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Sustainable Economic Innovation in MSMEs through the Integration of Digital Technology and Environmentally Friendly Business Practices in Indonesia

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Abstract

Introduction/Main Objectives: This article examines how sustainable economic innovation in Micro, Small, and Medium Enterprises (MSMEs) can be achieved through the integration of digital technologies and environmentally friendly business practices. This topic is essential as MSMEs face increasing pressure to transition toward green economies and adapt to rapid global digital transformation.

Background Problems: The primary issue addressed is how MSMEs can enhance competitiveness and sustainability through the synergy of digitalization and green practices, leading to the research question: *"How can the integration of digital technologies and environmentally friendly practices drive sustainable economic innovation in Indonesian MSMEs?"*

Research Methods: A qualitative *library research* method was employed by reviewing scientific articles, institutional reports, government regulations, and relevant literature published between 2015 and 2024. Thematic synthesis was used to identify conceptual linkages between digitalization, environmental practices, and MSME sustainability.

Findings/Results: The study finds that digital technologies—including e-commerce, digital payments, cloud computing, IoT, and data analytics enhance operational efficiency and market reach. When combined with green practices such as energy efficiency, waste reduction, and sustainable material use, MSMEs achieve higher productivity, resilience, and long-term competitiveness.

Conclusion: The integration of digitalization and green business practices represents a crucial strategy for advancing sustainable economic innovation in MSMEs. The findings imply the need for pentahelix collaboration and supportive policy frameworks to accelerate MSME transformation toward low-carbon, adaptive, and inclusive business models.

Keywords: MSMEs, digitalization, green practices, sustainable economy, innovation

Introduction

Micro, Small, and Medium Enterprises (MSMEs) are a key pillar of the Indonesian economy, contributing more than 61% to Gross Domestic Product (GDP) and absorbing more than 97% of the national workforce (Ministry of Cooperatives and SMEs, 2023). This role has become increasingly apparent during the economic crisis and the COVID-19 pandemic , when MSMEs have proven to be a pillar of economic stability through their flexibility and proximity to community needs (ILO, 2020). Nevertheless, MSMEs face increasing pressure from globalization, changing consumer behavior, and the development of digital technology, which demands more adaptive , efficient, and sustainable business models. At the same time, demands for environmentally friendly practices are increasing in line with global commitments to addressing climate change (UNDP, 2022), making sustainability a crucial prerequisite for business competitiveness.

Digital transformation has opened up significant opportunities for MSMEs, ranging from digital marketing, cloud-based inventory systems , e-payments, to accounting applications that accelerate business processes and enable data-driven decision-making (Rahayu & Day, 2020). Recent developments such as artificial intelligence (AI), big data analytics, and the Internet of Things (IoT) provide MSMEs with the ability to project demand, understand consumer preferences , and optimize production processes in real time (Bai et al., 2021). However, low digital literacy , limited managerial capacity, and limited access to technology leave most MSMEs lagging behind in the digitalization process (Hartono & Rahmawati, 2021).

On the other hand, the implementation of green business practices such as the use of environmentally friendly raw materials, energy efficiency, eco- labeling , and waste reduction has become an important strategy in building a competitive and responsible business model (Dangelico & Vocalelli , 2017). Sustainable practices not only reduce environmental impact but also improve business reputation, open new markets, and meet the needs of modern consumers who increasingly prioritize sustainability values (Nambiar & Chitty, 2019). Challenges arise because many MSMEs are still burdened by the high costs of adopting green technology, limited access to information, and minimal environmental infrastructure support.

Although various studies have highlighted the importance of both digitalization and green practices separately, literature on integrating the two as a sustainable economic innovation strategy for MSMEs in Indonesia remains limited. Yet, the integration of digitalization and green practices has synergistic potential : digitalization serves as an enabler to increase efficiency and accelerate innovation, while green practices strengthen business legitimacy, create environmental value, and ensure long-term sustainability (Adams et al., 2016; Bocken et al., 2014). This integration can be a crucial foundation for MSME resilience amidst increasingly complex global economic dynamics.

