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The Role of Generative AI in the Digital Transformation of MSMEs: A Literature Review of Opportunities, Challenges, and Future Research Directions

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ABSTRACT

This study examines the role of generative artificial intelligence (GenAI) in the digital transformation of micro, small, and medium enterprises (MSMEs), focusing on opportunities, implementation challenges, and future research directions. Using an integrative literature review, the study synthesizes theoretical perspectives and empirical findings concerning AI adoption, organizational capabilities, business process integration, and performance. The findings indicate that generative AI can improve operational efficiency, marketing activities, customer communication, and innovation. However, technology adoption does not automatically produce meaningful digital transformation. Its contribution depends on employee competencies, managerial readiness, technological infrastructure, and responsible AI governance. By integrating the Technology–Organization–Environment framework, Resource-Based View, and dynamic capabilities perspective, this study proposes a conceptual framework linking AI adoption with organizational capabilities, process integration, and transformation outcomes. The findings emphasize that sustainable business value requires strategic technology integration rather than occasional AI use, particularly among resource-constrained MSMEs operating in increasingly competitive digital markets.

ABSTRAK

Penelitian ini mengkaji peran kecerdasan buatan generatif (GenAI) dalam transformasi digital usaha mikro, kecil, dan menengah (UMKM), dengan menekankan peluang, tantangan implementasi, dan arah penelitian masa depan. Menggunakan pendekatan integrative literature review, penelitian ini menyintesis perspektif teoretis dan temuan empiris mengenai adopsi AI, kapabilitas organisasi, integrasi proses bisnis, dan kinerja usaha. Hasil kajian menunjukkan bahwa AI generatif berpotensi meningkatkan efisiensi operasional, aktivitas pemasaran, komunikasi pelanggan, dan inovasi. Namun, adopsi teknologi tidak secara otomatis menghasilkan transformasi digital yang bermakna. Kontribusinya bergantung pada kompetensi karyawan, kesiapan manajerial, infrastruktur teknologi, dan tata kelola AI yang bertanggung jawab. Melalui integrasi kerangka Technology–Organization–Environment, Resource-Based View, dan perspektif kapabilitas dinamis, penelitian ini mengusulkan kerangka konseptual yang menghubungkan adopsi AI dengan kapabilitas organisasi, integrasi proses bisnis, dan hasil transformasi digital. Temuan ini menegaskan bahwa penciptaan nilai bisnis berkelanjutan memerlukan integrasi teknologi secara strategis, bukan sekadar penggunaan AI untuk aktivitas rutin.

1. INTRODUCTION

Digital transformation has become an increasingly important factor in the competitiveness and sustainability of micro, small, and medium enterprises (MSMEs). Changes in consumer behavior, the expansion of digital markets, and the growing availability of technological solutions have encouraged businesses to reconsider how they manage operations, communicate with customers, and create economic value. In recent years, artificial intelligence (AI) has introduced another dimension to this transformation. Unlike earlier digital technologies that primarily supported communication, transactions, and information storage, generative artifi-

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cial intelligence (GenAI) enables businesses to produce text, images, software code, and other forms of content through relatively accessible digital applications. This development has created new opportunities for smaller enterprises that traditionally face limitations in financial resources, technological expertise, and organizational capacity. Nevertheless, the increasing accessibility of AI does not necessarily mean that MSMEs are prepared to integrate it effectively into their business processes.

The economic importance of MSMEs makes their digital transformation a significant issue for both business development and public policy. In Indonesia, the Ministry of Investment and Downstreaming/BKPM reported in 2025 that approximately 65 million MSMEs contributed around 61% of national gross domestic product and absorbed approximately 97% of employment. Despite this contribution, MSMEs continue to face challenges related to productivity, market expansion, access to financing, and technological capabilities. These structural constraints influence their ability to respond to changing competitive conditions. Digital transformation is therefore not simply a matter of introducing new applications but involves improving how businesses organize resources, develop capabilities, and respond to market opportunities. Within this context, generative AI presents a potentially important technological development because it may allow smaller enterprises to perform activities that previously required specialized expertise or additional personnel.

Recent international evidence indicates that generative AI is beginning to enter everyday business activities. The Organisation for Economic Co-operation and Development (OECD, 2025) surveyed more than 5,000 SMEs across Austria, Canada, Germany, Ireland, Japan, Korea, and the United Kingdom. The findings showed that approximately 31% of surveyed SMEs were using generative AI, although adoption varied considerably across countries and industries. Among SMEs using the technology, 65% reported improvements in employee performance, while 35% indicated that generative AI had helped them scale their activities and 26% reported increased revenue. These findings suggest that generative AI may support productivity and business development. However, the figures represent reported experiences among surveyed businesses rather than universally established causal effects. They also demonstrate that improvements in employee performance are more frequently reported than direct financial gains, indicating that the economic benefits of AI adoption may emerge through different organizational processes.

One of the most attractive characteristics of generative AI is its potential to reduce certain barriers associated with digital business activities. MSMEs can use AI-supported applications to prepare marketing content, develop product descriptions, respond to customer inquiries, generate business ideas, and assist with administrative tasks. For example, a small food business may use generative AI to prepare promotional messages, while a local fashion enterprise may apply it to develop product descriptions and explore alternative marketing strategies. These applications can reduce the time required for routine activities and allow business owners to concentrate on other operational priorities. Rajaram & Tinguely (2024) explain that generative AI offers smaller enterprises opportunities to improve scalability, creativity, and innovation despite their limited resources. However, the authors also emphasize that successful implementation requires employee competence, effective leadership, organizational culture, and collaboration with external partners. Thus, the potential value of generative AI extends beyond the technical capabilities of the applications themselves.

