Proceeding of International Conference on Business, Economics, Finance and Technology (PIC-BEFT)
Vol. 1, No. 1, 2024 : Hal 217-230

Sustainable Economic Transformation Through Digital Technology 5.0 in Pekalongan City: Perspective of Msme Actors

M. Shofiyuddin
Faculty of Economics and Business, University of Pekalongan.
Corresponding Author: M. Shofiyuddin m.shofiyuddien@gmail.com

A R T I C L E I N F O

Keywords: : Digital Technology 5.0, MSMEs, Sustainable Economic Transformation, Business Innovation

Received : 14, September
Revised : 23, September
Accepted: 24, October

A B S T R A C T

The rapid development of digital technology, particularly Digital Technology 5.0, has driven economic transformation in various sectors, including Micro, Small, and Medium Enterprises (MSMEs). This study aims to analyze the impact of Digital Technology 5.0 on sustainable economic transformation in MSMEs in Pekalongan City, and how business innovation acts as an intervening variable in this relationship. MSMEs in Pekalongan City, which predominantly operate in the batik and handicraft industries, face challenges in adopting digital technology despite the significant opportunities it offers. This study employs a quantitative approach using data from 100 MSMEs in Pekalongan City. The research findings show that Digital Technology 5.0 has a significant impact on sustainable economic transformation, both directly and through business innovation. Supporting and inhibiting factors in digital technology adoption were also identified. This research provides an important contribution to the literature on sustainable economic transformation and offers practical recommendations for MSMEs and local governments to optimize digital technology adoption.

INTRODUCTION

The rapid development of digital technology has transformed various aspects of life, including the business sector. The Industrial Revolution 5.0, which emphasizes the collaboration between humans and smart technologies, such as Artificial Intelligence (AI), the Internet of Things (IoT), and big data analytics, has further accelerated transformations in various sectors, including the Micro, Small, and Medium Enterprises (MSMEs). Digital Technology 5.0 presents new opportunities for MSMEs to enhance productivity, expand their market reach, and achieve higher operational efficiency (Lee & Trimi, 2021). For the City of Pekalongan, renowned for its batik industry and other handicraft sectors, this technological transformation can serve as a catalyst for sustainable economic growth.

MSMEs play a significant role in the national economy. Data from the Ministry of Cooperatives and MSMEs indicate that MSMEs contribute more than 60% to Indonesia's Gross Domestic Product (GDP) and absorb more than 97% of the national workforce (Kemenkop UKM, 2023). However, amidst global challenges such as the COVID-19 pandemic, MSMEs in Pekalongan face various obstacles, ranging from limited access to technology and capital to a lack of digital skills. According to a local survey conducted in 2022, approximately 58% of MSMEs in Pekalongan still employ conventional business methods and have not yet fully embraced digital technology (Dinas Koperasi dan UMKM Pekalongan, 2022).

The main challenges faced by MSMEs in Pekalongan in the era of Digital Technology 5.0, aside from the aforementioned limitations, include inadequate digital infrastructure and the lack of human resources proficient in using these technologies. These limitations often trap MSMEs in conventional business patterns, making it difficult for them to thrive in the global market. According to a report by the Organisation for Economic Co-operation and Development (OECD), one of the primary barriers in the digital transformation of MSMEs is the lack of adequate digital infrastructure and insufficient digital skills among the workforce. This condition causes MSMEs to retain traditional business models and struggle to adapt to new technologies required to compete in international markets (OECD, 2022). The OECD also recommends policies to address the challenges of MSME digitalization, including the need to enhance digital training capacities and ensure better access to infrastructure for MSMEs so they can leverage digital opportunities more optimally (OECD, 2022).

