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The Synergy of Artificial Intelligence and Digital Innovation Hubs in Driving Digital Innovation For MSMES

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Abstract *This study aims to explore the role of collaboration between artificial intelligence (AI) platforms and Digital Innovation Hubs (DIHs) in enhancing the digital transformation of SMEs. Digital transformation is the key to ensuring the sustainability and competitiveness of SMEs in the digital age, yet many face challenges in adopting advanced technologies. Collaboration between AI and DIHs can offer solutions to overcome these barriers. AI platforms provide automation and data analytics capabilities, while DIHs offer technical support, training, and innovation facilities to assist SMEs in implementing technology. This study uses a qualitative literature review methodology to identify and analyze previous research related to this topic. The findings suggest that this collaboration can enhance productivity, operational efficiency, and market access for SMEs. However, challenges such as resource limitations, resistance to change, and digital readiness of SMEs are critical factors to consider in its implementation. This research provides valuable insights for policymakers, academics, and practitioners in designing strategies to accelerate the digital transformation of SMEs through collaboration between AI and DIHs.*

Keywords : *Digital Transformation , SMEs , Artificial Intelligence (AI) , Digital Innovation Hubs (DIHs) , Technology Collaboration*

1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a vital role in the global economy, especially in terms of job creation and economic growth. However, amidst the rapid digital transformation, MSMEs often face challenges in adopting new technologies such as artificial intelligence (AI). Digital transformation, especially through the application of AI, promises greater efficiency, innovation, and competitiveness for MSMEs. However, the implementation of this technology is often hampered by limited resources, technical competence, and access to advanced technologies (Hansen & Bøgh, 2021; EU, 2022). In this context, collaboration between AI platforms and Digital Innovation Hubs (DIHs) can be a strategic solution to accelerate the digital transformation of MSMEs.

AI platforms act as a bridge between AI technology developers and end users, including MSMEs. These platforms provide services such as pre-trained machine learning models, AI APIs, and cloud infrastructure that enable the integration of AI technologies without requiring deep technical competencies (Villalonga et al., 2021). However, many MSMEs are still unable to fully exploit the potential of this technology due to a lack of information, skills, and support in implementation (EY, 2018; Bettoni et al., 2021). DIHs, on the other hand, serve as a supporting ecosystem that bridges MSMEs' technology needs with available solutions, providing training, consulting, and technology demonstrations (Hervas-Oliver et al., 2020).

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Collaboration between AI platforms and DIHs offers an integrative approach that can address these challenges. By combining the technological services offered by AI platforms and the ecosystem support provided by DIHs, MSMEs can gain easier access to technology, understand its potential benefits, and adopt solutions that suit their needs (Ejsmont et al., 2021). In addition, DIHs can play a key role in building trust and mitigating psychological barriers such as the "not-invented-here" syndrome that often hinders collaboration (Amann et al., 2022).

In digital transformation, MSMEs face various obstacles, including limited funds, lack of digital competencies, and difficulties in understanding new technologies such as AI (Albukhitan, 2020). In the European Union, for example, only 56% of MSMEs have achieved a basic level of digital intensity (EU, 2022). Another problem that often arises is the lack of human resources with AI expertise, which is considered a major barrier to the implementation of this technology (McKinsey, 2020).

In addition, strategic challenges also arise. Many MSMEs do not have a strategic plan for integrating new technologies. As a result, technologies are often adopted ad-hoc without adequate impact analysis or planning (Hansen & Bøgh, 2021). In this regard, support from DIHs and AI platforms can help MSMEs design effective and relevant digital strategies.

AI platforms offer a range of services designed to facilitate AI adoption in MSMEs. These services include cloud-based infrastructure, ready-to-use AI models, and application development tools that can be used without in-depth technical expertise (Villalonga et al., 2021). The concept of AI-as-a-Service (AIaaS) allows MSMEs to experiment with AI technologies without significant upfront investment (Elger & Shanaghy, 2020).