A particularly important distinction concerns the difference between adopting generative AI and achieving digital transformation. A business may use ChatGPT to produce promotional captions without changing its marketing strategy, customer relationship management, or internal decision-making processes. Such activities represent technological adoption, but they do not necessarily constitute meaningful organizational transformation. Digital transformation requires more substantial changes in how technology is integrated into business operations, organizational capabilities, and value creation. This distinction is supported by OECD (2025), which found that only 29% of generative AI-using SMEs reported applying the technology to their core business activities. Most applications remained concentrated in supporting or peripheral tasks. This finding raises an important question about whether the growing use of generative AI among smaller enterprises reflects genuine business transformation or primarily the adoption of convenient tools for routine work.

The opportunities associated with generative AI are also accompanied by substantial implementation challenges. Unlike large corporations, MSMEs frequently operate with limited technological infrastructure, financial flexibility, and specialized human resources. Oldemeyer et al. (2025), through a systematic literature review examining AI implementation in SMEs, identified 27 distinct implementation challenges,

with inadequate knowledge, financial costs, and insufficient infrastructure among the most frequently reported barriers. Similarly, Schwaeke et al. (2025), in a review of 106 peer-reviewed articles, classified AI adoption factors into eight major dimensions, including compatibility, infrastructure, knowledge, resources, organizational culture, competition, regulation, and the business ecosystem. These findings indicate that technological adoption is shaped by interconnected organizational and environmental conditions. Consequently, providing MSMEs with access to AI applications may be insufficient when business owners and employees lack the capabilities needed to evaluate, integrate, and manage these technologies effectively.

Beyond organizational readiness, generative AI introduces risks associated with information accuracy, data confidentiality, intellectual property, and responsible technology use. AI-generated content may contain inaccurate information or misleading recommendations, creating potential problems when businesses rely on outputs without adequate verification. Customer information, internal business documents, and commercially sensitive data may also be exposed to privacy and security risks when entered into external AI services without appropriate safeguards. The OECD (2025) reported that 54% of surveyed SMEs expressed concerns involving copyright, legal or regulatory issues, and the handling of information submitted to generative AI systems. The same report found that no more than approximately one-third of generative AI-using SMEs had implemented measures such as employee training, internal guidelines, or investigation of relevant legal requirements. These findings suggest that the availability of AI technology may be advancing more rapidly than the organizational practices needed to govern its responsible use.

The implications of these challenges become particularly significant when generative AI is considered within the broader context of MSME competitiveness. Although AI-supported applications may improve operational efficiency, they do not automatically create sustainable competitive advantages. When similar tools are widely available, businesses may generate comparable marketing materials, product descriptions, and customer communications. Competitive differentiation may therefore depend less on access to generative AI itself and more on the ability to combine AI-generated outputs with business knowledge, customer understanding, creativity, and organizational learning. In this regard, the Resource-Based View provides a relevant theoretical perspective by emphasizing the strategic importance of valuable organizational resources and capabilities. Generative AI may function as a supporting resource, but its contribution to competitiveness depends on how effectively enterprises integrate it with capabilities that competitors cannot easily reproduce. This interpretation suggests that AI adoption should be evaluated through business value creation rather than the mere frequency of technology use.

The Technology–Organization–Environment (TOE) framework also provides a useful explanation of the conditions influencing generative AI adoption among MSMEs. Technological factors include perceived usefulness, compatibility with existing operations, complexity, and concerns regarding information quality. Organizational factors involve leadership commitment, financial readiness, employee capabilities, and willingness to change established business practices. Environmental factors include competitive pressure, customer expectations, access to technological partners, and regulatory support. Schwaeke et al. (2025) demonstrate the relevance of these dimensions in explaining broader AI adoption among SMEs. However, generative AI introduces characteristics that deserve more specific attention, particularly its conversational interfaces, ability to generate original-looking content, dependence on user instructions, and potential for producing inaccurate outputs. These characteristics may create adoption patterns that differ from those associated with conventional enterprise software, automated analytics, or earlier digital technologies.

Existing studies have contributed valuable insights into AI adoption and implementation challenges among smaller enterprises. Oldemeyer et al. (2025) emphasize the barriers associated with AI implementation, while Schwaeke et al. (2025) provide a broader classification of technological, organizational, and environmental adoption factors. Rajaram & Tinguely (2024) focus more directly on generative AI and propose strategic considerations for its deployment in SMEs. Meanwhile, OECD (2025) offers empirical evidence concerning adoption patterns, workforce implications, and perceived business benefits. Although these contributions provide an important foundation, they also reveal a need for greater conceptual integration. Research on AI adoption frequently examines readiness and implementation barriers, while discussions of generative AI often emphasize productivity and operational opportunities. The relationship between initial AI use, organizational capability development, business process transformation, and longer-term MSME performance requires more systematic examination. In addition, the available evidence is unevenly distributed across countries and business contexts, creating uncertainty about how findings from technologically advanced economies apply to microenterprises and resource-constrained businesses in developing countries.