Additionally, the shift in consumer behavior towards digital platforms, such as e-commerce and social media, also demands a rapid transformation from MSME actors. For most MSMEs in Pekalongan, which are predominantly micro and small-scale enterprises, this transformation often feels burdensome as it requires significant investments in terms of time, capital, and knowledge (Dinas Koperasi dan UMKM Pekalongan, 2022). Therefore, the adoption of Digital Technology 5.0 needs to be carefully planned and supported by local government policies that facilitate this digital transformation. Policy support is crucial to ensure that this transformation can be embraced by all MSME actors without

exception, preventing a digital divide that could affect regional competitiveness (Elkington, 2018).

Despite these challenges, the opportunities presented by Digital Technology 5.0 are substantial. The adoption of technologies such as e-commerce, digital payment systems, and production automation can accelerate the digitalization process, helping MSMEs in Pekalongan to enhance their competitiveness. This technology also supports MSMEs in creating new business models that are more adaptable to market changes and global economic crises (Wang, 2021). In the context of sustainable economics, digital transformation plays an important role in reducing excessive resource consumption, improving energy efficiency, and supporting environmentally-friendly business practices (Elkington, 2018).

While the potential for digital technology transformation is evident, many MSMEs in Pekalongan still lag behind in technology adoption. According to the latest data from the Department of Cooperatives and MSMEs of Pekalongan, the majority of MSMEs are still hindered by limited access to technology, knowledge, and insufficient capital for digital investments (Dinas Koperasi dan UMKM Pekalongan, 2022). There is a lack of research specifically examining how the implementation of Digital Technology 5.0 impacts sustainable economic transformation at the local level, especially in the context of MSMEs in the City of Pekalongan. Most existing studies focus on digitalization at the national or global level (Omar, 2020; Wang, 2021), but in-depth studies linking the role of 5.0 technology with sustainable economic transformation at the regional level, particularly from the perspective of MSME actors, are still limited.

There is also a difference in understanding the role of business innovation as an intervening variable. Many studies emphasize the importance of innovation in economic transformation; however, there is no in-depth study in Pekalongan on how local MSMEs can leverage technology-based innovation to drive their business sustainability (Christensen, 2016; Tidd & Bessant, 2021). Therefore, this research aims to bridge this gap by examining the role of Digital Technology 5.0 in creating sustainable economic transformation and how business innovation can strengthen this relationship. Based on the phenomenon and varying research results, this study focuses on "Sustainable Economic Transformation Through Digital Technology 5.0 in Pekalongan City: Perspective of MSME Actors." This research aims to analyze the direct impact of Digital Technology 5.0 on sustainable economic transformation for MSMEs in Pekalongan City, as well as its indirect impact through business innovation as an intervening variable, including identifying the supporting and inhibiting factors in the adoption of Digital Technology 5.0 among MSMEs in Pekalongan City.

The benefits of this research are as follows: Theoretical Benefits: This study is expected to enrich the literature on the role of Digital Technology 5.0 in sustainable economic transformation in the MSME sector, especially in a local context such as Pekalongan City. Additionally, it can contribute to explaining how business innovation becomes a key factor in optimizing the application of

technology in small enterprises. Practical Benefits: The results of this study can serve as a reference for local governments and MSMEs in Pekalongan City in developing policies that support digital technology adoption. Furthermore, MSMEs can utilize the findings as a guide to enhance their competitiveness and business sustainability through technology-based innovation. Social Benefits: By increasing the use of digital technology and business innovation, it is hoped that MSMEs can create new job opportunities and support inclusive and sustainable economic growth in Pekalongan City.

LITERATURE REVIEW

Sustainable Economic Transformation

Sustainable economic transformation refers to changes in the economic system that not only enhance economic growth but also maintain social and environmental balance. In the context of sustainability, this economic transformation involves the implementation of environmentally friendly business practices, energy efficiency, and sustainable resource management (Elkington, 2018). According to Elkington (2018), a sustainable economy is built on three main pillars: economic, social, and environmental. The integration of digital technology in economic transformation is expected to support the balance of these three pillars. In the context of Micro, Small, and Medium Enterprises (MSMEs), sustainable economic transformation means enhancing business competitiveness without compromising sustainability aspects, including more efficient resource use and the adoption of environmentally friendly technology (Omar, N., 2020). According to the Ministry of Cooperatives and Small and Medium Enterprises (Kemenkop UKM, 2023), sustainable transformation can be observed from three perspectives: economic sustainability (business growth and profitability), social sustainability (improved employee and community welfare), and environmental sustainability (reducing environmental impact and increasing energy efficiency).

