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MSMEs DIGITALIZATION STRATEGY: INCREASING SUSTAINABILITY IN THE ERA OF DIGITAL TRANSFORMATION

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ABSTRACT

Objectives: This research aims to explore strategies for improving the sustainability of micro, small, and medium enterprises (MSMEs) in the era of digital transformation by identifying the key factors and challenges businesses face in adopting digital technologies.

Research Design & Methods: This research uses a qualitative approach with a literature review methodology to analyze existing studies and best practices related to digital transformation strategies and MSME sustainability.

Findings: The research identified key aspects of sustainability that support the digital transformation process in MSMEs: digital presence, data analytics, process optimization, customer experience, and digital skills and training. Furthermore, sustainability practices such as adaptability, collaboration, risk management, continuous learning, scenario planning, crisis communication, and cybersecurity play an important role in ensuring business continuity in the digital age.

Implications & Recommendations: The successful digital transformation of MSMEs requires a comprehensive approach that includes technology, digital skills, business innovation, and organizational culture. Policy support through regulations, incentives, and training is also a key factor in improving the readiness of MSMEs in the digital era.

Contribution & Value Added: This study presents a strategic framework for MSMEs in the face of digital transformation, helping to overcome challenges and promote sustainability. The findings contribute to the academic literature and guide practitioners, policymakers, and researchers.

Keywords: Digital transformation, MSME sustainability, Business Innovation

JEL codes: L26, M15, O33

Article type: research paper

INTRODUCTION

Digital transformation has become a crucial factor in improving the sustainability of MSMEs in the modern era. The adoption of digital technology enables MSMEs to optimize their business processes, improve operational efficiency, and reduce production and distribution costs. The adoption of digital technology not only enhances operational efficiency but also enables MSMEs to expand their market reach and improve competitiveness in an increasingly competitive business environment (Philbin et al., 2022). The utilization of digital platforms, including e-commerce, social media, and technology-based marketing, has been proven to help MSMEs expand their market reach, both locally and nationally, as well as globally (Saputera et al., 2024). Studies show that the

adoption of digital technologies can improve operational efficiency, expand market reach, and enhance the competitiveness of MSMEs (Hokmabadi et al., 2024; Raji et al., 2024). Digital transformation also contributes to MSME sustainability by encouraging more environmentally friendly business practices, such as waste reduction and energy efficiency (Melo et al., 2023).

Every entrepreneur wants a business that not only grows but is also sustainable in the long run. The sustainability of a business depends not only on internal strategies but also on the acceptance and support of the surrounding environment. A business will provide optimal benefits if it can adapt to the needs of society, establish harmonious relationships with stakeholders, and contribute positively to the economic, social, and ecological environment in which it operates. Business sustainability refers to a business's ability to continue operating and growing in the long term. Some businesses are even able to survive across generations, where the leadership and vision of the business are passed on from the founder to the next generation. This regeneration process not only ensures business continuity but also enables innovation and adaptation to changing times. Such sustainability is generally supported by strategic planning, solid management, and business values that are maintained and developed by each successive generation.

Business sustainability is not just a trend but a paradigm shift that defines business success beyond traditional financial indicators. This concept emphasizes that business activities must be carried out with responsibility for economic, social, and environmental aspects, while maintaining a balance that meets the needs of future generations (Singh, 2024). In the modern business world, sustainability has transformed into a core strategy that is not only profit-oriented but also socially responsible and environmentally sustainable. Companies that apply sustainability principles tend to be more resilient in the face of market changes, have a better reputation, and gain greater trust from consumers and investors (Diawati et al., 2024). The application of sustainability principles in business enhances reputation and competitiveness, while also reducing long-term operational risks. Sustainability strategies encompass resource efficiency, reducing carbon emissions, and enhancing social and environmental well-being (Mullick, 2023). The current business paradigm is increasingly leading to a sustainable model, where the success of the company is no longer measured solely by financial profit, but also by the positive impact it has on society and the environment.

MSMEs, which were previously proven to survive the global financial crisis, are now facing new challenges in adapting to the digital era. Transformation from conventional to digital business models is imperative to remain competitive amid rapid technological change (Ragazou et al., 2022). Technologies such as blockchain can enhance transparency and security in business transactions, while artificial intelligence (AI) and machine learning (ML) facilitate automation and more accurate data analysis, supporting informed decision-making (Chowdhury, 2024). The application of these technologies also has a significant impact on the financial system of MSMEs, where blockchain and AI-based fintech platforms can overcome the constraints of access to financing, which has been a major challenge for MSMEs in developing countries (Agu et al., 2024).