This study addresses these issues by reviewing the role of generative AI in the digital transformation of MSMEs, with particular attention to its opportunities, implementation challenges, and future research directions. Using an integrative literature review approach, the study seeks to synthesize theoretical perspectives and empirical findings concerning generative AI adoption, organizational readiness, operational efficiency, innovation, and business transformation. Its primary contribution is to distinguish the adoption of AI tools from the development of organizational capabilities required to generate sustained business value. The review also considers how technological characteristics, organizational resources, and environmental conditions may influence the transition from experimental AI use to more integrated digital business practices. By bringing these perspectives together, the study aims to develop a conceptual foundation for future research and provide insights for MSME owners, technology providers, and policymakers seeking to promote responsible and effective AI-enabled digital transformation.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

2.1. Generative AI and MSME Digital Transformation

Generative artificial intelligence (GenAI) refers to AI systems capable of producing new content, including text, images, and other digital outputs, based on patterns learned from existing data. Unlike conventional digital applications that primarily facilitate transactions, communication, or information management, generative AI can assist businesses in performing creative, analytical, and administrative activities. For MSMEs, this technology offers opportunities to access capabilities that previously required specialized personnel or substantial financial investment. However, adopting generative AI does not automatically constitute digital transformation. Verhoef et al. (2021) distinguish digital transformation from narrower forms of digitalization by emphasizing changes in organizational structures, business models, and value creation. Similarly, Vial (2019) conceptualizes digital transformation as a process through which digital technologies trigger organizational changes and strategic responses. These perspectives suggest that the contribution of generative AI should be evaluated not merely through its adoption but through its integration into business processes, organizational capabilities, and long-term value creation.

2.2. Opportunities and Challenges of Generative AI Adoption

Generative AI offers MSMEs opportunities to improve operational efficiency, marketing activities, customer communication, and business innovation. Rajaram & Tinguely (2024) highlight its potential to support creativity, scalability, and organizational productivity, particularly in smaller enterprises with limited resources. Nevertheless, these opportunities are accompanied by challenges involving technological knowledge, implementation costs, infrastructure, and organizational readiness. Oldemeyer et al. (2025) identify inadequate expertise, financial constraints, and technological limitations among the major barriers to AI implementation in SMEs. Beyond these structural challenges, generative AI introduces concerns regarding inaccurate outputs, data confidentiality, intellectual property, and excessive reliance on automated recommendations. Consequently, its business value depends on the ability of MSMEs to combine technological applications with employee competence, managerial judgment, and responsible governance. The central issue is therefore not simply whether generative AI is accessible, but whether enterprises possess the capabilities required to use it effectively and sustainably.

2.3. Theoretical Perspectives on Generative AI Adoption and Business Value

The Technology–Organization–Environment (TOE) framework and the Resource-Based View (RBV) provide complementary perspectives for explaining generative AI adoption and its potential contribution to MSME performance. The TOE framework, introduced by Tornatzky & Fleischer (1990), explains technological adoption through technological characteristics, organizational conditions, and external environmental influences. In the context of generative AI, these dimensions include perceived usefulness, compatibility, leadership support, employee capabilities, competitive pressure, and regulatory conditions. Schwaeke et al. (2025) demonstrate the relevance of these factors in broader AI adoption among SMEs. Meanwhile, RBV emphasizes that competitive advantage depends on valuable organizational resources and capabilities (Barney, 1991). From this perspective, access to generative AI alone is unlikely to create sustained competitive advantage because similar applications are available to competing businesses. Instead, business value may emerge when MSMEs combine AI capabilities with market knowledge, employee expertise, organizational learning,

and distinctive business processes. Integrating TOE and RBV therefore helps distinguish the conditions enabling AI adoption from the organizational capabilities required to transform adoption into meaningful business outcomes.

2.4. Research Gap and Conceptual Integration

Existing literature provides important insights into AI adoption, implementation barriers, and potential business benefits. However, these discussions do not always clearly distinguish initial technology adoption from the broader organizational changes associated with digital transformation. Studies focusing on AI adoption often emphasize technological readiness and implementation conditions, while research on generative AI frequently highlights productivity improvements and operational opportunities. Less attention has been given to how MSMEs develop the capabilities needed to move from occasional AI use toward integrated business processes and sustainable value creation. This distinction is particularly relevant for resource-constrained enterprises in developing economies. Accordingly, this study integrates TOE and RBV to examine how technological, organizational, and environmental conditions may influence generative AI adoption, while organizational capabilities and business process integration may shape its contribution to digital transformation. The proposed relationships represent a conceptual interpretation of existing literature rather than empirically established causal effects. This perspective provides a foundation for identifying future research opportunities concerning AI readiness, organizational learning, responsible implementation, and long-term MSME competitiveness.

3. RESEARCH METHOD

3.1. Research Design

This study adopts a qualitative approach using an integrative literature review to examine the role of generative artificial intelligence (GenAI) in the digital transformation of micro, small, and medium enterprises (MSMEs). This approach enables the integration of theoretical perspectives and empirical findings from different research traditions to develop a comprehensive understanding of emerging technological phenomena (Torraco, 2005; Snyder, 2019). The review focuses on three interconnected issues: opportunities arising from generative AI adoption, challenges affecting its implementation, and organizational conditions that may support meaningful digital transformation. Rather than estimating causal relationships, the study aims to identify recurring patterns, theoretical gaps, and directions for future research.

3.2. Literature Search and Selection

The literature search is designed to cover academic databases and scholarly search platforms, including Scopus, Web of Science, ScienceDirect, and Google Scholar. The review prioritizes publications from 2020 to 2026, while earlier foundational studies are included when relevant to the theoretical framework. Search terms include generative artificial intelligence, generative AI, ChatGPT, micro, small, and medium enterprises, SMEs, MSMEs, digital transformation, AI adoption, organizational readiness, and business performance, combined using Boolean operators. Publications are considered based on their relevance to generative AI adoption, implementation challenges, organizational capabilities, and business transformation. Priority is given to peer-reviewed journal articles, supplemented by authoritative institutional reports and foundational theoretical publications. Studies focusing exclusively on technical AI development without a clear connection to business adoption or organizational transformation are excluded.