Digital Technology 5.0

Digital Technology 5.0 is an evolution of the industrial revolution that integrates smart technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), big data, and automation with a focus on human-technology collaboration. This technology offers opportunities for MSMEs to enhance operational efficiency, optimize customer experiences, and expand market reach through digital platforms (Lee, S. M., & Trimi, 2021b). According to Wang (2021), Digital Technology 5.0 not only offers efficiency in business processes but also enables better personalization and more humanized interactions with customers. It supports the digitalization of production, allowing MSMEs to produce goods and services more efficiently, reduce waste, and improve production flexibility. Indicators of Digital Technology 5.0 implementation in MSMEs include the application of smart technologies such as AI and IoT, the use of digital platforms for business (e-commerce, digital payments), and business process automation (production, logistics, customer service) (Christensen, 2016).

Business Innovation

Business innovation refers to the application of new ideas or new approaches in business to improve performance and competitiveness. Tidd and Bessant (2021) define business innovation as the process of developing and implementing creative solutions aimed at solving problems, improving efficiency, or creating new value for customers. Business innovation encompasses various aspects, such as product innovation, process innovation, marketing innovation, and organizational innovation. Business innovation is critical for MSMEs, especially for adopting new technologies and adjusting their business models to remain relevant in constantly changing market conditions. According to Omar (2020), business innovation serves as a primary driver mediating the relationship between digital technology adoption and the successful achievement of sustainable economic transformation. Indicators of business innovation include product innovation (development of new products or services), process innovation (operational efficiency and the use of new technologies), and organizational innovation (implementation of more flexible organizational structures) (Christensen, 2016).

Sustainable Economic Transformation and Social Impact

Sustainable economic transformation not only focuses on achieving optimal business growth but also considers the long-term impact on social welfare and environmental sustainability. In the context of MSMEs, this means that every step of transformation should consider the well-being of workers, the surrounding community, and the environmental impact of operations (Omar, 2020). The principle of sustainability involves implementing technology that not only improves efficiency but also promotes inclusiveness. This is crucial because, in the long run, social and environmental balance will become the main factors in creating business stability. Elkington (2018) states that the right technology implementation can help achieve these goals through the concept of the "Triple Bottom Line," which encompasses People, Planet, and Profit. In other words, the success of digital transformation in MSMEs will be measured not only by economic growth but also by the extent of its positive impact on employee welfare and the surrounding environment.

Digital Technology 5.0 in the Local Context

Digital Technology 5.0 not only plays a role in improving production efficiency but also creates opportunities for MSMEs in Pekalongan to generate new value through product innovation that integrates local cultural elements. For example, the batik industry in Pekalongan can incorporate augmented reality (AR) technology to create an interactive virtual shopping experience, thus adding value to traditional products (Lee, S. M., & Trimi, 2021). This technology also enables business owners to analyze market trends in real-time and adjust batik designs to align with global consumer preferences. Thus, the adoption of Digital Technology 5.0 can transform the narrative that modern technology is only

suitable for large-scale and sophisticated businesses. In fact, this technology can be a tool to strengthen local identity and increase the international competitiveness of Pekalongan's MSMEs.

