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# Implementation of Digital Transformation and Artificial Intelligence as Innovation for MSMEs in the Era of the Industrial Revolution 4.0

Fatma Ramadhani Br Siagian<sup>1,\*</sup>

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<sup>1</sup> UIN Syekh Ali Hasan Ahmad Addary Padangsidempuan; [fatmaramadhanisiagian@gmail.com](mailto:fatmaramadhanisiagian@gmail.com)

\* Correspondence: [fatmaramadhanisiagian@gmail.com](mailto:fatmaramadhanisiagian@gmail.com)

**Abstract:** Technology plays an important role in economic development. The COVID-19 pandemic has changed people's lifestyles, encouraging businesses to shift to a digital approach. Although it has had a major impact on the economy, including MSMEs, the pandemic has also encouraged adaptation, innovation, and digital transformation through technology and artificial intelligence (AI). This study uses a qualitative descriptive method with data from articles, journals, books, and official publications. The objective is to explore the phenomenon of the Fourth Industrial Revolution in supporting SME growth through digital transformation and the utilization of AI. The research findings indicate that the 4th Industrial Revolution opens opportunities for SMEs to build sustainable businesses. SMEs are beginning to utilize digital technologies such as e-commerce, food delivery apps, and online business models. However, AI adoption remains limited, although some SMEs have already implemented chatbots for automated customer service. Government and private sector support is crucial to enable SMEs to adapt their business models to technological advancements, ensuring their survival and growth in the future.

**Keywords:** artificial intelligence; digital transformation; industrial revolution 4.0; MSMEs

## 1. Introduction

The current trend of digitalization cannot be ignored, especially for micro, small, and medium enterprises (MSMEs). Digitalization can be either an obstacle or an opportunity to ensure business competitiveness and sustainability, both in the domestic and international markets. Digital transformation primarily aims to access new market data and apply a more data-driven approach, thereby creating opportunities to gain a competitive edge through business model reorientation. Digitalization is a complex and dynamic process, serving as an innovation with the potential to shape a better future.

Digital transformation encompasses a process of change aimed at achieving digital resilience, which is often part of a company's core strategy and mission. Digital transformation in SMEs (Small and Medium Enterprises) refers to the use of information and communication technology to improve business efficiency, productivity, and competitiveness. The phenomenon of digital transformation in SMEs can be seen from various aspects, one of which is the challenge related to resources that arise during the transformation process, as digital transformation, like any other change, also requires sufficient resources [1].

The Covid-19 pandemic that began at the end of 2019 has changed the social and economic order, both psychologically and in terms of weakening the global economy. However, on the other hand, this pandemic has also had a positive impact with a significant increase in the application of technology. Large-scale social restrictions and work-from-home (WFH) policies have indirectly encouraged people to adapt to the use of additional technology in their work and daily activities. These changes have accelerated digital transformation, disrupting various sectors, particularly in the economic sphere. Concurrently, digital transformation aligns with the increasing adoption of digital technology to accelerate the onset of the Fourth Industrial Revolution [2].

The industrial revolution has had a huge impact on the way we live and has accelerated business growth around the world. The changes brought about by the industrial revolution in the economic field have made it easier to reduce costs, time, and labor, making it more efficient and effective. The industrial revolution itself has gone through four stages, starting from the industrial revolution 1.0, 2.0, 3.0, and now we are in the industrial revolution 4.0 stage. The industrial revolution 4.0 is a shift from the use of traditional industrial tools to cyber-physical systems (CPS) that are more focused on automation. The main difference between the 4th Industrial Revolution and previous industrial revolutions (1.0 to 3.0) is clear: it changes human lifestyles and basic tasks. The 4th Industrial Revolution has a broader scale, scope, and complexity, and can influence various fields of science, economics, politics, and industrial sectors.

In the technology of the 4th Industrial Revolution, there are several key technologies that play a significant role, such as the Internet of Things (IoT), artificial intelligence (AI), big data, cloud computing, augmented reality, cybersecurity, additive manufacturing, system integration, and simulation. Some of these technologies have been applied in industry, such as big data, which has been utilized by businesses to analyze business data. Additionally, 3D printing technology (which falls under additive manufacturing) has been used by some factories to produce goods more quickly. Currently, some businesses have also begun adopting artificial intelligence technology.

A study conducted by revealed that their survey results showed a trend driven by the increasing availability of data (big data) globally, which has also driven the development of artificial intelligence (AI), such as ChatGPT. This AI-based chatbot, launched in November 2022, quickly attracted global attention thanks to its technology that enhances learning and strengthens techniques in the industrial and academic sectors, although ChatGPT still has some shortcomings in terms of language delivery.