3.3. Data Analysis and Conceptual Synthesis

The selected literature is analyzed using a thematic synthesis approach informed by Braun & Clarke (2006). The analysis is organized around four themes: generative AI adoption and business opportunities, technological and organizational challenges, AI integration into business processes, and implications for MSME digital transformation. Findings are compared to identify recurring patterns, differences in research contexts, and unresolved theoretical questions. The Technology–Organization–Environment framework is used to interpret adoption conditions, while the Resource-Based View provides a perspective for understanding how organizational capabilities may transform AI adoption into business value. The synthesis subsequently develops a conceptual framework connecting generative AI adoption, organizational capabilities, business process integration, and digital transformation outcomes. This framework represents a theoretical interpretation of the literature rather than an empirically validated causal model.

4. DATA ANALYSIS AND DISCUSSION

4.1. Generative AI Adoption and the Changing Landscape of MSME Digital Transformation

The literature indicates that generative artificial intelligence (GenAI) is changing the technological opportunities available to micro, small, and medium enterprises (MSMEs). Unlike conventional digital applications that primarily support transactions, information storage, or communication, generative AI can assist with content creation, customer interactions, information processing, and selected analytical activities. Its conversational interfaces and relatively accessible applications allow smaller enterprises to experiment with capabilities that previously required specialized personnel or substantial technological investment. Nevertheless, greater accessibility does not necessarily produce meaningful organizational transformation. The central issue is whether MSMEs can integrate these technologies into their existing business processes and develop the capabilities needed to generate sustained economic value.

Evidence from OECD (2025) illustrates both the opportunities and limitations of this development. Based on a survey of more than 5,000 SMEs across seven countries, approximately 31% of surveyed enterprises reported using generative AI. Adoption varied from 24% in Japan to 39% in Germany, indicating differences in technological readiness and business environments. Among generative AI users, 65% reported improvements in employee performance, 35% indicated that the technology helped them expand their activities, and 26% reported increased revenue. These findings suggest that generative AI can support business activities, but they also reveal an important distinction between operational improvements and financial outcomes. The percentages represent self-reported benefits among surveyed users and should not be interpreted as causal estimates or as representative of MSMEs worldwide. More importantly, OECD (2025) found that only 29% of generative AI-using SMEs applied the technology to their core business activities. Most applications remained concentrated in peripheral or supporting tasks, particularly text generation and relatively simple activities. This finding raises a fundamental question about the nature of digital transformation. An enterprise may use generative AI to create promotional materials, prepare customer messages, or summarize business documents without changing its underlying operating model. Although these applications may save time, they do not necessarily indicate that the enterprise has transformed its business processes, organizational structure, or strategic capabilities.

The distinction is consistent with Vial (2019), who conceptualizes digital transformation as a process involving organizational changes triggered by digital technologies. Verhoef et al. (2021) similarly emphasize that digital transformation extends beyond the adoption of individual technologies and involves changes in business models, organizational arrangements, and value creation. Applying these perspectives to generative AI suggests that technology adoption should be understood as a potential starting point rather than the final outcome of transformation. The contribution of generative AI becomes more substantial when its use is connected to improvements in business processes, organizational learning, and customer value. This distinction is particularly relevant for MSMEs because technological adoption often occurs incrementally. Small enterprises may begin with low-cost applications before developing more integrated digital practices. Such experimentation can be beneficial because it allows businesses to assess potential advantages without committing substantial resources. However, experimentation can also remain disconnected from strategic objectives. If generative AI is used only to produce occasional marketing content, the enterprise may experience limited efficiency gains without developing capabilities that support longer-term competitiveness. The literature therefore suggests that generative AI adoption and digital transformation should be treated as related but conceptually distinct phenomena. Adoption concerns whether and how a technology is used, whereas transformation concerns the extent to which its integration changes business processes, capabilities, and value creation. This distinction provides an important foundation for evaluating the opportunities and challenges of generative AI among MSMEs.

4.2. Opportunities for Productivity, Marketing Innovation, and Business Development

One of the strongest arguments supporting generative AI adoption concerns its potential contribution to productivity. Generative AI can assist with repetitive and knowledge-intensive activities, allowing employees and business owners to complete selected tasks more efficiently. For MSMEs, where owners frequently perform several managerial and operational functions simultaneously, reducing the time required for administrative and communication activities may create opportunities to allocate attention to customers, product development, and strategic decisions. Experimental evidence provides support for these productivity

opportunities. Noy & Zhang (2023) examined the effects of ChatGPT on professional writing tasks involving 453 college-educated participants. Their findings showed that access to generative AI reduced average task completion time by approximately 40% while improving output quality by 18%. The study also found that participants with initially weaker performance experienced relatively greater improvements. These results suggest that generative AI can support task efficiency and reduce certain differences in individual performance. However, the experiment involved specific writing activities rather than the complete operating processes of MSMEs. Consequently, the findings demonstrate task-level productivity potential but do not establish equivalent improvements in enterprise profitability or long-term competitiveness.