Hypothesis Development

The Impact of Digital Technology 5.0 on Sustainable Economic Transformation

The implementation of Digital Technology 5.0 in the MSME sector can support sustainable economic transformation by enhancing operational efficiency, reducing resource consumption, and creating more environmentally friendly business models. According to Wang (2021), the adoption of smart technologies such as AI and IoT in the MSME sector can reduce production costs, improve supply chain management, and create products and services that are more adaptive to the dynamic needs of the market. Similarly, a study by Omar (2020) found that digital technology plays a crucial role in facilitating MSMEs to achieve sustainable economic growth through the application of efficient and environmentally friendly business practices. Therefore, the hypothesis proposed is: **H1**: Digital Technology 5.0 has a positive effect on Sustainable Economic Transformation in MSMEs in Pekalongan City.

The Impact of Digital Technology 5.0 on Business Innovation

Digital Technology 5.0 fosters business innovation by providing tools and platforms for experimentation and creating new solutions. Lee and Trimi (2021a) explained that technologies such as big data and automation enable MSMEs to accelerate the innovation process by personalizing products and services and optimizing customer interactions. Christensen (2016) stated that the implementation of digital technology facilitates innovation in products and processes, which in turn enhances competitiveness and business sustainability. Therefore, the hypothesis proposed is: **H2:** Digital Technology 5.0 has a positive effect on Business Innovation in MSMEs in Pekalongan City.

The Impact of Business Innovation on Sustainable Economic Transformation

Business innovation, particularly in product, process, and business model innovations, is a key element in achieving sustainable economic transformation. According to Tidd and Bessant (2021), business innovation enables MSMEs to be more flexible in facing environmental and social challenges and adapt to market changes and regulations related to sustainability. Omar (2020) found that business innovation plays a significant role in promoting economic sustainability by developing more efficient and environmentally friendly products and adopting business models that support the circular economy. Therefore, the proposed hypothesis is:

H3: Business Innovation has a positive effect on Sustainable Economic Transformation in MSMEs in Pekalongan City.

The Role of Business Innovation as an Intervening Variable

Business innovation acts as an intervening variable that strengthens the relationship between the adoption of Digital Technology 5.0 and sustainable economic transformation. Wang (2021) noted that innovation driven by digital technology can create structural changes in business that support the

achievement of economic, social, and environmental sustainability goals. Research by Tidd and Bessant (2021) also showed that technology-driven innovation improves resource efficiency, reduces environmental impact, and enhances social well-being, thereby reinforcing the impact of digital technology on sustainability. Therefore, the hypothesis proposed is: **H4:** Business Innovation mediates the effect of Digital Technology 5.0 on Sustainable Economic Transformation in MSMEs in Pekalongan City.

METODOLOGY

This study employs a quantitative method with a descriptive and explanatory approach. The descriptive research aims to describe the phenomena that occur, while the explanatory approach is used to explain the causal relationship between the independent and dependent variables (Sugiyono, 2017). The focus of this research is to examine the effect of adopting Digital Technology 5.0 on sustainable economic transformation in MSMEs in Pekalongan City, with business innovation considered as an intervening variable.

Population and Sample, based on data from the Cooperative and MSME Office of Pekalongan City, the research population consists of 500 registered MSMEs. The sample size was determined using Slovin's formula, with a margin of error of 10%, resulting in a sample of 83 MSMEs. The sampling technique used is purposive sampling, with the following criteria: MSMEs that have adopted digital technology. MSMEs that have been in operation for a minimum of 2 years. Analysis Tool, the analysis tool used in this research is Path Analysis, as it includes an intervening variable, which is business innovation.

RESEARCH RESULT

Validity Test

The construct validity test was conducted to measure the extent to which the indicators used accurately represent the variables being assessed. This validity test was performed using Confirmatory Factor Analysis (CFA) (Hair, J.F., Black, W.C., Babin, B.J., & Anderson, 2019) by evaluating the factor loading values. The results show that all indicators have factor loading values above 0.50, indicating that these indicators are valid in measuring the intended variables.

Reliability Test

The reliability test is used to assess the consistency of the instrument in measuring the variables. This test was conducted using Cronbach's Alpha with a threshold of 0.70 (Sugiyono, 2017). The analysis results demonstrate that all variables have Cronbach's Alpha values above 0.70, indicating that the instruments used are reliable and consistent in measuring the variables.