While digital transformation is crucial for the sustainability of MSMEs, many still face constraints, including limited resources, a lack of digital skills, and difficulties accessing capital (Alam et al., 2022; Li et al., 2018). Many MSMEs have faced budget constraints in adopting new technologies or increasing their operational capacity (Farliana et al., 2024). Additionally, the low level of digital skills among MSME owners and employees presents an obstacle to the effective application of technology, resulting in suboptimal utilization of digital platforms. Another significant challenge is the difficulty in obtaining capital. Although digitalization opens up opportunities through fintech and crowdfunding, many MSMEs still experience difficulties in accessing funding due to a lack of financial literacy and limited collateral (Situmorang, 2022). In developing countries like Indonesia, MSMEs play a crucial role in the economy, yet they still face barriers to improving their capacity and productivity (Maksum et al., 2020). Therefore, a comprehensive strategy from various stakeholders, including the government, financial institutions, and the private sector, is needed to support the acceleration of digital transformation for MSMEs in Indonesia.

In this context, research on strategies to improve the sustainability of MSMEs in the era of digital transformation is very relevant and important. A comprehensive approach that considers technological, organizational, and environmental (TOE) aspects is needed to help understand the

factors that influence digitalization (Ammeran & Latip, 2024), understand the important role of innovative marketing capabilities in increasing customer engagement and expanding markets (Triayudi et al., 2023), and continuous innovation in increasing the resilience of MSME businesses in the digital era to remain competitive by adjusting products and services according to market trends (Hokmabadi et al., 2024; Xiumei et al., 2023). This approach not only helps MSMEs adapt to technological changes but also opens up new opportunities for market expansion, improved operational efficiency, and strengthened customer relationships through more optimal utilization of digital solutions. By implementing strategies that integrate aspects of technology, marketing, and innovation, MSMEs can strengthen their competitiveness and improve business sustainability in the digital era.

LITERATURE REVIEW

Business Sustainability

Business sustainability is a multidimensional concept that encompasses not only environmental aspects but also economic and social dimensions, thereby demanding a balance among profitability, social responsibility, and environmental sustainability in the long term (Gazzola et al., 2024). Business sustainability focuses on achieving long-term progress by balancing energy security, energy affordability, and environmental sustainability (Tajunnisa et al., 2023). Mansur (2010) stated that business sustainability has a close relationship with the concept of sustainable development, as defined by the Brundtland Commission, which involves ensuring the fulfillment of the needs of the current generation without compromising the ability of future generations to meet their own needs. Business sustainability is often associated with innovation and efficiency strategies in resource management, enabling businesses to remain competitive while minimizing environmental harm and protecting surrounding communities (Afriza & Ariyani, 2022).

Experts emphasize the importance of companies incorporating sustainability goals into their strategies and business models (Gazzola et al., 2024; White, 2009). In the context of startups, Sharma and Mathur (2022) emphasize that business sustainability can be realized through innovative value creation, resilient business models, and self-sustaining economic sustainability. Sustainable innovation becomes a major element in business strategy, encompassing three key aspects: capabilities, management, and organizational structure of the company (Trizotto et al., 2024). The long-term value of a business can be enhanced through the integration of economic, social, and environmental values, which contributes to the company's stability and resilience in the face of global challenges. Strategies such as Corporate Social Responsibility (CSR) not only increase revenue but also provide social benefits, such as education and infrastructure (Kusumadewi et al., 2023). In addition, the application of green technology and the circular economy supports business continuity in the future (Said et al., 2021). By integrating these strategies, companies not only increase competitiveness but also strengthen resilience to changes in environmental regulations and market demands that increasingly emphasize sustainability. This enables companies to remain relevant, innovative, and viable in the long term amidst evolving global challenges.