Compared to previous industrial revolutions, there are differences in technology driven by increased speed, specifications, and system transformations, which in turn boost demand for goods and services. Today, more businesses are adopting the on-demand economy and human cloud. Fundamentally, the human cloud transforms

professional activities into project-based tasks carried out by virtual workers located anywhere in the world. In the on-demand economy, labor providers are no longer considered employees in the traditional sense but rather as independent workers completing specific tasks. Thus, the 4th Industrial Revolution has a significant impact on the development of the global economy and business.

The internet and digitalization have transformed traditional business models into new service models within industries. Currently, there are still some traditional business models that have not been integrated or leveraged the internet. Traditional companies face challenges such as high operational costs, difficulties in inventory management, low user engagement, and a lack of understanding of user positions and needs, which seriously impact the development of micro, small, and medium enterprises (MSMEs). [3]

According to a report by the Coordinating Minister for Maritime Affairs and Investment, Luhut Binsar Pandjaitan, MSMEs play a vital role in the national economy. As of June 2023, 22.68 million MSMEs have onboarded to the digital ecosystem.

Additionally, the United Nations Conference on Trade and Development (UNCTAD) noted that SMEs contributed 60.3% to Indonesia's Gross Domestic Product (GDP) and absorbed 97% of the workforce in Indonesia in 2022.

The large scale and number of SMEs in Indonesia are key factors supporting the national economy. National economic growth can be achieved if sustainable development continues to be strengthened, both in the economic sector and in social stability, for the welfare of the people and the nation. Currently, the dilemma faced is that transformation is an important step to ensure the sustainability of SMEs. If this step is not taken, in the long term, SMEs risk decline or even bankruptcy.

On the other hand, the transformation process requires significant resources, changes in management, and updates to operational models, which pose major challenges for business operators. In an era of rapidly increasing internet usage, companies need to adopt innovative models, operational methods, and new sales strategies to replace traditional bureaucratic management methods that are no longer efficient [4].

Another phenomenon is organizational barriers, such as limited financial resources, lack of management support, resistance to change, and inadequate infrastructure. There are also technological barriers, where MSMEs are hesitant to implement advanced technology services, such as Enterprise Resource Planning (ERP) technology innovations and artificial intelligence, due to a lack of knowledge. In addition, there are legal barriers related to a lack of cooperation and integration between management and departments, as well as privacy issues.

## 2. Results

Overall, the impact of the 4.0 industrial revolution on the business world is a change that is inseparable from the simple digitization that characterized the 3.0 industrial revolution, and has now evolved into far more complex innovations that combine the latest technologies. This change forces every business actor to re-evaluate how they run their businesses and adapt to new forms. The 4th Industrial Revolution encourages business actors to create innovations that transform traditional businesses, resulting in disruption and bringing consumers into the digital world by leveraging the Internet and the latest technologies, such as artificial intelligence. One of the disruptive changes in the transportation sector in Indonesia is the emergence of online transportation services through apps like Go-Jek, Grab, and Maxim.

The COVID-19 pandemic has played a significant role in creating a new economic ecosystem in Indonesia, namely digital entrepreneurship, which indirectly encourages SMEs to adapt to digital technology. Key factors to consider in developing digital SMEs include production quality and capacity, as well as the importance of human resources with digital literacy. Additionally, another equally important factor is alignment with consumer behavior in the digital era and challenges related to infrastructure [5].

Digital transformation and the application of artificial intelligence (AI) technology in Indonesia have become an important part of economic and social development. With advances in information and communication technology, various sectors in Indonesia have begun to adopt digital transformation to improve operational efficiency and competitiveness. Both large companies and SMEs are starting to utilize digital solutions, such as shifting to e-commerce, digital financial services, and implementing AI systems to increase productivity and innovation.

Large companies such as Shopee, Tokopedia, and Lazada, for example, are already utilizing AI technologies such as chatbots, recommendation engines, and big data. The shift toward adopting the latest technologies is also evident in the financial sector, where digital banking services are increasingly dominant, using AI to analyze credit risks, detect fraud, manage portfolios, and transform how financial institutions operate. Additionally, in the manufacturing sector, companies are beginning to implement automation and Internet of Things (IoT) technologies supported by AI to improve production efficiency and product quality.