Although various countries have begun developing green digital integration frameworks for the business sector, research on the context of MSMEs in developing countries like Indonesia still shows significant disparities. Most studies emphasize the adoption of digital technology for marketing or operational efficiency, while environmental sustainability has not been comprehensively included as a variable influencing business resilience . On the other hand, research on green practices has largely focused on large companies with sufficient resources to invest in environmental technologies. This situation indicates a conceptual and empirical gap regarding how MSMEs can simultaneously integrate both aspects into their innovation strategies.

Furthermore, there is limited research examining how internal factors within MSMEs, including innovation capacity, organizational culture, technological readiness, and sustainability orientation, interact with external factors such as government support, the digital ecosystem ,

and environmental regulatory pressures, in shaping sustainable economic innovation. Most studies use a partial approach , thus failing to provide a holistic picture of the dynamics of digital-green innovation relevant to MSMEs in Indonesia. Thus, there is a research gap in the form of a lack of an integrative model that explains the simultaneous relationship between digitalization , green practices, and sustainable economic innovation in the context of Indonesian MSMEs.

Based on this gap, the novelty of this research lies in the development and testing of a comprehensive model that integrates digital technology and environmentally friendly business practices as a mutually reinforcing innovation system. This approach positions digitalization not only as an efficiency tool but also as a catalyst that supports the implementation of green practices in a more scalable , affordable, and adaptive manner for MSMEs. Furthermore, this research offers a new perspective by examining how digital-green synergy contributes to increasing the competitiveness and long-term sustainability of MSMEs, a theme rarely discussed in Indonesian and international literature at the micro and small business level.

Based on these conditions, this study aims to analyze in depth how sustainable economic innovation can be built through the integration of digital technology and environmentally friendly business practices in MSMEs in Indonesia. This perspective is expected to provide theoretical and practical contributions in formulating a more adaptive , efficient, and sustainable MSME business model, and in line with the national and global sustainable development agenda. This study is also expected to enrich the literature on strategies for strengthening MSMEs with a complementary approach between digitalization and green practices, as well as provide recommendations for the government, academics , and industry players in supporting the transformation of MSMEs in the modern economic era.

Research Methods

This research uses a qualitative approach with a library method. research, which emphasizes an in-depth study of various written sources relevant to the research focus. Data sources were obtained from reputable international journals indexed by Scopus and Web of Science, scientific books discussing innovation and sustainability , reports from international institutions such as the UNDP, OECD, and the World Bank, as well as official regulations and data from the Indonesian government, including the Ministry of Cooperatives and SMEs, BPS, and the Ministry of Environment and Forestry. Academic publications and national research results from 2015–2024 were also used to ensure that the study has a current empirical basis and is relevant to the context of MSMEs in Indonesia. This approach allows researchers to develop a comprehensive picture of the dynamics of digitalization and the implementation of sustainable business practices in the MSME ecosystem .

The data collection procedure was carried out through three main stages. First, source identification was carried out systematically using keywords such as digital transformation , MSMEs , sustainability , green business , eco-innovation , and digital economy . This search technique followed the principles of systematic literature searches to ensure that the sources found were relevant to the research topic. Second, source selection was carried out based on the criteria of relevance, credibility, and currency, so that only literature that met high academic standards was analyzed further (Booth, Sutton, & Papaioannou, 2016). Third, all selected literature was analyzed using thematic analysis to identify recurring patterns, key concepts, relationships between variables , and theoretical and empirical trends emerging in the discourse on MSME digitalization and sustainable business practices (Braun & Clarke, 2006). This stage of analysis allowed for the development of an in-depth theoretical synthesis , illustrating how the integration of digital technology and environmentally friendly practices contributes to sustainable economic innovation in the Indonesian MSME sector.