Several key elements ensure a balance between business sustainability, economic growth, social responsibility, and environmental sustainability. 1) One key element is Corporate Social Responsibility (CSR), which plays a role in supporting sustainable development through social and economic initiatives that have a positive impact on society (Herrmann, 2004). 2) Stakeholder management and environmental responsibility: The company must be able to interact and cooperate with parties involved in maintaining environmental responsibility (Camilleri, 2017). 3) Environmentally friendly business practices, such as increasing energy efficiency, reducing waste, and utilizing more sustainable raw materials, can help companies mitigate negative environmental impacts while enhancing operational efficiency (Mbasera et al., 2016). 4) Compliance with environmental regulations and social needs: Companies that comply with applicable legal and regulatory standards not only avoid legal risks but also build a better reputation in the eyes of stakeholders (Tajunnisa et al., 2023).

Micro, Small, and Medium Enterprises (MSMEs)

Micro, Small, and Medium Enterprises (MSMEs) are a crucial economic sector that plays a vital role in driving a country's economic growth. MSMEs generally refer to small to medium-

scale businesses with limited numbers of workers and capital. Nevertheless, this sector continues to make a significant contribution to the economy, particularly in creating job opportunities and enhancing people's welfare (Karunia & Janah, 2023). MSMEs are viewed as a strategic sector with high resilience to economic instability, thanks to their flexibility in adapting to market dynamics, adopting innovations, and responding to changes in consumer demand and trends quickly and effectively (Sumarni et al., 2024).

MSMEs play a crucial role in driving economic growth by making a significant contribution to the Gross Domestic Product (GDP) and creating jobs, which in turn supports community welfare and national economic stability (Mardian et al., 2024). MSMEs are regarded as the primary pillar in maintaining economic sustainability, contributing to national financial stability, and demonstrating strong resilience in the face of various challenges, including economic crises, while still adapting and innovating to ensure business continuity (Susan, 2020). The definition of MSMEs has evolved, often varying by country, but is usually based on criteria such as investment level, turnover, and total employment (Nagaraj & Vaibhav, 2020). In addition, Crane (2020) highlighted that many MSMEs struggle due to inadequate business knowledge and a lack of effective management strategies, which are critical to their sustainability and growth.

The Badan Pusat Statistik (BPS) classifies Micro, Small, and Medium Enterprises (MSMEs) based on the number of workers. Micro enterprises are business units with more than four permanent workers, small enterprises have between 5 and 19 workers, while medium enterprises have more than 19 permanent workers. This classification is used to understand the structure and scale of businesses in Indonesia, as well as to inform the design of policies and support programs for MSMEs (Simpony et al., 2024). MSMEs generally have characteristics such as limited capital and simple technology and are managed independently by their owners. The basic concept of MSMEs encompasses aspects of innovation, independence, and sustainability in business operations. For example, the application of entrepreneurial marketing strategies in the creative industries of MSMEs reveals that innovation, risk-taking, and resource utilization are the primary factors driving business development (Ashari, 2022).

Digital Transformation

Digital transformation refers to the process of converting analog information into digital formats to improve accessibility, efficiency, and automation in various sectors. It serves as the foundation for broader digital transformation efforts, which involve integrating digital technologies into business operations to enhance performance and competitiveness (Kosenkov, 2020). Digitalization refers to the application of digital technologies in various business processes and operations to improve effectiveness and competitiveness. This process involves the utilization of various digital devices and systems to enhance work efficiency, increase productivity, and facilitate more accurate and faster data-driven decision-making (Bilal et al., 2024; Yang et al., 2024). It refers to changes in an organization's operations and business models triggered by the application of digital technologies (Kääriäinen et al., 2021). It is customer-centric by leveraging innovations in Information and Communication Technology (ICT) to develop or improve more effective processes in the modern business environment (Pihir et al., 2019).

Digital transformation is a comprehensive and strategic change that fundamentally alters the way an organization conducts its operations and competes in the marketplace. This process involves not only the adoption of digital technologies but also the restructuring of business models, enhancement of human resource capabilities, and the development of a culture of innovation. By implementing digital transformation, organizations can enhance efficiency, expedite data-driven decision-making, and generate new value for customers, enabling them to survive and thrive in increasingly competitive market dynamics (Narayanan, 2023; Verhoef et al., 2021). One of the main benefits of digital transformation is increased operational efficiency. In the business world, the adoption of digital technology can reduce operational costs and speed up work processes. For example, in the financial industry, financial technology (fintech) has enabled transactions to be faster, safer, and more accessible to the wider community (Buwono et al., 2022). Digital transformation also enables the automation of routine tasks, facilitates more accurate data analysis, and enhances the customer experience, ultimately supporting business competitiveness and growth in the digital era.