Brynjolfsson et al. (2025) provide complementary evidence from a real-world organizational setting. Examining the introduction of a generative AI conversational assistant among 5,172 customer-support agents, the researchers found that AI assistance increased productivity by approximately 15%, measured through the number of customer issues resolved per hour. The benefits were particularly pronounced among less experienced and lower-skilled workers, while more experienced employees experienced smaller improvements. This finding suggests that generative AI may help transfer certain forms of organizational knowledge and support employee learning. Nevertheless, the evidence originates from a structured customer-service environment and cannot be directly generalized to small businesses with different technologies, organizational arrangements, and customer requirements. These findings have important implications for MSME marketing activities. Generative AI can assist enterprises in preparing product descriptions, promotional messages, customer communication materials, and alternative marketing ideas. A small food business, for example, may use AI to develop promotional content for different customer segments, while a fashion enterprise may use it to explore alternative product positioning strategies. Such applications may reduce content preparation time and improve the consistency of communication. However, these examples illustrate possible applications rather than empirically established improvements in marketing performance.

A critical distinction must also be made between content generation and marketing innovation. Producing promotional materials more quickly does not necessarily mean that a business has developed an innovative marketing strategy. Marketing innovation requires meaningful changes in how an enterprise understands customers, communicates value, reaches markets, or organizes marketing activities. Generative AI may support these processes by assisting with idea generation and information analysis, but the quality of the resulting decisions depends on business knowledge, customer understanding, and managerial judgment. Rajaram & Tinguely (2024) emphasize that generative AI can create opportunities for creativity, scalability, and innovation among SMEs, while also requiring organizational capabilities and strategic preparation. Their perspective supports the argument that the value of generative AI should not be reduced to automation. Its potential contribution lies in combining technological assistance with human creativity and organizational knowledge.

From the Resource-Based View (RBV), these findings suggest that generative AI is unlikely to create sustained competitive advantage merely because an enterprise has access to the technology. Barney (1991) argues that sustained competitive advantage depends on resources and capabilities that are valuable, rare, difficult to imitate, and not readily substitutable. Since many generative AI applications are widely accessible, competitive differentiation may instead emerge from how businesses combine them with distinctive customer knowledge, employee expertise, brand identity, and organizational routines. Thus, the literature supports a distinction between immediate operational benefits and longer-term strategic outcomes. Generative AI may improve the speed and quality of selected activities, but sustainable business development requires these improvements to contribute to stronger capabilities, better customer value, or more effective business processes. Productivity gains should therefore be treated as potential contributors to business transformation rather than definitive evidence that transformation has occurred.

4.3. Technological, Organizational, and Environmental Challenges

Despite its potential advantages, generative AI adoption presents substantial challenges for MSMEs. These challenges are not limited to technological complexity but also involve financial constraints, employee capabilities, organizational readiness, and the external business environment. The Technology–Organization–Environment (TOE) framework provides a useful perspective for examining these interconnected conditions. Oldemeyer et al. (2025), through a systematic review of AI implementation in SMEs, identified 27 implementation challenges. Inadequate knowledge, financial costs, and insufficient technological infrastructure were among the prominent barriers. Although the review addresses AI more broadly rather than generative AI

exclusively, its findings remain relevant because many MSMEs face similar resource limitations when introducing emerging technologies. However, generative AI also presents distinctive implementation characteristics, including dependence on user instructions, variable output quality, and risks associated with automatically generated information.

Technological challenges include compatibility with existing business processes, information accuracy, system reliability, and data security. Generative AI applications may produce convincing but inaccurate information, requiring users to verify outputs before applying them to business decisions. This problem becomes particularly important when AI-generated information concerns product specifications, customer commitments, financial calculations, or regulatory requirements. In such situations, incorrect outputs may create operational costs or damage customer trust. Organizational challenges concern the resources and capabilities needed to implement technology effectively. MSMEs may lack dedicated information technology personnel, formal digital strategies, or sufficient time for employee training. Business owners may also find it difficult to evaluate which AI applications are appropriate for their operations. Consequently, the low initial cost of accessing a generative AI application should not be confused with the total cost of responsible implementation. Training, output verification, process redesign, data protection, and employee supervision can create additional resource requirements.

Schwaeke et al. (2025), in a review of 106 peer-reviewed articles, identified several dimensions influencing AI adoption among SMEs, including technological compatibility, infrastructure, knowledge, organizational resources, culture, competition, regulation, and the business ecosystem. These findings support the TOE perspective by demonstrating that adoption depends on more than technological usefulness. A business may recognize the potential advantages of AI but remain unable to implement it because of inadequate employee skills, financial constraints, or limited external support. Environmental conditions also influence adoption. Competitive pressure may encourage MSMEs to experiment with generative AI, particularly when competitors use digital tools to improve customer communication or operational efficiency. However, competitive pressure does not necessarily lead to effective adoption. Enterprises may introduce AI applications primarily because they perceive the technology as a market trend, without clearly identifying the business problems they intend to solve. Such decisions can produce fragmented implementation and limited organizational benefits.

The broader regulatory environment introduces additional considerations. Data protection, intellectual property, and the responsible use of AI-generated content are particularly important when businesses process customer information or produce commercially distributed materials. OECD (2025) identifies legal, regulatory, and information-handling concerns among the issues reported by SMEs using or considering generative AI. These concerns indicate that responsible implementation requires more than individual technological competence; it also depends on clear organizational practices and accessible external guidance. The TOE framework therefore helps explain why generative AI adoption may differ across MSMEs even when similar applications are available. Technological accessibility represents only one component of readiness. Financial resources, managerial commitment, employee capabilities, competitive conditions, and institutional support jointly influence whether enterprises can adopt and integrate AI effectively.

