governance and human oversight. The synthesis consequently suggests that sustainable MSME performance emerges when AI is embedded within broader organizational capabilities and responsible management practices. In other words, AI is an enabler of sustainability, not a guarantee of sustainability; its contribution depends on how technological capabilities are translated into economically viable, environmentally responsible, and socially accountable business practices.

4.2.6 Barriers and Enabling Conditions for AI Implementation

Despite the opportunities identified across the previous themes, the synthesis demonstrates that the benefits of AI are highly dependent on the readiness of MSMEs to adopt, integrate, and manage the technology. Rupeika-Apoga & Petrovska (2022) demonstrate that resource limitations, skills shortages, and organizational readiness can constrain digital transformation. Similar concerns are identified in research on AI read-

business and adoption. Maharani (2023), Hussain & Rizwan (2024), and Fitriyanti et al. (2026) highlight the importance of human resources, AI literacy, infrastructure, implementation costs, leadership, organizational culture, and organizational readiness. These findings indicate that AI implementation is not simply a technological acquisition decision but a multidimensional organizational transformation process. MSMEs may have access to affordable AI applications, but without employees who understand how to formulate appropriate prompts, interpret AI outputs, evaluate accuracy, manage data, and integrate AI into workflows, the actual value generated may remain limited. Likewise, inadequate infrastructure, poor-quality data, financial constraints, or weak managerial commitment can prevent AI tools from being integrated into core business processes. Therefore, the primary challenge is increasingly shifting from access to AI toward the capability to use AI effectively and responsibly.

The emergence of generative AI makes these enabling conditions even more important because the technology substantially lowers the technical barriers to producing text, images, marketing materials, analysis, and other forms of business content. At the same time, easier access increases the risks associated with inaccurate information, privacy violations, intellectual property, biased outputs, security vulnerabilities, and excessive dependence on automated recommendations. Rajaram & Tinguely (2026) demonstrate that generative AI adoption among SMEs requires adequate skills and governance, reinforcing the importance of human oversight in AI-enabled business processes. Accordingly, AI readiness should be understood as a combination of technological readiness, human capability, organizational readiness, data readiness, and governance readiness. These dimensions are interdependent: high-quality infrastructure is insufficient without skilled users, skilled employees are constrained by poor-quality data, and both technological and human capabilities can create risks when governance mechanisms are weak. For MSMEs, effective AI implementation therefore requires a gradual capability-building approach that combines AI literacy, employee training, leadership support, data management, appropriate infrastructure, ethical guidelines, and continuous evaluation. This perspective strengthens the overall synthesis by showing that the strategic benefits identified across transformation, efficiency, innovation, competitiveness, resilience, and sustainability are conditional upon the organizational capacity to implement AI effectively and responsibly.

4.3 Conceptual Synthesis

Based on the synthesis of the 25 articles, a consistent pattern emerges in which AI functions as an enabling technology that strengthens digital transformation and MSME capability development. This transformation is subsequently associated with efficiency, innovation, adaptability, competitiveness, and resilience, which collectively support business sustainability (see Figure 3).