One of the key characteristics of the digital age is the widespread availability of high-speed connectivity. The internet serves as a key foundation that connects the world globally, enabling instant communication, access to information without geographical boundaries, and cross-border collaboration. With the increasing use of the internet, businesses, governments, and communities are relying more heavily on digital technologies to conduct various daily activities. In the business world, digital connectivity enables the rapid development of new business models, such as e-commerce and digital marketing, providing opportunities for small and medium-sized enterprises to compete in the global market (Fauziah et al., 2021). Digital connectivity has revolutionized various sectors, especially in marketing and public services. In business, digital marketing strategies utilize social media, data analysis, and algorithm-based advertising to reach a wider audience with high efficiency, thereby significantly increasing brand awareness compared to traditional methods (Gunawan & Kasih, 2024).

Verhoef et al. (2021) have classified digital transformation into three main stages: (1) Digitization, which involves converting data and information from analog to digital formats to enhance accessibility and efficiency. 2) Digitalization, in which digital technology is applied to optimize business processes, increase productivity, and accelerate data-driven decision-making. 3) Digital transformation, which involves fundamental changes in the company's business and operational models, including the adoption of technology-based strategies, organizational restructuring, and the creation of new value for customers. By understanding and effectively implementing these three stages, companies can enhance their competitiveness, increase flexibility in the face of technological disruptions, and establish sustainable advantages in the digital era.

METHODS

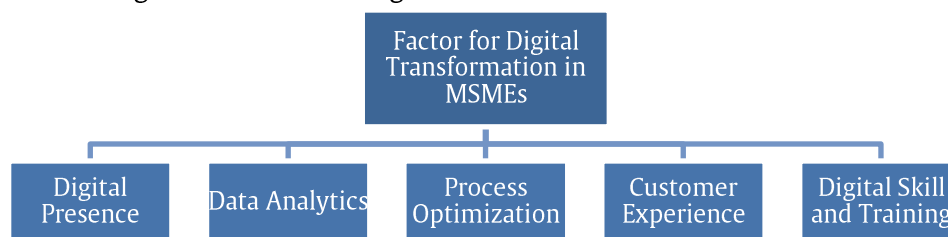
In this study, researchers employed a qualitative method with a literature-based approach, which relies on various literature sources to explore and understand the phenomenon or problem under investigation. This approach involves in-depth analysis of various written references, such as books, journals, articles, and other documents, to obtain relevant data and information. Through this approach, researchers conduct a systematic review of the available literature to classify information, identify patterns, and synthesize previous findings, thereby gaining a more comprehensive understanding of the research topic (Hanafizadeh & Zareravasan, 2020). This process allows researchers to build a comprehensive understanding of the topic under study, identify gaps in existing knowledge, and formulate new research questions (Kegler et al., 2019). In the literature research, data is collected through a process of selection, analysis, and synthesis of various sources relevant to the topic under study, namely identifying patterns and trends in MSME business sustainability and understanding how digital technology can be leveraged to improve their competitiveness. In addition, this approach also enables researchers to explore the challenges and opportunities faced by MSMEs in adopting digital-based strategies, thereby formulating more appropriate recommendations for the sector's sustainability in the era of digital transformation.

RESULT

Key Factors of Digital Transformation in MSMEs

Digital transformation in MSMEs occurs in a step-by-step manner, encompassing the adoption of digital technologies, adjustments to business functions and processes, management of skills gaps, and modifications to operational strategies (Anim-Yeboah et al., 2020). The initial stage of transformation begins with the adoption of digital technologies in business activities, including the use of e-commerce platforms, digital payment systems, and social media for marketing purposes. This digitalization aims to improve operational efficiency and expand the market reach of MSMEs (Widowati et al., 2024). Once technology is implemented, MSMEs must adjust their business functions and processes to optimize the benefits of digitalization. This includes changes to production, distribution, and customer service systems to make them more responsive to market demands. For example, utilizing customer data in marketing strategies can increase sales effectiveness (Septiadi & Agus, 2024).