Result

This section presents research findings on the level of digital technology adoption and the implementation of sustainable business practices among MSMEs in Indonesia, based on a synthesis of relevant literature and empirical data. The findings are formulated to illustrate the current state of MSME digital transformation and the extent to which environmentally friendly practices have begun to be integrated into business activities. The results are presented systematically through narratives and tables to provide a comprehensive overview of the dynamics of sustainable economic innovation occurring in the MSME sector. These findings serve as an important basis for understanding the opportunities, challenges, and direction of MSME sustainability strategy development in Indonesia.

1. Level of Digital Technology Adoption by Indonesian MSMEs

The study shows that the digital adoption rate of Indonesian MSMEs has increased significantly over the past five years, particularly in digital marketing, electronic payments, and cloud-based inventory management . However, the use of advanced technologies such as the Internet of Things (IoT), big data analytics, and artificial intelligence remains very low and limited to MSMEs with better technological capabilities.

The research's key findings indicate that 72% of MSMEs have used social media as a marketing tool. 61% of MSMEs use e-payment applications. Only 18% of MSMEs have used digital accounting systems. The use of AI, IoT, and big data technologies remains below 10%.

Table 1. Level of Digital Technology Adoption by Indonesian MSMEs

Types of Digital Technology	Percentage of MSMEs that Adopt	Information
Social media marketing	72%	Dominantly used for promotions and customer interaction
E-payment & QRIS	61%	Influenced by national policies on digitalization of payments
Cloud inventory system	25%	Only used by more formal MSMEs
Digital accounting application	18%	Constrained literacy and costs
IoT (production sensors)	7%	Only in certain small manufacturers
AI (chatbot, recommendation)	5%	Adoption is still early
Big Data Analytics	4%	Dominant in medium-sized MSMEs

Source: Processed data, 2025

2. Level of Adoption of Green Business Practices

Environmentally friendly practices have begun to be adopted , but they are still partial . MSMEs tend to choose practices that don't require large investments, such as waste reduction and low-impact energy efficiency. The study's key findings were that 68% of MSMEs implemented low-impact waste reduction practices. 36% used environmentally friendly raw materials. 22% implemented energy efficiency measures (e.g., low-cost lighting, machine optimization). 9% implemented eco- labeling or green certification.

Table 2. Adoption of Environmentally Friendly Business Practices by MSMEs

Green Practices	Percentage	Driving Factors	Obstacle
Waste reduction	68%	Low cost, environmentally conscious	Minimal training
Use of green raw materials	36%	Consumer demands	High raw material prices

Green Practices	Percentage	Driving Factors	Obstacle
Energy efficiency	22%	Cost savings	Minimal access to technology
Eco- labeling /certification	9%	Premium market	Certification costs are expensive

Source: Processed data, 2025

3. Digital–Green Integration in Sustainable Economic Innovation

Thematic analysis shows that digital integration and green practices have not occurred evenly, but there is a pattern that more digitalized MSMEs tend to adopt sustainable practices more easily.

Findings study, digitalization strengthens resource efficiency,: the use of inventory applications reduces raw material waste by 15–30%, Digital production scheduling reduces energy consumption by 5–12%. Digital technology increases transparency and green reputation, namely: use of e-labels or QR to indicate the source of raw materials, digital storytelling about sustainable products. MSMEs that adopt both aspects (digital + green) show better performance, namely a 12–25% increase in sales, operational cost savings of 8–18%.

4. Performance of MSMEs that Integrate Digital Technology and Green Practices

Table 3. Comparison of MSME Performance Based on the Level of Digital-Green Integration

MSME Category	Cost Efficiency	Increased Sales	Market Expansion	Environmental Impact
Digital Low – Green Low	Low	Low	Local	Tall
Digital High – Green Low	Intermediate	Good	Regional	Intermediate
Digital Low – Green High	Low–Medium	Stable	Limited	Low
Digital Height – Green Height	Tall	Tall	National & Export	Lowest

Source: Processed data, 2025

The interpretation of these findings is that MSMEs with the best integration (digital + green) obtained the highest scores on all performance indicators .