4.4. Organizational Capabilities and the Transition from AI Adoption to Digital Transformation

The reviewed literature suggests that organizational capabilities represent a potentially important link between generative AI adoption and meaningful digital transformation. This relationship is especially relevant because using an AI application does not automatically change how a business creates value. The transformation process requires enterprises to identify appropriate applications, integrate technology into existing activities, evaluate results, and adjust organizational practices. The Resource-Based View provides an explanation of why enterprises using similar technologies may experience different outcomes. Barney (1991) emphasizes that organizational resources and capabilities influence competitive advantage. In the context of generative AI, access to a widely available application may provide operational assistance, but its strategic value depends on how the enterprise combines technological capabilities with distinctive knowledge and resources. An MSME with a strong understanding of customer preferences, for example, may use generative AI more effectively than a competitor that relies entirely on automatically generated recommendations without considering market conditions. The concept of dynamic capabilities extends this interpretation by emphasizing the ability of organizations to identify opportunities, mobilize resources, and reconfigure existing

capabilities in response to environmental changes. Teece (2007) explains dynamic capabilities through sensing, seizing, and reconfiguring activities. Applied to generative AI, sensing involves recognizing business problems and identifying appropriate technological opportunities. Seizing concerns allocating resources and integrating AI applications into relevant activities. Reconfiguring involves adjusting routines, responsibilities, and processes to support continued technological improvement.

This perspective helps explain why AI adoption may remain superficial in some enterprises while contributing to broader transformation in others. A business that uses generative AI only for occasional content generation may obtain immediate time savings without changing its organizational capabilities. By contrast, an enterprise that systematically evaluates customer communication, develops internal AI-use guidelines, trains employees, and integrates AI assistance into recurring business processes may establish more substantial organizational changes. However, these relationships should be interpreted cautiously. The reviewed evidence supports the importance of organizational capabilities, but it does not establish that capability development always mediates the relationship between generative AI adoption and digital transformation. Such a proposition requires empirical testing, particularly among MSMEs with different levels of technological readiness and organizational complexity.

The literature also suggests that human capabilities remain important even when AI applications become increasingly sophisticated. Brynjolfsson et al. (2025) demonstrate that AI assistance can improve worker productivity and facilitate learning in certain organizational settings. Nevertheless, the benefits differ across employees, indicating that technological assistance interacts with existing skills and experience. For MSMEs, this suggests that AI implementation should focus on complementing human judgment rather than assuming that automated outputs can replace business knowledge. An important implication is that digital transformation should be evaluated through changes in organizational processes and value creation rather than technology adoption alone. Relevant outcomes may include improved customer responsiveness, more consistent business processes, enhanced employee capabilities, better use of organizational knowledge, and increased capacity to adapt to market changes. These indicators offer a more meaningful basis for assessing AI-enabled transformation than simply measuring whether an enterprise uses ChatGPT or similar applications.

4.5. Responsible AI Adoption and the Sustainability of Business Value

Responsible implementation is another important condition influencing the long-term contribution of generative AI to MSMEs. Although the technology may reduce the time required for certain activities, its use also creates risks involving information reliability, customer privacy, intellectual property, and managerial accountability. These concerns become particularly important when AI-generated outputs are used in customer-facing activities or business decisions. One challenge involves the reliability of AI-generated information. Generative AI systems may produce responses that appear plausible but contain factual inaccuracies. If business owners rely on such outputs without verification, operational decisions may be based on incorrect assumptions. For example, inaccurate product information or misleading customer responses could undermine consumer confidence. Therefore, human oversight remains necessary, particularly when the consequences of errors extend beyond routine administrative activities.

Data confidentiality presents another concern. MSMEs may use generative AI to summarize customer messages, prepare business documents, or analyze commercially sensitive information. However, entering personal or confidential information into external AI services can create risks depending on the service's data-handling practices and the safeguards adopted by the business. Responsible implementation therefore requires clear procedures governing what information may be shared, how outputs should be verified, and who remains accountable for final decisions. These issues are consistent with the OECD (2025) findings concerning SMEs' legal, regulatory, and information-handling concerns. The report also indicates that formal organizational responses, including employee training and internal guidance, remain less widespread than general awareness of generative AI. This gap suggests that technological experimentation may advance more quickly than organizational governance.

The sustainability of business value also depends on whether AI adoption strengthens or weakens internal capabilities. Excessive reliance on automatically generated outputs may reduce opportunities for employees to develop independent analytical and creative skills. Conversely, when used as a supporting tool, generative AI may facilitate learning and allow employees to concentrate on activities requiring judgment, customer understanding, and interpersonal communication. The critical issue is therefore not whether

MSMEs should adopt generative AI without restriction or avoid it because of potential risks. Instead, the literature points toward a balanced approach in which technological opportunities are accompanied by appropriate oversight, employee development, and organizational accountability. Responsible AI practices should be treated as part of digital transformation rather than as additional requirements considered only after implementation.

4.6. Integrated Conceptual Framework of Generative AI and MSME Digital Transformation

The preceding discussion provides a foundation for integrating the TOE framework, RBV, and dynamic capabilities perspective into a conceptual explanation of generative AI-enabled digital transformation. These perspectives address different but interconnected questions. TOE explains the technological, organizational, and environmental conditions that influence adoption. RBV explains why organizational resources and capabilities may determine whether technological adoption creates business value. Dynamic capabilities provide a perspective on how enterprises identify opportunities, mobilize resources, and adapt business processes over time. Based on this integration, generative AI adoption is conceptualized as an initial technological response that may support organizational capability development and business process integration. These developments may subsequently contribute to digital transformation and business performance. However, the relationships are expected to depend on organizational readiness, technological compatibility, employee competencies, external support, and responsible AI governance. The proposed framework therefore distinguishes three stages. The first involves adoption, where enterprises begin using generative AI applications for selected activities. The second involves integration, where AI-supported practices become connected to organizational routines, employee capabilities, and business processes. The third involves transformation, where these changes contribute to more substantial improvements in value creation, organizational adaptability, and business competitiveness.