According to Accenture's research titled "Realising a Cloud-Enabled Economy: How Cloud Drives Economic and Societal Impact Through Micro, Small, and Medium-Sized Businesses," AI technologies such as Generative AI are experiencing significant growth among cloud technologies and are projected to grow by 27% annually over the next 10 years. Additionally, the study revealed that 75% of Indonesian SMEs across various industries are expected to adopt AI technologies such as machine learning, natural language processing, and generative AI by 2030 [6].

### 3. Discussion

The Application of Artificial Intelligence (AI) in Digital Transformation for MSMEs. Digital transformation in Indonesia is growing rapidly through the application of artificial intelligence (AI), which has a positive impact, especially for Micro, Small, and Medium Enterprises (MSMEs). The application of AI in the context of SMEs in Indonesia has brought innovative solutions to improve operational efficiency, competitiveness, and the ability to adapt to market changes. One of the key aspects of AI integration is its ability to analyze big data and provide valuable insights for SMEs [7].

The rapid development of the digital economy today, along with the 4.0 industrial revolution, opens up opportunities for businesses to adopt the latest technologies, including artificial intelligence. Although the adoption of artificial intelligence among small and medium-sized businesses in Indonesia is still relatively low, several MSMEs have begun to implement AI. For example, Sri Ratu Laundry utilizes a no-code chatbot platform from WhatsApp Business as a system for communication, record-keeping, and scheduling of pickup and delivery services efficiently.

In the world of e-commerce, it is hoped that SMEs in Indonesia will also adopt artificial intelligence technology to enhance the online shopping experience. AI-based product recommendation systems in e-commerce can help SMEs understand customer preferences, increase sales, and build long-term relationships. Additionally, AI can assist SMEs in managing supply chains, predicting demand, optimizing inventory, and reducing the risk of overstocking or understocking, which can be detrimental to business[8].

The application of artificial intelligence (AI) and digital transformation provides a number of important benefits for MSMEs in Indonesia. One of the main benefits is increased operational efficiency. AI can help MSMEs automate various tasks, from inventory management and customer data analysis to automated customer service. This not only increases productivity but also allows companies to focus more on innovation and product development.

Additionally, digital transformation opens up opportunities for SMEs to expand their market access. Through e-commerce platforms and digital marketing, SMEs can reach a broader consumer base, even extending to global markets. Advanced data analysis also

helps SMEs understand market trends, customer preferences, and compete more effectively. The adoption of AI technology also streamlines financial and payment processes, thereby strengthening the competitiveness of SMEs in the digital economy era[9].

One important aspect of artificial intelligence is its ability to analyze big data. With this ability, AI can identify patterns that are difficult for humans to recognize. In a business context, this allows companies to make more accurate and informed decisions, open up new opportunities, and improve operational efficiency. Machine learning technology, which is at the core of artificial intelligence, enables systems to learn from data and past experiences and adapt without the need for complex programming.

Although in general, not many MSMEs in Indonesia have adopted AI technology, some MSMEs have started to utilize platforms that use AI features. One such example is Warung Pintar, a startup that helps small shops collaborate directly with suppliers and distributors, and improve the efficiency of shop management to make it more effective.

Although digital technology and artificial intelligence (AI) offer various benefits, there are also several risks that need to be considered when using these technological tools for SMEs. One of the main risks is the high cost of implementing technology, which is often too expensive for SMEs, especially for small-scale (home-based) businesses that may face financial constraints in adopting this advanced technology. Additionally, risks related to data privacy (security) must also be a concern. The use of digital technology can increase the potential for customer data breaches or cyberattacks that could damage a business's reputation [10].

Digital literacy is also a challenge. MSMEs that lack technological knowledge may find it difficult to integrate and understand the benefits of AI technology. Therefore, training and guidance in the application of this technology is very important as part of the digital transformation strategy for MSMEs. By understanding and managing these risks, MSMEs can maximize the benefits of AI and digital transformation to increase their competitiveness and business growth.

#### **4. Materials and Methods**

This study uses a qualitative descriptive method, which aims to describe a phenomenon or event in depth, focusing on understanding meaning and context, without involving quantitative measurements. In this study, data was collected through observation and content analysis derived from literature reviews, including articles, journals, official sources, and books. This method then applies qualitative analysis to identify patterns, themes, or characteristics that emerge.

The results of this study are narrative descriptions that provide an in-depth understanding of the phenomenon being studied. The descriptive qualitative approach was chosen because the purpose of the research was to explore insights, contextual understanding, and the complexity of the topic of digital transformation and artificial intelligence implementation as innovations in the development of micro, small, and medium enterprises (MSMEs). In addition, this research also discusses the relationship between the era of the 4.0 industrial revolution and digital transformation, which is highly relevant in the context of this development.