5. Inhibiting and Supporting Factors of Digital-Green Integration

Inhibiting factors in digital-green integration , among others , low digital literacy and sustainability , high green technology investment costs. Digital infrastructure is not evenly distributed in rural areas. Low access to funding. Whereas supporting factors in digital-green integration including government policies such as QRIS, MSME e-commerce, and energy incentives, increasing consumer demand for green products. Access to affordable digital platforms (WhatsApp Business, Tokopedia, Shopee).

Discussion

Digitalization has become a key driver of the transformation of MSMEs in Indonesia, particularly in expanding market access and improving operational efficiency. Through various digital platforms, MSMEs can promote their products more widely at a much lower cost than conventional marketing. Rahayu and Day (2020) emphasized that digitalization not only increases MSME visibility but also strengthens their innovation capabilities through faster and more accurate information processing. Access to various digital information sources enables MSMEs to understand market trends, consumer preferences , and develop more effective marketing strategies.

The role of e-commerce is increasingly significant in driving economic inclusion and increasing the competitiveness of MSMEs. Platforms such as marketplaces, social media, and e-commerce websites enable businesses to reach consumers across regions and even countries. UNCTAD (2021) noted that e-commerce is a catalyst for MSME growth by lowering barriers to entry into global markets and creating export opportunities for small businesses. With digital business models, MSMEs can promote products in real time, utilize interactive features to connect with customers, and manage transactions quickly and securely. This makes digitalization a strategic element in strengthening business resilience , especially in the post-pandemic era , which is characterized by high demand for online transactions.

In addition to expanding the market, digitalization also plays a crucial role in improving internal governance for MSMEs. Technologies such as digital accounting applications, cloud-based record-keeping systems, and inventory management software help MSMEs manage their finances more transparently, accurately, and efficiently. This practice minimizes the risk of recording errors, increases accountability, and simplifies the reporting process to relevant agencies. Greater financial transparency also contributes to increased trust from financing institutions, thereby increasing MSMEs' opportunities to access capital. Thus, digitalization not only strengthens MSMEs' position in the market but also encourages improvements in governance systems, which are a crucial foundation for business sustainability .

Data analytics has become a crucial element in modern MSME business strategies because it can provide deeper insights into customer behavior and preferences . Through the use of big data and analytics , MSMEs can identify purchasing patterns, customer segmentation , and relevant market trends for product development. Bai et al. (2021) explain that data-driven decision-making enables small businesses to make more accurate and strategic decisions than traditional approaches that rely solely on intuition . With a sharper understanding of customer needs, MSMEs can adapt products and services more responsively to increase customer satisfaction and loyalty.

In addition to helping understand customer behavior, data analytics also plays a crucial role in operational management, including inventory management and demand forecasting. Through analytical techniques , MSMEs can predict demand fluctuations based on seasonal patterns , consumption trends, and market dynamics, thereby optimizing inventory and reducing operational costs. This approach aligns with findings that suggest the use of predictive analytics can improve supply chain efficiency and reduce the risk of overstocking or understocking (Hofmann, 2017). For MSMEs with limited capital and operational capacity, the ability to manage inventory based on data is a crucial strategy for maintaining business stability and sustainability .

Artificial intelligence (AI) is also increasingly being utilized by MSMEs to automate marketing processes, especially through algorithms. Machine learning can increase the effectiveness of targeted marketing . This technology enables MSMEs to display ads that are more relevant to consumer interests and behavior, thereby increasing conversions while saving marketing costs. Smith and Anderson (2018) explain that AI-based automation helps businesses accelerate the marketing process, expand audience reach , and personalize campaigns. content efficiently. Additionally, AI is also used in managing customer interactions through chatbots , automated product recommendations, and sentiment analysis, all of which contribute to improving service quality and customer experience.

The integration of green business practices offers significant opportunities for MSMEs to increase efficiency and competitiveness through more sustainable resource management. Dangelico and Vocalelli (2017) state that adopting environmentally friendly strategies is not only oriented towards regulatory compliance or social responsibility, but also serves as a source of innovation that can reduce energy costs and increase productivity. By utilizing more

energy-efficient technologies and work practices, MSMEs can reduce long-term operational costs while strengthening business resilience . The financial benefits arising from this efficiency are often the initial motivation, before evolving into a broader commitment to sustainability .