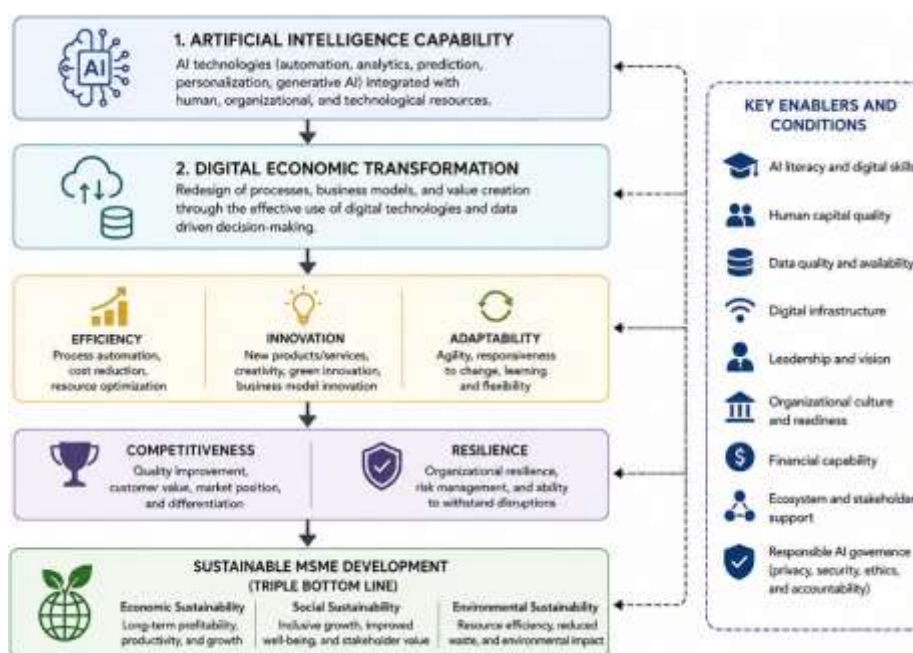


Figure 3. Conceptual Synthesis

Figure 3 presents the conceptual synthesis derived from the entire body of literature analyzed. AI is positioned as an enabler that strengthens digital capability and the digital economic transformation process. This transformation subsequently creates or strengthens efficiency and innovation. These two capabilities support MSME adaptability, competitiveness, and resilience, which ultimately contribute to economic, social, and environmental sustainability. However, this pattern represents a conceptual synthesis rather than a statistically tested causal model. The relationships presented are intended to explain recurring patterns in the literature and integrate findings that were previously dispersed across different research streams. The synthesis also demonstrates that this process is influenced by enabling conditions, particularly AI literacy, digital skills, human resource quality, infrastructure, data quality, financial capacity, leadership, organizational culture, ecosystem support, and AI governance. Thus, the success of AI-enabled transformation depends on the ability of MSMEs to develop the capabilities required to effectively utilize AI.

4.4 Research Gap

The synthesis of the 25 articles reveals several research gaps. First, research on AI and digital transformation continues to develop across relatively separate streams of literature. Some studies focus on digital transformation, digital capability, business model transformation, and resilience, whereas others examine AI adoption, AI readiness, AI capability, automation, creativity, and performance. Studies integrating these two perspectives within the MSME context remain limited. Second, the relationship between AI and sustainability is still relatively emerging. Previous research has demonstrated the benefits of AI for efficiency, productivity, creativity, and competitiveness. More recent studies have begun to connect AI with sustainable performance and green innovation, but the integration of AI, digital transformation, innovation, adaptability, competitiveness, resilience, and sustainability remains insufficiently developed. Third, research in the context of MSMEs in developing countries, including Indonesia, remains limited. MSMEs in developing countries differ from large firms or organizations in developed economies, particularly in terms of capital, infrastructure, skills, technology access, and organizational capabilities. Therefore, findings regarding AI need to be interpreted in consideration of the specific conditions of the MSME ecosystem and its organizational capacity.

Fourth, the development of generative AI creates new research opportunities. Generative AI provides opportunities for MSMEs in content creation, customer service, information processing, idea development, and other business activities. However, empirical evidence regarding how generative AI contributes to digital economic transformation and MSME sustainability is still developing. Fifth, the literature tends to evaluate AI primarily in terms of adoption or readiness, while the perspective of how AI is transformed into strategic capabilities that generate sustainable value requires further development. This gap indicates the need to shift attention from simply asking whether MSMEs use AI toward understanding how MSMEs integrate AI with organizational resources and capabilities. Overall, these research gaps demonstrate the need for a more integrated perspective on AI as an enabler of digital economic transformation toward sustainable MSME development. Such a perspective connects the development of AI with digital transformation, efficiency, innovation, adaptability, competitiveness, resilience, and sustainability within a unified conceptual framework.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This study aimed to analyze the role of Artificial Intelligence (AI) as an enabler of digital economic transformation in supporting sustainable MSME development through a synthesis of 25 scientific articles published between 2019 and 2026. The findings indicate that AI has evolved from merely a supporting technology into a strategic capability that can strengthen the digital transformation processes of MSMEs. AI capabilities in automation, data analytics, prediction, personalization, generative functions, and decision-making support enable MSMEs to improve how they manage resources, interact with customers, and create value. The literature synthesis indicates that AI contributes to MSME development through several key dimensions. First, AI strengthens efficiency and productivity through the automation of routine tasks, resource optimization, information processing, and data-driven decision-making. Second, AI supports innovation capability through trend identification, understanding customer needs, product development, creativity, and green innovation. Third, these capabilities can strengthen MSME adaptability, competitiveness, and resilience in responding to changes in the business environment. Fourth, the combination of these capabilities has the potential to support economic, social, and environmental sustainability. However, this study also demonstrates