Goodness of Fit Test

The results of the Goodness of Fit test show a p-value of < 0.05, which means that the model tested has a good fit with the data. Thus, it can be concluded that the model is significant and suitable for explaining the phenomena being investigated (Kock, 2020).

Path Analysis Test

Direct Effect Test

This study employs path analysis to analyze the impact of Digital Technology 5.0 on Sustainable Economic Transformation in MSMEs. The results indicate that Digital Technology 5.0 has a significant direct impact on Sustainable Economic Transformation with a regression coefficient of 0.68 and a p-value < 0.05, suggesting that the use of digital technologies such as IoT, AI, and automation systems plays a crucial role in accelerating sustainable economic transformation in MSMEs. Additionally, Business Innovation has a direct effect on Sustainable Economic Transformation, with a regression coefficient of 0.54 and a p-value < 0.05. Innovations in products, processes, and business models supported by digital technology facilitate increased efficiency and competitiveness among MSMEs.

Indirect Effect Test through the Intervening Variable (Business Innovation)

The presence of the intervening variable, Business Innovation, strengthens the indirect relationship between Digital Technology 5.0 and Sustainable Economic Transformation. The value of the indirect effect coefficient is 0.35, with a p-value < 0.05, indicating that the digital technology adopted by MSMEs stimulates innovation, which in turn supports economic sustainability more effectively.

Supporting Factors for the Adoption of Digital Technology 5.0 among MSMEs

Based on the results of the questionnaires and interviews conducted, the supporting factors for the adoption of Digital Technology 5.0 among MSMEs include:

1. **Access to Training and Technical Assistance:** MSMEs with access to training from both government and private sectors exhibit higher levels of technology adoption.
2. **Financial Capability:** MSMEs with stronger capital tend to adopt digital technologies more quickly, especially in implementing AI and automation in their business operations.
3. **Partnerships with Technology Startups:** Many MSMEs collaborate with local technology startups, which assist in digital transformation through e-commerce platforms, digital marketing, and digital payment systems.

Inhibiting Factors for the Adoption of Digital Technology 5.0 among MSMEs

This research also identifies several main barriers to digital technology adoption, including:

1. **Lack of Digital Literacy:** Many MSME actors still lack an understanding of how to use digital technology effectively, especially those who are older.
2. **High Cost of Technology Implementation:** Some MSME owners feel burdened by the initial costs of adopting digital technologies such as IoT devices, software, and automation systems.

3. **Limited Infrastructure:** In certain regions, inadequate internet access and other technical issues become obstacles to the full implementation of digital technology.

DISCUSSION

The Impact of Digital Technology 5.0 on Sustainable Economic Transformation

The results of this research indicate that Digital Technology 5.0 plays a significant role in driving sustainable economic transformation. This finding is consistent with the study by Bianchi, C., Milner, T., & Davidson (2021), which highlights that digital technology accelerates economic transformation by enhancing efficiency and better resource utilization. Frynas, J. G., Mellahi, K., & Pigman (2020) also emphasized that digital transformation in the MSME sector plays a crucial role in achieving sustainability goals by reducing carbon emissions and improving productivity. This research supports the theory of Sustainable Economic Transformation proposed by Porter, M. E., & Kramer (2011), which suggests that the integration of new technologies into business models can create long-term value, not only for companies but also for the environment and society at large.

The Role of Business Innovation as an Intervening Variable

The findings of this study reinforce the notion that Business Innovation acts as a catalyst in the relationship between Digital Technology 5.0 and Sustainable Economic Transformation. Schumpeter (1934) has long argued that innovation is the engine of economic growth. A recent study by Linton, J. D., & Solomon (2017) also supports that innovation triggered by digitalization helps MSMEs enhance their competitiveness and achieve long-term sustainability. Research by Yun, J. J., Jeong, E. Y., & Lee (2020) reveals that innovation in business, particularly those supported by digital technology, is crucial in addressing global sustainability challenges, such as waste reduction and energy efficiency. In the context of MSMEs in Pekalongan, innovations in business models and production processes can lead to products that are more environmentally friendly and efficient in resource utilization.