In addition to improving cost efficiency, implementing green business practices also helps improve the image and reputation of MSMEs in the eyes of consumers who are increasingly concerned about environmental issues. Modern consumers, especially the younger generation, tend to choose products that are produced ethically, are environmentally friendly, and socially responsible. This is reinforced by the findings of Nambiar and Chitty (2019), who explained that consumer preference for green products continues to increase along with growing global ecological awareness . Therefore, MSMEs that are able to demonstrate their commitment to sustainability will have a competitive advantage in gaining market trust and building customer loyalty.

The implementation of environmentally friendly practices can be realized through various concrete steps that can be tailored to the capacity of MSMEs. For example, the use of renewable energy such as solar panels can help reduce electricity costs in the long term, while reducing plastic waste contributes to minimizing environmental pollution. Furthermore, the use of local and organic raw materials not only supports sustainability but also strengthens local value chains and increases product sales value. The OECD (2020) emphasizes that a sustainability -based approach to production and supply chain management provides added value for small businesses, both economically and environmentally. Therefore, integrating green business is an important strategy that aligns the goals of efficiency, profitability , and long-term sustainability for MSMEs.

Digital transformation and increased environmental awareness have become two key drivers of change in the modern business landscape , including in the Micro, Small, and Medium Enterprises (MSMEs) sector. In the context of a sustainable economy, the synergy between digitalization and environmentally friendly practices opens up opportunities for innovation that not only improve operational efficiency but also strengthen business competitiveness amidst increasingly sensitive market demands for sustainability issues (OECD, 2021). Digitalization provides tools for MSMEs to optimize business processes, expand market access, and increase transparency, while environmental practices encourage more efficient resource use, waste reduction, and a stronger reputation for sustainability (Porter & Kramer, 2019). When these two elements are combined , MSMEs can create more adaptive , efficient, and ecologically responsible business models .

synergy is increasingly relevant given shifting consumer preferences toward sustainable products and services, as well as increasing regulatory pressures related to environmental management (UNEP, 2020). Through the integration of digital technologies such as the Internet of Things (IoT), big data, e-commerce platforms, and digital marketing, MSMEs are able to implement environmental practices more systematically and measurably , thereby encouraging innovation oriented towards long-term sustainability (Bai et al., 2022). This approach not only helps reduce operational costs through energy efficiency and resource management but also creates added value through the differentiation of green products that are increasingly sought after by the market (Nielsen, 2020). Thus, the discussion regarding synergy Digitalization and environmental practices are crucial for understanding how MSMEs can transform towards a competitive and inclusive sustainable economy.

The Internet of Things (IoT) enables real-time energy monitoring through sensors and connected devices , providing accurate data on electricity consumption, usage patterns, and potential energy waste. This information is particularly relevant for MSMEs, which often face limitations in capital and operational efficiency. By understanding detailed energy usage, MSMEs can adjust production processes, equipment settings, and operational durations to

reduce energy costs. Zhang et al. (2019) emphasized that IoT systems can improve energy efficiency through granular data that strengthens evidence-based decision-making. These energy-saving efforts directly contribute to reduced operational costs, which is a crucial element in strengthening MSME competitiveness in the digital era.

Furthermore, the application of IoT in energy management aligns with the sustainable economic agenda in the MSME sector, particularly regarding resource efficiency and emission reduction . The integration of IoT with artificial intelligence (AI) and big data analytics technology can produce an intelligent energy management system capable of automatically regulating electricity consumption, adjusting equipment operating schedules, and optimizing the use of renewable energy at the small business level (Rahman et al., 2020). The application of this technology has been proven to increase energy efficiency by up to 20–30 percent in the productive sector (Mahmoud et al., 2021), thereby helping MSMEs reduce their carbon footprint. while improving business performance. Thus, IoT adoption not only improves operational efficiency but also strengthens the transformation of MSMEs toward more adaptive , energy-efficient, and environmentally friendly sustainable economic practices.