Figure 1. Factors for Digital Transformation in MSMEs



Sumber: [Satpathy et al., \(2025\)](#)

Five key aspects support this process, namely digital presence which relates to the utilization of online platforms to improve business visibility, data analytics which enables data-driven decision-making for more effective strategies, process optimization which includes operational efficiency through automation and digitization, customer experience which emphasizes improving customer interaction and satisfaction through technology, and digital skills and training which aims to improve workforce competence in the face of technological developments. By paying attention to these factors, MSMEs can be more competitive and adaptive in the digital era.

The success of digital transformation in an organization is highly dependent on the strategic interaction between strategic vision, resource orchestration, and technology, organization, and environment (TOE) framework factors. The strategic vision serves as the primary guide, providing direction for change and ensuring that every step of the transformation has a clear purpose. Resource orchestration, which involves structuring, combining, and leveraging resources, plays a crucial role in adapting organizational capabilities to the demands of digital transformation. Additionally, technological, organizational, and environmental factors also have a significant impact on this process. Technology is a key enabler that enables innovation and efficiency, while organizational factors such as culture, leadership, and internal capabilities determine readiness and resilience to change. Environmental factors, including government regulations, competitive pressures, and customer needs, also influence the dynamics and direction of digital transformation in a business ([Cheng et al., 2024](#); [Ta & Lin, 2023](#)). The combination of these three elements determines the extent to which an organization can successfully adopt and implement digital transformation. Therefore, MSMEs need to consider these various aspects holistically to achieve effective digital transformation.

Sustainability Steps for MSMEs

In the digital era, MSMEs must implement various strategies and sustainability measures to remain competitive and able to thrive amid rapid technological changes. Digital transformation is a crucial step for MSMEs in facing the challenges of Industry 4.0 and the impact of the COVID-19 pandemic. By adopting digital technology, MSMEs can enhance operational efficiency, expand their market reach, and improve customer satisfaction ([Anatan & Nur, 2023](#)). Digital transformation enables small businesses to leverage e-commerce, digital marketing, and cloud-based solutions, thereby enhancing their competitiveness. The use of marketplaces and digital marketing strategies is an important aspect. The existence of marketplaces has been proven to increase sales and have a positive impact on MSME business operations ([Prabowo et al., 2024](#)). Additionally, technologies such as the Internet of Things (IoT) and artificial intelligence (AI) are being increasingly applied by MSMEs to optimize supply chains and enhance customer experiences. In a pandemic situation, digitalization plays an important role in maintaining the sustainability of MSMEs by supporting remote work, diversifying distribution channels, and automating customer service ([Marsdenia, 2023](#)).

Figure 2. Sustainability Steps



Sumber: [Satpathy et al., \(2025\)](#)

Adaptability

MSMEs must have high flexibility in responding to market dynamics, technological advancements, and regulatory changes to remain competitive and sustainable. Rapid response to economic trends and accelerated digitalization are key factors in strengthening business competitiveness. The utilization of digital technologies, such as e-commerce, social media, and cloud-based platforms, has been proven to help MSMEs not only survive but also thrive, particularly in challenging situations like the pandemic ([Leong et al., 2021](#)). Additionally, MSMEs' ability to adopt new technologies, such as artificial intelligence (AI) and data analytics, can enhance operational efficiency, expand their market reach, and strengthen customer relationships. By adapting well to digital innovations, MSMEs can more easily cope with economic uncertainty and create more resilient and sustainable business models in the long term ([Budiarto et al., 2023](#)).

Collaboration

Collaboration is a crucial element in strengthening the MSME ecosystem, particularly in addressing economic and digitalization challenges, and achieving sustainable growth amid changing environmental dynamics, whether through industry organizations, business partnerships, or cooperative networks ([Unni, 2020](#)). Collaborating with various parties, including suppliers, customers, government agencies, and technology companies, can optimize supply chain efficiency, encourage innovation, and accelerate the adoption of digital technology ([Fitriyani et al., 2022](#)). Collaborative efforts in the business world, particularly for MSMEs, play a crucial role in facilitating knowledge exchange, mitigating risks, and sharing costs, which in turn encourage innovation and adaptability. Research indicates that knowledge sharing through business cooperation can enhance product innovation and the competitiveness of MSMEs ([Wahyuda et al., 2023](#)). Additionally, collaboration in new product development enables firms to share costs and labor, thereby reducing uncertainty and enhancing business sustainability ([Bhaskaran & Krishnan, 2009](#)). In the context of supply chains, collaboration with suppliers and customers also helps manage risks and improve operational efficiency. Thus, well-structured collaboration can be an effective strategy for MSMEs to expand their market reach, access new technologies, and increase their competitive advantage in the digital era.