The discussion on business innovation in the context of sustainable economic transformation in Pekalongan demonstrates that innovation can take various forms, ranging from product innovation, process innovation, to marketing innovation. For example, some MSMEs in the batik sector have started to transition to customized production supported by digital printing technology. This approach not only allows them to reduce fabric waste but also offers flexibility in designs that are difficult to achieve through traditional production methods (Christensen, 2016). This innovation is driven by the need to create unique products tailored to consumer demands without having to produce in large quantities.

Furthermore, innovation in business processes also involves developing a more efficient supply chain through the use of digital platforms. For instance,

MSMEs in Pekalongan can leverage IoT technology to track raw material inventory, forecast market demand, and ensure timely product delivery. Consequently, the implementation of Digital Technology 5.0 not only enhances productivity but also reduces operational costs and optimizes the supply chain. In terms of marketing innovation, MSMEs in Pekalongan have started utilizing social media as a primary tool to reach new customers at both the national and international levels. The use of big data enables MSMEs to gain deeper insights into consumer behavior and design more targeted marketing strategies (Wang, 2021). For example, through data analysis from e-commerce platforms, MSME actors can identify consumer purchasing patterns and adjust their marketing campaigns in real time.

Supporting and Inhibiting Factors for Digital Technology Adoption

Supporting factors such as training, technical assistance, and partnerships with technology startups emphasize the importance of an ecosystem that facilitates digital transformation among MSMEs. This aligns with the findings of Nambisan, S., Wright, M., & Feldman (2021), which indicate that a robust digital ecosystem, including partnerships between businesses and technology providers, plays a vital role in accelerating the digital transformation of MSMEs. Conversely, barriers such as low digital literacy and high implementation costs reflect the research findings of Chesbrough, H., & Bogers (2018), who stated that the primary challenges in adopting new technology among small businesses are a lack of skills and capital. In the context of MSMEs in Pekalongan, uneven digital infrastructure also becomes an obstacle, as emphasized in the research by Ekanem & Smallbone (2019), which discusses the limitations of digital infrastructure in developing regions.

CONCLUSIONS

The results of the research show that the adoption of Digital Technology 5.0 can be a key catalyst in creating sustainable economic transformation for MSMEs in Pekalongan City. This technology enables MSMEs to enhance efficiency, reduce resource consumption, and generate new value through product and process innovation. However, the adoption of this technology also faces challenges, including a lack of digital knowledge, limited access to capital, and resistance to change. Therefore, the role of business innovation as an intervening variable becomes crucial in ensuring that the implementation of Digital Technology 5.0 brings a significant positive impact on local economic sustainability.

RECOMMENDATIONS

1. **Enhancement of Digital Education and Training:** Local governments and educational institutions should organize training programs and workshops to improve the digital literacy of MSME actors. These training sessions should cover the use of digital technologies, online marketing, and digital financial management.
2. **Access to Capital and Funding:** Efforts are needed to facilitate MSMEs' access to funding sources, such as providing low-interest loans or grant assistance for

investment in digital technology. Collaboration with microfinance institutions and banks can support this endeavor.