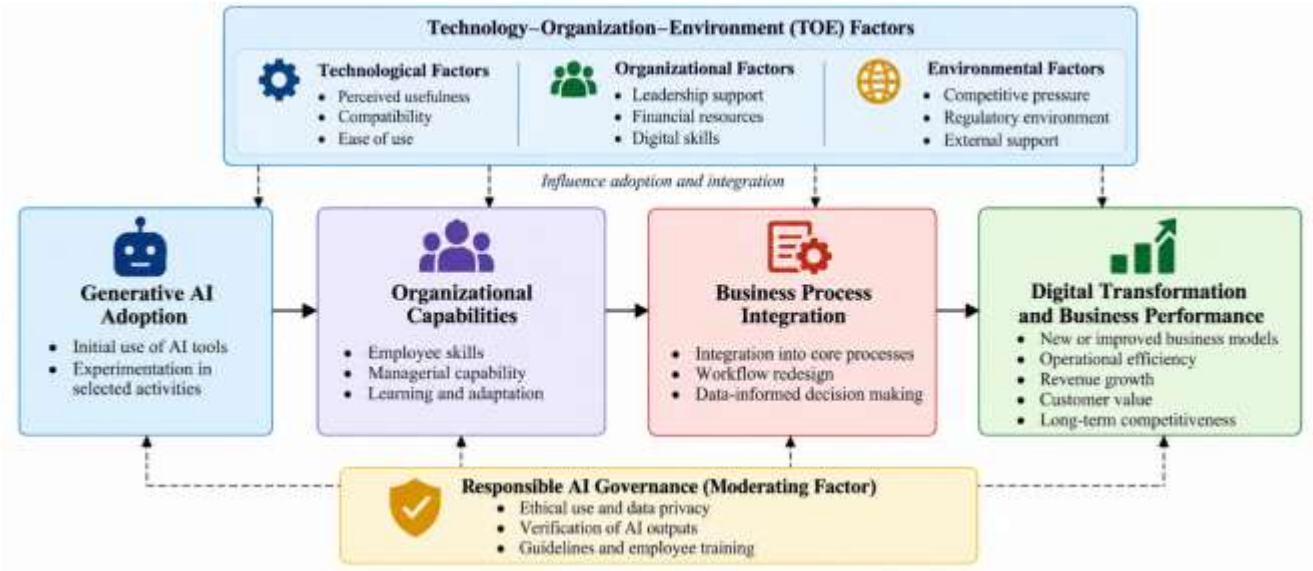


Figure 1. Integrated Conceptual Framework

An important contribution of this framework is that it avoids treating generative AI adoption as equivalent to successful digital transformation. Instead, it emphasizes the organizational processes through which technology may become strategically valuable. This distinction is consistent with the finding that most generative AI-using SMEs in the OECD (2025) survey had not yet integrated the technology into their core business activities. The framework also suggests that business performance should be treated as a multidimensional outcome. Productivity, customer satisfaction, innovation, market reach, and organizational adaptability may respond differently to AI adoption. Improvements in one dimension do not necessarily produce equivalent improvements in others. For example, reducing the time required to create marketing content may improve operational efficiency without increasing sales or customer loyalty. Consequently, the proposed framework should be understood as an analytical foundation for future research rather than an empirically established causal model. Its value lies in identifying the relationships and conditions that deserve

closer investigation among MSMEs, particularly those operating in resource-constrained environments.

4.7. Synthesis of Major Findings and Future Research Directions

The literature synthesis identifies several interconnected findings concerning the role of generative AI in MSME digital transformation. First, generative AI offers opportunities to improve task-level productivity, particularly in communication, content generation, and customer service. However, these improvements do not automatically translate into financial performance or organizational transformation. Second, AI adoption depends on technological readiness, organizational resources, and external environmental conditions. Third, organizational capabilities and business process integration appear important for converting initial technology use into sustained business value. Finally, responsible AI governance is necessary to address risks involving information accuracy, confidentiality, and accountability. Table 1 summarizes the principal findings and their implications for MSME digital transformation.

Table 1. Synthesis of Key Findings on Generative AI and MSME Digital Transformation

Research dimension	Principal findings	Supporting literature	Implications
Generative AI adoption	Adoption is expanding, but many SMEs use AI primarily for supporting activities.	OECD (2025)	Adoption should be distinguished from digital transformation.
Productivity improvement	Generative AI can improve efficiency and output quality in selected tasks.	Noy & Zhang (2023); Brynjolfsson et al. (2025)	Task-level benefits require further examination at the enterprise level.
Business opportunities	AI may support creativity, customer communication, and innovation.	Rajaram & Tinguely (2024)	Business value depends on strategic integration.
Implementation challenges	Knowledge gaps, financial constraints, and technological limitations hinder adoption.	Oldemeyer et al. (2025); Schwaeke et al. (2025)	Organizational readiness remains important.
Organizational capabilities	Resources and adaptive capabilities may influence the strategic value of AI.	Barney (1991); Teece (2007)	Capability development may explain differences in transformation outcomes.
Digital transformation	Transformation involves organizational changes beyond technology adoption.	Vial (2019); Verhoef et al. (2021)	Evaluation should include process integration and value creation.
Responsible AI governance	Information accuracy, privacy, and accountability require organizational safeguards.	OECD (2025); Rajaram & Tinguely (2024)	Responsible implementation should accompany technological adoption.