The initial stage of the research began with the collection of data from reliable literature and books related to the 4.0 industrial revolution era associated with digital transformation, which drives implementation in the field of economic development, particularly for MSMEs. Next, the researcher sought perspectives from a broad and in-depth literature review on the technology applied in artificial intelligence in Indonesia for MSMEs and analyzed the data to draw conclusions about the implementation, potential, and challenges in applying artificial intelligence technology and digital transformation.

In this study, the data analysis technique used is data reduction, where data is obtained from reliable sources, websites, and the author's observations to draw conclusions without losing the value of the data. Data presentation is done narratively to

make it easy for readers to understand. This study also provides recommendations to SME actors, the private sector, and the government to collaborate in enhancing or maximizing the productivity and management of business actors through the utilization of digital transformation in Indonesia.

## 5. Conclusions

The Fourth Industrial Revolution presents significant opportunities for small and medium-sized enterprises (SMEs) to transform their operational processes. By adopting advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), and additive manufacturing, SMEs can optimize their business processes. Digitalization provides a platform that enables SMEs to enhance production efficiency, manage supply chains more effectively, and reduce operational costs. Additionally, big data analysis offers SMEs deep insights into market trends, customer behavior, and more effective and efficient business strategies [11].

Collaboration through digital networks also opens up broader business partnership opportunities, while the use of technology to enhance customer experience can help MSMEs excel in competition. However, challenges such as data privacy, digital security, and the importance of employee engagement in the process of learning and developing new skills must also be considered in the adoption of AI. With the right awareness and adaptation, SMEs can reap significant benefits from the Fourth Industrial Revolution and strengthen their competitiveness in the increasingly interconnected global market.

It is hoped that the Indonesian government can provide support for AI implementation in SMEs through various initiatives and regular training programs, especially outside Java. Training and mentoring programs, as well as accessibility to AI technology, are key focuses to ensure SMEs can maximize the benefits of this digital revolution. Additionally, AI innovation opens opportunities for SMEs to engage in broader sectors such as smart manufacturing, digital agriculture, and innovative financial services. By integrating AI, SMEs in Indonesia can play a more significant role in the digital economy, create jobs, and support sustainable national economic growth.

## References

- [1] A. Novianti and Munawaroh, "Digital Transformation Changes the Business Landscape of MSMEs in the Age of Technology," *Trending J. Ekon. Accounting. and Manaj.*, vol. 3, no. 1, pp. 271–278, 2025.
- [2] E. Supriyadi and S. Raharjo, "The Role of Digital Technology in Supporting Economic Activities during the Covid-19 Pandemic," *J. Ekon. and Bisnis Indones.*, vol. 15, no. 1, pp. 23–25, 2021.
- [3] D. Angraini, Y. Riady, A. Pratama, A. Sadria, and Rosmiati, "Digital Transformation in Increasing the Competitiveness of Indonesian Micro, Small, and Medium Enterprises (MSMEs): A Systematic Review," *EKLEKTIK J. Educator. Ekon. and Entrepreneurship Vol.*, vol. 7, no. 2, pp. 132–142, 2024.
- [4] K. K. and U. R. Indonesia, *Report on the Digitalization of MSMEs in Indonesia*. Jakarta: Ministry of Cooperatives and MSMEs, 2022.
- [5] R. Suryani, *Industrial Revolution 4.0 and Business Disruption: Challenges and Opportunities for MSMEs*. Jakarta: Erlangga Publishers, 2022.
- [6] H. Siti, *Digital Transformation in Indonesia: The Impact and Role of AI in Business and Economy*. Yogyakarta: Gadjah Mada Publishers, 2022.
- [7] D. Andriani, *The Utilization of AI in MSMEs to Improve Business Performance*. Jakarta: Kompas Publishers, 2022.
- [8] T. Prabowo, *Digital Transformation of MSMEs: AI and Technology Solutions for Business Improvement*. Jakarta: Gramedia Publishers, 2021.
- [9] M. Prasetya, *Digitalization of MSMEs: Utilizing Technology to Expand the Market and Improve Operational Efficiency*. Yogyakarta: Andi Publishers, 2021.
- [10] A. Nasution, *Artificial Intelligence and Implementation Risks in MSME Business*. Bandung: Pustaka Jaya Publishers, 2020.
- [11] R. Wijaya, *Digitalization and Its Influence on SME Business Processes*. Yogyakarta: Digital Solutions Publisher, 2021.