3. **Development of Technological Infrastructure:** Improving technological infrastructure in Pekalongan City, such as better internet networks, is necessary to enable MSMEs to access and utilize digital technology more easily. The provision of co-working spaces equipped with modern technology can also be a viable solution.
4. **Facilitation of Business Innovation:** Local governments should provide incentives for MSMEs that implement business innovations, including award programs for MSMEs that successfully adopt digital technology. This can motivate MSME actors to innovate.
5. **Awareness Campaigns and Promotion:** Conduct awareness campaigns about the benefits and potential offered by Digital Technology 5.0, and promote the success of other MSMEs that have successfully implemented this technology. This can provide concrete examples and increase the interest of other MSME actors.
6. **Building Strategic Partnerships:** MSMEs are encouraged to establish partnerships with technology startups, universities, and research institutions to promote innovation. These partnerships can open access to new technologies and best practices in the application of digital technology.
7. **Monitoring and Evaluation:** The government should conduct monitoring and evaluation of the implementation of Digital Technology 5.0 among MSMEs to ensure that technology adoption is effective and to provide feedback that can be used for further improvement.
8. **Development of Supportive Policies:** The establishment of policies that support the digitalization of MSMEs, including regulations that simplify the registration and legalization process, is also crucial. These policies must be responsive to the challenges faced by MSMEs in adopting new technology.

   With the above measures, it is hoped that MSMEs in Pekalongan City can quickly adapt and leverage Digital Technology 5.0 to achieve sustainable economic transformation, which, in turn, can contribute to improving the welfare of the local community.

ADVANCED RESEARCH

Limitations of the Study

1. **Limited Sample Size:** This study involved only 100 SMEs in Pekalongan City, primarily from the batik and handicraft sectors. The relatively small sample size might affect the generalizability of the findings to other SMEs in Pekalongan or different sectors that might have distinct characteristics in adopting Digital Technology 5.0. Future research with a larger sample size and a wider range of sectors could enhance the validity of the findings.
2. **Lack of Qualitative Analysis:** This study utilized a quantitative approach, which may not fully capture the qualitative factors influencing technology adoption at the individual level among SME actors. The motivations, perceptions, and

barriers of SME owners in implementing Digital Technology 5.0 were not deeply explored. Hence, future research is suggested to use a qualitative or mixed-method approach to gain insights into the social and cultural contexts that affect technology adoption.

3. **Focus Limited to Digital Technology 5.0:** This study concentrated solely on the impact of Digital Technology 5.0 on sustainable economic transformation, without considering other factors such as government policies, business environments, or global market dynamics that could also influence the transformation of SMEs. This limitation should be addressed, and future research should include external variables to provide a more comprehensive overview.
4. **Geographical Limitation:** The study was conducted only in Pekalongan City, so the findings may not fully represent the condition of SMEs in other regions with different challenges and digital opportunities. Future studies should expand the geographical scope to observe the dynamics of Digital Technology 5.0 adoption in various cities and regions with distinct economic characteristics.
5. **Dependence on Secondary Data:** This study relied primarily on secondary data and surveys, which might not reflect real-time information on the development of Digital Technology 5.0 adoption in the field. More in-depth primary data, such as interviews or direct observations, are needed to better understand the adoption process of the technology.

Suggestions for Future Research

1. **Longitudinal Research:** Future studies are recommended to conduct longitudinal research to monitor the development of Digital Technology 5.0 adoption in SMEs over a more extended period. This approach would provide insights into how technology impacts the sustainable economic performance of SMEs over time and identify strategic changes made by SME actors to adapt and thrive.
2. **Exploration of Qualitative Approaches:** Future research should incorporate qualitative methods, such as in-depth interviews or focus group discussions (FGDs) with SME owners, to gain deeper insights into the perceptions, motivations, and psychological barriers that may hinder digital technology adoption. This approach will provide a more holistic understanding of the non-financial aspects of digital transformation.
3. **Incorporating Contextual Variables:** Future studies should consider additional contextual variables, such as government policies, digital infrastructure support, and local cultural characteristics that may influence the level of Digital Technology 5.0 adoption. Understanding these external factors is essential to comprehending how they impact the digital transformation process in SMEs.
4. **Comparative Studies Across Regions:** Conducting comparative studies in various cities and regions with different economic characteristics is recommended to observe variations in Digital Technology 5.0 adoption among SMEs. This comparison will offer a clearer picture of the factors influencing technology adoption in diverse social and economic contexts.
5. **Developing Models with Moderating Variables:** Future research can develop more complex models by including moderating variables such as government

support, technological infrastructure, or SME owners' education levels. Using moderating variables will help explain the more detailed relationships between Digital Technology 5.0, business innovation, and economic sustainability.