The synthesis also reveals several unresolved questions. Existing experimental studies provide relatively strong evidence concerning productivity improvements in specific tasks and organizational settings, but their findings cannot be assumed to represent the broader performance of MSMEs. Similarly, studies examining AI adoption and implementation barriers do not consistently explain how enterprises progress from initial experimentation to integrated digital business practices. This creates a need for research that connects adoption conditions, organizational capabilities, business process integration, and measurable transformation outcomes within the same analytical framework. Future research should investigate whether organizational capabilities and business process integration mediate the relationship between generative AI adoption and digital transformation. The moderating roles of technological readiness, leadership support, digital literacy, and responsible AI governance also deserve attention. Longitudinal studies would be particularly valuable for determining whether initial productivity improvements develop into sustained business performance. Comparative research across micro, small, and medium enterprises could further clarify how differences in organizational size, resources, and technological capabilities influence implementation outcomes.

For Indonesia and other developing economies, research should examine how generative AI adoption interacts with limited financial resources, uneven digital capabilities, and differences in access to technological support. Such studies could provide a more context-sensitive understanding of AI-enabled transformation rather than relying primarily on findings from larger enterprises or technologically advanced countries. Overall, the literature suggests that the strategic contribution of generative AI depends less on

whether MSMEs use the technology and more on how they develop the organizational capabilities required to integrate it into meaningful business activities. This perspective provides a foundation for future empirical research and a more realistic understanding of AI-enabled digital transformation.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This study concludes that generative artificial intelligence offers significant opportunities to support the digital transformation of micro, small, and medium enterprises (MSMEs), particularly through improvements in operational efficiency, marketing activities, customer communication, and business innovation. However, the literature indicates that adopting generative AI does not automatically lead to meaningful organizational transformation or sustainable competitive advantage. While AI applications can improve the speed and quality of selected business activities, their broader contribution depends on organizational capabilities, technological readiness, and integration into existing business processes. The synthesis of the Technology–Organization–Environment framework, Resource-Based View, and dynamic capabilities perspective suggests that generative AI adoption represents an initial stage of transformation rather than its final outcome. Organizational learning, employee competencies, managerial commitment, and responsible AI governance may influence whether initial technological benefits develop into sustained business value. Therefore, the strategic contribution of generative AI depends not simply on its accessibility or frequency of use, but on the ability of MSMEs to integrate the technology into organizational practices that improve adaptability, value creation, and long-term competitiveness.

The findings offer theoretical, managerial, and policy implications for understanding generative AI-enabled digital transformation among MSMEs. Theoretically, this study integrates the Technology–Organization–Environment framework, Resource-Based View, and dynamic capabilities perspective to explain how adoption conditions, organizational resources, and business process integration may collectively influence digital transformation outcomes. This integration helps distinguish technology adoption from the development of organizational capabilities and sustainable business value. From a managerial perspective, MSME owners should prioritize AI applications that address identifiable business problems rather than adopting technologies solely because of market trends. Investments in employee training, organizational learning, and responsible AI practices are equally important for ensuring effective implementation. For policymakers, the findings highlight the need to expand affordable technological access, strengthen digital literacy programs, facilitate collaboration with technology providers, and provide practical guidance on data protection and responsible AI use. Such support is particularly important for resource-constrained enterprises that may recognize the benefits of generative AI but lack the capabilities required to implement it effectively.

This study has several limitations that should be considered when interpreting its findings. As an integrative literature review, the analysis relies on previously published theoretical and empirical studies rather than primary data, limiting its ability to establish causal relationships between generative AI adoption, organizational capabilities, digital transformation, and business performance. Differences in research methods, enterprise characteristics, technological applications, and geographical settings also restrict the direct comparability of existing findings. Furthermore, some experimental evidence concerning generative AI productivity originates from individual task settings or larger organizational environments, which may not fully represent the operating conditions of MSMEs. The proposed conceptual framework has not been empirically tested, meaning that the potential mediating roles of organizational capabilities and business process integration, as well as the influence of responsible AI governance, remain theoretical propositions. In addition, the literature search and selection process requires complete documentation to establish the final study corpus and strengthen methodological transparency. Consequently, the findings should be interpreted as a conceptual synthesis rather than definitive evidence of the long-term business effects of generative AI.

Future research should empirically investigate how generative AI adoption contributes to MSME digital transformation through organizational capability development and business process integration. Particular attention should be given to testing whether these factors mediate the relationship between AI adoption and business performance, while technological readiness, employee competencies, managerial support, and responsible AI governance may influence the strength of these relationships. Longitudinal studies are recommended to determine whether initial productivity improvements translate into sustained financial performance, innovation, and competitive advantage. Comparative research involving micro, small, and medium enterprises across different industries and countries would also help explain variations in technological adoption and transformation outcomes. For Indonesia and other developing economies, future studies

should examine how limited financial resources, uneven digital literacy, and institutional support influence AI implementation. From a practical perspective, MSMEs should adopt generative AI gradually, beginning with clearly defined business needs, followed by employee development, process integration, and continuous performance evaluation. These efforts should be supported by collaboration among government agencies, educational institutions, technology providers, and business associations to promote responsible, inclusive, and sustainable digital transformation.

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