Insurance and Risk Management

Insurance and risk management are important aspects of ensuring the sustainability of MSMEs amidst economic uncertainty and potential disasters. The implementation of effective risk management strategies, including protection through business insurance, can help MSMEs minimize the impact of operational risks and maintain financial stability. Research indicates that insurance plays a crucial role in safeguarding MSMEs against financial risks that could impede their growth ([Das & Chakraborty, 2019](#)). Systematic approaches to risk management, such as risk identification and mitigation through insurance, can increase MSMEs' chances of securing funding and strengthen their competitiveness. Other studies also emphasize that implementing effective risk management strategies can help MSMEs survive economic crises and disasters by enhancing their business preparedness and resilience ([Ciocoiu et al., 2024](#)). The implementation of comprehensive insurance and risk management is a strategic step for MSMEs in building a stronger, more resilient, and sustainable business.

Sustainability Practices

The implementation of sustainable practices in MSMEs not only contributes to environmental sustainability but also enhances business competitiveness by attracting customers who value sustainability issues. The use of environmentally friendly raw materials, energy efficiency, and good waste management are strategic steps that can improve business reputation and profitability. Research indicates that the adoption of sustainable manufacturing practices, including cleaner production and resource efficiency, has a positive impact on the financial and operational performance of MSMEs (Rani, 2019). The adoption of circular economy concepts in waste management can reduce carbon emissions and create new economic opportunities for MSMEs (Katigbak & Villaruel, 2023). The application of green knowledge management in culinary businesses can enhance product innovation and operational efficiency, ultimately contributing to sustainable business growth (Alfarizi & Sari, 2024).

Continuous Learning

Continuing education is crucial to the success and adaptability of MSMEs. Maintaining a clear understanding of industry trends, technological advancements, and shifting market dynamics is essential in navigating a rapidly evolving business environment. Allocating resources to training programs, workshops, and online courses enables employees to stay current and make significant contributions to company growth. Structured training can help improve their access to funding and strengthen business sustainability (Rizki & Hendarman, 2024). Through training and skills enhancement, including both formal and informal education, MSME actors can improve their capacity in various aspects of business, such as financial and digital literacy. Improved digital literacy encourages the adoption of technology in marketing, financial transactions, and supply chain management, contributing to the operational efficiency and market expansion of MSMEs (Mangawing et al., 2023).

Scenario Planning

Scenario planning is a crucial strategic tool for MSMEs to navigate uncertainty and adapt to various potential obstacles in the future (Fumo & Jabbour, 2011). The application of scenario planning has been proven to help companies cope with uncertainty by preparing several strategic options that can be utilized as the situation develops (Oliver & Parrett, 2017). MSMEs must have backup strategies to overcome unexpected challenges, such as economic crises or pandemics. With planning based on data and trend analysis, businesses can survive and operate effectively in difficult situations. Through this approach, MSMEs can explore various possible scenarios and design flexible and adaptive strategies to ensure their business continuity, as well as facilitate organizations in making data-driven decisions, managing resources efficiently, and developing backup strategies, thereby strengthening their ability to adapt and respond quickly to changes in a dynamic and evolving business environment.

Crisis Communication

An effective crisis communication strategy is key for MSMEs in maintaining the trust of customers and business partners amidst uncertain situations. Clear and transparent communication enables businesses to control the narrative, alleviate panic, and preserve their reputation. Open and coherent communication, both internally and externally, enables businesses to manage expectations, mitigate panic, and maintain a professional image in uncertain situations. Social media has become a crucial tool in crisis communication, enabling businesses to respond promptly, provide accurate information, and engage directly with customers in real-time, thereby mitigating the negative impact of misinformation (Nikolova, 2024).

Cyber Security

With the increasing digitalization in the MSME sector, cybersecurity has become a very crucial aspect of maintaining business continuity. Protecting customer data, financial transactions, and operational systems must be a top priority to mitigate the risk of cyberattacks that can lead to data breaches and financial losses. Allocating investments in IT security systems, such as data encryption and advanced firewalls, can significantly strengthen business resilience against cyber threats (Batmetan, 2023). Data security training for employees plays a crucial role in increasing awareness and preparedness against digital threats, as the human factor is often a significant gap in

cybersecurity (Tolossa, 2023). In addition, proactively monitoring, designing incident response strategies, and communicating with cybersecurity experts are also key elements in strengthening protection against evolving cyber threats.