that AI does not automatically generate transformation or sustainability. The benefits of AI depend heavily on AI literacy, human resource quality, digital infrastructure, data quality, financial capacity, organizational readiness, leadership, organizational culture, ecosystem support, and responsible AI governance. Therefore, the success of AI-enabled transformation is determined more by the ability of MSMEs to integrate technology with organizational resources and capabilities than by the level of technology adoption alone.

Theoretically, this study extends the perspective on digital transformation by positioning AI as a technology-enabled organizational capability. The findings indicate that AI should not be understood merely as a technology adopted by MSMEs but as a resource that can be combined with human resources, data, infrastructure, knowledge, and organizational processes to develop new capabilities. The synthesis also strengthens the understanding that the relationship between AI and sustainability is neither direct nor simple. AI can strengthen digital transformation, while digital transformation creates conditions that support efficiency, innovation, adaptability, competitiveness, and resilience. These capabilities subsequently contribute to MSME sustainability. Accordingly, this study offers a conceptual perspective that integrates AI, digital transformation, capability development, innovation, competitiveness, resilience, and sustainability within the MSME context.

For MSMEs, the findings indicate that AI utilization should begin with actual business needs and challenges, such as marketing, customer service, content creation, consumer analytics, demand forecasting, inventory management, and information processing. MSMEs do not need to adopt all AI technologies simultaneously but should select technologies that are aligned with their needs, resources, and organizational capabilities. The development of AI literacy and digital skills should also proceed alongside technology adoption. MSME owners and employees need to be able to use AI, evaluate its outputs, understand its limitations, and ensure that important decisions remain subject to appropriate human oversight. In addition, strengthening digital infrastructure, data quality, information security, and AI governance is an important component of the transformation process. For governments, MSME support institutions, and other stakeholders, the findings highlight the importance of building an inclusive AI transformation ecosystem. Support should not be limited to technology provision but should also include AI literacy training, digitalization assistance, infrastructure development, access to technology financing, data quality improvement, and the development of guidelines for safe and responsible AI use.

This study has limitations because it employs a qualitative literature review based on 25 articles as the foundation for the synthesis. Therefore, the findings describe conceptual patterns and developments in the literature but cannot establish causal relationships or statistically measure the magnitude of AI's influence on MSME sustainability. Furthermore, heterogeneity in the contexts, methodologies, business sectors, and countries represented in the reviewed literature may contribute to differences in findings across studies. Future research can empirically test the conceptual synthesis developed in this study through MSME surveys, SEM-PLS, longitudinal studies, and mixed-method research. Future studies can also examine the roles of AI literacy, AI capability, digital capability, innovation capability, and organizational readiness as mechanisms or conditions that determine the successful utilization of AI. The development of generative AI also represents an important research agenda. Future studies should explore how generative AI affects MSME productivity, creativity, innovation, competitiveness, and sustainability over the long term. Research in developing-country contexts, particularly Indonesia, is also needed to understand how limitations in infrastructure, skills, financing, and digital ecosystems affect the ability of MSMEs to transform AI into strategic capabilities. Overall, this study emphasizes that AI is not the ultimate goal of digital economic transformation but an enabler that can strengthen MSME capabilities to create value more efficiently, innovatively, adaptively, competitively, and sustainably. The success of this transformation ultimately depends on the ability of MSMEs and their supporting ecosystems to responsibly integrate technology, people, organizations, data, and governance.

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