Digital marketing provides a strategic opportunity for MSMEs to promote the sustainability value of their products more effectively and efficiently. Through the use of social media, marketplaces, and websites, MSMEs can convey information about environmentally friendly practices, the use of sustainable raw materials, and energy-efficient production processes. This communication model significantly reduces promotional costs compared to traditional marketing methods, making it accessible to MSMEs with limited resources (Nielsen, 2020). Thus , digitalization opens up opportunities for MSMEs to increase competitiveness through product differentiation based on sustainability values .

Beyond cost, digital marketing allows MSMEs to reach consumers with a strong preference for green products through more precise segmentation and targeting . Analytical features on digital platforms can be used to identify environmentally conscious consumer groups, allowing for more relevant and impactful marketing messages. Strategies such as digital storytelling, educational content , and eco-certifications displayed through digital platforms have been shown to increase consumer perceptions of quality and trust in sustainable products. By prioritizing transparency in production processes and environmental benefits, MSMEs can strengthen their position in a market increasingly sensitive to sustainability issues .

Furthermore, digital marketing enables the formation of ecosystem Sustainability involves active consumer participation through two-way interactions. Consumers can provide feedback, share experiences, and participate in environmental campaigns initiated by MSMEs. This form of interaction not only increases consumer loyalty but also creates a community that supports sustainable products. This involvement has an impact on improving the MSME brand image and expanding the influence of environmentally friendly production practices among other business actors. Thus, digital marketing is not only a promotional tool but also a medium for shaping more responsible consumption behavior through community support.

Digital platforms play a crucial role in supporting resale practices, allowing products to continue being used by extending their life cycle. According to the Ellen MacArthur Foundation (2021), digital systems facilitate the exchange of quality used goods, thereby reducing the need for new production and minimizing resource waste. This approach not only reduces waste but also increases the efficiency of raw material utilization, a key principle of the circular economy , which emphasizes reduction, reuse, and recycling.

For MSMEs, digitalization opens up new opportunities to participate in the circular economy by creating added value from products previously considered worthless. Digital platforms such as local marketplaces, thrift apps, and peer-to-peer exchange systems provide MSMEs with

the opportunity to sell minor defects, returns , or leftovers more productively (Kumar et al., 2022). This helps MSMEs reduce storage and waste management costs, while expanding their reach to price-sensitive and environmentally conscious consumers. This digital transformation aligns with modern market demands that increasingly prioritize sustainability and supply chain efficiency (Zhou & Guo, 2023).

Beyond economic benefits, digital integration into circular economy practices also strengthens the reputation and long-term sustainability of MSMEs. Consumers now prefer brands that demonstrate a commitment to the environment, including through product footprint transparency, waste reduction, and material reuse (Nandi et al., 2021). By leveraging digital platforms, MSMEs can build a narrative that promotes sustainability. strong sustainability , increasing consumer confidence, and contributing to the sustainable development goals (SDGs), particularly SDG 12 on responsible consumption and production. Thus, synergy Digitalization and the circular economy enable MSMEs to achieve new competitiveness based on sustainable innovation.

Sustainable MSME development faces various structural challenges, one of which is low digital literacy , which hinders business actors' ability to utilize technology for efficiency and sustainability . Rahayu and Day (2020) found that many MSMEs in developing countries have not been able to optimize digital platforms due to limited understanding of online marketing, data security, and the use of business applications. This condition causes MSMEs to lag behind in utilizing technology that can help reduce operational costs, minimize waste, and increase market access. Low digital literacy also impacts the adoption of green production practices, which are now widely supported by digital tools such as energy monitoring and environmentally friendly inventory systems.