DISCUSSION

In the era of digital transformation, Micro, Small, and Medium Enterprises (MSMEs) must adopt innovative strategies to enhance their business sustainability. Digitalization presents opportunities for MSMEs to expand their markets, enhance operational efficiency, and boost competitiveness through the adoption of technologies such as e-commerce, social media, and digital payment systems. According to studies by Hokmabadi et al. (2024) and Rozak et al. (2023), the application of digital technology and the improvement of digital skills are crucial steps for MSMEs to optimize operational efficiency, expand market access, and strengthen their competitiveness. The use of social media and e-commerce platforms plays a crucial role in helping MSMEs enhance their brand image, execute effective marketing strategies, and communicate more efficiently with customers (Ragazou et al., 2022; Rozak et al., 2023). In addition, the implementation of digital-based business models and strategic planning integrated with digitalization are key factors in increasing organizational adaptability to the dynamics of the external environment (Rozak et al., 2023).

Strategies to enhance the sustainability of MSMEs in the digital transformation era involve aspects of the entrepreneurial ecosystem, financial digitalization, and technology-based marketing. The study by Wahyuningsih et al. (2024) highlights that entrepreneurial ecosystems and embedded finance play an important role in the digital transformation of MSMEs, especially in expanding market reach and increasing competitiveness. In addition, research by Salim et al. (2020) shows that the utilization of online food delivery services and promotion through social media can significantly increase MSME turnover. This confirms that the adoption of digital technology is a key strategy for MSMEs to survive and thrive in an increasingly digital business landscape.

Digital transformation has brought about significant changes not only in technological aspects but also in human resource management (HRM) and organizational culture within the micro, small, and medium enterprise (MSME) sector. Investments in digital technology enable MSMEs to adopt more efficient digital-based HR management systems, including the use of automated payroll software, artificial intelligence-based recruitment systems, and online learning platforms for employee skills development (Espina-Romero et al., 2024). Digitalization also contributes to a change in organizational culture by encouraging more open collaboration, greater work flexibility, and increased transparency in internal communication. The proper implementation of digital technology not only enhances operational efficiency but also fosters a more adaptive and innovative work environment, ultimately improving the competitiveness of MSMEs in the digital economy era.

Strategies to enhance the sustainability of MSMEs in the era of digital transformation require a holistic approach that involves technology integration, capacity building of human resources in digital skills, innovation in business models, and changes in organizational culture to be more adaptive to digital developments. Appropriate technology adoption can improve operational efficiency and expand market reach, while strengthening digital skills within the workforce enables MSMEs to become more competitive in the digital business ecosystem. In addition, the transformation of organizational culture is a key factor that enables all elements in MSMEs to adapt quickly to technological and market changes. The government also plays a crucial role in supporting MSME digitalization through conducive regulations, financial incentives, and technology-based training programs, thereby improving the readiness of businesses to face the challenges of digitalization (Raji et al., 2024). With this combination of strategies, MSMEs can be more resilient, innovative, and able to survive in the midst of increasingly fierce competition.

CONCLUSION

Digital transformation is a key factor in improving the sustainability of MSMEs in the modern era. The adoption of digital technology enables MSMEs to optimize business processes, enhance operational efficiency, expand their market reach, and adopt more environmentally

friendly business practices. Although important, many MSMEs still face obstacles, such as limited resources, a lack of digital skills, and difficulty accessing capital, when implementing digital transformation. This research employs a qualitative method with a desk-based approach to explore strategies for enhancing the sustainability of MSMEs in the digital transformation era. The results showed five key aspects that support the digital transformation process in MSMEs, namely digital presence, data analysis, process optimization, customer experience, and digital skills and training. In addition, there are several sustainability measures that MSMEs need to implement, such as adaptability, collaboration, insurance and risk management, sustainable practices, continuous learning, scenario planning, crisis communication, and cybersecurity. Strategies to improve the sustainability of MSMEs in the era of digital transformation require a comprehensive approach that involves technology integration, increasing HR capacity in digital skills, business model innovation, and changing organizational culture to be more adaptive to digital developments.

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