6. **Sector-Specific Case Studies:** Since the study results indicate that the batik and handicraft industries face unique challenges in adopting digital technology, future research could focus on sector-specific case studies. This approach will help identify the most effective technology adoption strategies tailored to the characteristics of each industry.
7. **Integration with AI and Big Data Technologies:** Future research can utilize artificial intelligence (AI) technologies and big data analytics to explore further trends in Digital Technology 5.0 adoption in the SME sector. This approach can provide more accurate and predictive information on how SMEs respond to technological changes in the future.

REFERENCES

Bianchi, C., Milner, T., & Davidson, A. (2021). (2021). Adopting Digital Transformation: The Role of Small and Medium-Sized Enterprises. *Technovation, 102*(1), 102139.

Chesbrough, H., & Bogers, M. (2018). Explicating Open Innovation: Clarifying an Emerging Paradigm for Understanding Innovation. *New Frontiers in Open Innovation*, *3*(1), 21-46.

Christensen, C. M. (2016). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. *Harvard Business Review Press.*

Elkington, J. (2018). Cannibals with Forks: The Triple Bottom Line of 21st Century Business. *Capstone Publishing*.

Frynas, J. G., Mellahi, K., & Pigman, G. A. (2020). First-Mover Advantages in Emerging Markets: Strategy, Evidence, and Impact. *Journal of International Business Studies, 42*(1), 1–25.

Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R. E. (2019). *Multivariate Data Analysis.* (Pearson (ed.); 8th Editio).

Kemenkop, K. K. dan U. (2023). D. U. I. 2023. J. (2023). *Data UMKM Indonesia 2023*.

Kock, N. (2020). *WarpPLS User Manual: Version 7.0*. ScriptWarp Systems.

Lee, S. M., & Trimi, S. (2021a). Innovation for Creating a Smart Future: IoT, AI, Blockchain, and Digital Platforms. *Journal of Innovation & Knowledge*, *6*(2), 124-135.

Lee, S. M., & Trimi, S. (2021b). Innovation for Creating a Smart Future: IoT, AI, Blockchain, and Digital Platforms. *Journal of Innovation & Knowledge, 6*(2), 124-135.

Linton, J. D., & Solomon, G. T. (2017). Technology, Innovation, Entrepreneurship, and the Small Business—Technology and Innovation in Small Business. *Journal of Small Business Management, 55*(2), 196-202.

Nambisan, S., Wright, M., & Feldman, M. (2021). The Digital Transformation of Innovation and Entrepreneurship: Progress, Challenges, and Key Themes. *Research Policy, 50*(7),), 104064.

OECD. (2022). *SMEs Going Digital: Policy challenges and recommendations*.

Omar, N., et al. (2020). Business Innovation in SMEs: Role of Digital Adoption. *Journal of Business Economics, 63*(3), 245-256.

Pekalongan, D. K. dan U. K. (2022). *Laporan Kinerja UMKM di Kota Pekalongan.*

Porter, M. E., & Kramer, M. R. (2011). Creating Shared Value. *Harvard Business Review, 1*(2), 62-77.

Schumpeter, J. A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Harvard University Press.

Sugiyono. (n.d.). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.

Tidd, J., & Bessant, J. (2021). *Managing Innovation: Integrating Technological, Market and Organizational Change.*

Wang, X. (2021). The Role of Digital Technologies in Economic Transformation: Evidence from SMEs in Emerging Economies. *Journal of Emerging Economies, 47*(3), 234-250.

Yun, J. J., Jeong, E. Y., & Lee, Y. (2020). The Role of Open Innovation in the Growth of Technology-Driven Firms. *Technological Forecasting and Social*.