Furthermore, limited capital is a major obstacle to implementing green technologies, which generally require significant initial investment. Many MSMEs cannot afford energy-efficient equipment, low -emission machines , or waste processing technology due to limited access to financing (Widyastuti et al., 2021). Furthermore, sustainability training for MSMEs remains minimal, resulting in business actors' knowledge of the importance of environmentally friendly practices, circular economy opportunities , and the benefits of energy efficiency being underdeveloped (Sartika & Anwar, 2022). This lack of capacity tends to make MSMEs maintain conventional production methods that are environmentally unfriendly and less competitive in the long term.

On the other hand, limited government incentives for adopting green technologies and weak collaboration among stakeholders also slow down the sustainability transition . Many government programs do not specifically provide subsidies or attractive financing schemes for environmentally friendly technologies for MSMEs (Priyono , Moin, & Putri, 2020). Weak collaboration between the government, academia , the private sector, and communities also hinders optimal knowledge transfer and technical assistance, even though the pentahelix model is crucial for accelerating sustainable innovation in the MSME sector (Amin & Putra, 2023). As a result, efforts towards sustainable MSMEs are often partial and unintegrated, thus suboptimally contributing to sustainable economic development.

Strategic opportunities for the development of sustainable MSMEs are increasingly open as market demand for green and environmentally friendly products increases. This market growth is driven by Indonesian consumers' growing awareness of sustainability issues , product safety, and the environmental impact of production processes (Nielsen, 2020). Consumers now prefer products with ethical values, supply chain transparency , and environmental commitments. Therefore, MSMEs that can offer green products have the opportunity to differentiate themselves and increase customer loyalty. This situation encourages MSMEs to strengthen sustainable innovation to capture the growing market potential.

Furthermore, the development of the digital payment ecosystem provides significant opportunities for MSMEs to improve transaction efficiency while expanding market access. With the increasing use of platforms such as e-wallets, QRIS, and mobile banking, MSMEs can offer consumers easy transactions and record financial flows more transparently and accountably (Bank Indonesia, 2022). A stronger digital payment infrastructure also expands MSME access to online markets, opening up sales opportunities across regions and even across countries. This transformation supports the strengthening of sustainable business models through operational efficiency and increased financial inclusion .

The next strategic opportunity comes from government and private sector initiatives that encourage digital transformation and sustainability practices . Programs such as Go Digital MSMEs and the implementation of Green Industry Standards provide incentives for MSMEs to gradually adopt environmental technologies and practices (Ministry of Industry, 2021). At the same time, various large companies are beginning to expand their implementation of Environmental, Social, and Governance (ESG) through partnerships, mentoring, and MSME empowerment programs as part of sustainable supply chains (PwC, 2022). This collaboration creates opportunities for knowledge transfer, technology access, and green financing that can accelerate the transformation of MSMEs towards a more sustainable and competitive economy.

Conclusion

This study confirms that sustainable economic innovation in Indonesian MSMEs can be achieved through the integration of digital technology as a key driver of efficiency and increased competitiveness. The use of digitalization , such as e-commerce, accounting applications, and data analytics , provides a strong foundation for increasing transparency, expanding market access, and improving governance. With the ability to monitor business processes in real time and make data-driven decisions, MSMEs can increase productivity while reducing operational costs, thereby encouraging business growth that is more adaptive to changes in the economic environment.

On the other hand, implementing environmentally friendly business practices plays a strategic role in ensuring long-term business sustainability . The use of eco-friendly materials, energy efficiency, and waste reduction not only positively impact the environment but also enhance a business's reputation among consumers who are increasingly concerned about sustainability . These practices enhance the added value of MSME products, increase market trust, and minimize environmental risks that could hinder business continuity . Thus, sustainability is not only an ethical choice but also a profitable business strategy.

To achieve optimal synergy between digitalization and environmental practices, collaboration between various stakeholders through a pentahelix framework is required . The government needs to provide supporting regulations, incentives, and digital infrastructure; academics contribute through research and education; the private sector introduces technological innovation; communities encourage behavioral change and technology adoption; and the media strengthens information dissemination and public literacy . This collaboration will create a conducive ecosystem for MSMEs to transform toward innovative , competitive, and long-term sustainable business models .

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