However, most of the existing AI platforms do not fully meet the needs of MSMEs in the manufacturing sector. Many of them focus more on providing development tools for data scientists and software developers, while MSMEs often require ready-to-use solutions that can be directly integrated into their operations (Pierleoni et al., 2020).

DIHs play a critical role in supporting MSMEs' digital transformation by providing access to technology, training, and implementation support. DIHs act as a bridge connecting technology to MSMEs' specific needs, helping them understand the opportunities offered by digital technologies (Hervas-Oliver et al., 2020). In the context of AI, DIHs can help MSMEs identify the most relevant applications, overcome adoption barriers, and build trust in the use of new technologies (Amann et al., 2022).

Although DIHs have great potential, they also face challenges. Many MSMEs are not aware of the existence of DIHs or do not understand their role in the digital innovation

ecosystem (Ejsmont et al., 2021). Therefore, efforts are needed to increase the visibility and effectiveness of DIHs through collaboration with AI platforms.

Collaboration between AI platforms and DIHs offers a comprehensive solution to support the digital transformation of MSMEs. AI platforms can provide the necessary technology and infrastructure, while DIHs can help MSMEs understand the technology and integrate it into their operations. In addition, this collaboration can help overcome organizational and cultural challenges that often hinder the adoption of new technologies (Amann et al., 2022; Hervas-Oliver et al., 2020).

Several studies have shown that such collaborations can increase the efficiency of technology adoption, expand the reach of DIHs' services, and create a more inclusive innovation ecosystem (Gladysz et al., 2023). DIHs can also leverage these collaborations to strengthen their internal competencies through training and partnerships with external experts (Hervas-Oliver et al., 2020).

Collaboration between AI platforms and DIHs is a strategic approach that can accelerate the digital transformation of MSMEs. By combining the technological power offered by AI platforms and the ecosystem support from DIHs, MSMEs can overcome the challenges of technology adoption, improve operational efficiency, and take advantage of the opportunities offered by the digital revolution. This study aims to explore the role of this collaboration in supporting the digital transformation of MSMEs, based on the analysis of relevant qualitative literature.

2. LITERATURE REVIEW

Digital transformation has become a strategic need for Micro, Small, and Medium Enterprises (MSMEs) to remain competitive in the digital era. However, the challenges of adopting advanced technologies such as Artificial Intelligence (AI) are still significant, especially for MSMEs that have limited resources. Collaboration between the AI Platform and Digital Innovation Hubs (DIHs) is considered a strategic approach to bridge this gap.

Digital transformation in MSMEs directly contributes to increased efficiency and competitiveness. Ghobakhloo and Ching's (2019) research found that the adoption of digital technologies, including IoT and AI, in MSMEs is greatly influenced by technological readiness and digital organizational culture. However, they also noted that limited technical knowledge is often a major barrier to such transformation.

Martínez-Caro et al. (2020) highlighted that digital organizational culture is a critical catalyst for ensuring the success of digital transformation. This is relevant for SMEs, which often face challenges in creating a culture that supports technological innovation.

AI offers great potential to improve operational efficiency and decision-making in MSMEs (Bettoni et al., 2021). However, limited technical and financial resources make it difficult for many MSMEs to adopt this technology (Hansen & Bøgh, 2021). Therefore, support from external entities such as DIHs is very important.

Hervas-Oliver et al. (2020) identified that DIHs can act as key facilitators in promoting technology adoption in MSMEs through knowledge transfer, training, and provision of accessible technology infrastructure.

Collaboration between AI Platform and DIHs presents a strategic solution to accelerate the digital transformation of MSMEs. Gladysz et al.'s (2023) research shows that DIHs play an important role in supporting AI adoption through service design that suits MSME needs. By integrating AI Platform into DIHs services, MSMEs can gain access to previously unreachable tools and solutions.

In addition, Hervas-Oliver et al. (2020) also revealed that DIHs have great potential to become a "digital bridge" that helps MSMEs overcome technical and economic barriers in adopting AI. In this context, collaboration with the AI Platform allows DIHs to provide AI-based solutions tailored to the specific needs of MSMEs.

Elger and Shanaghy (2020) assert that AI-as-a-Service (AIaaS) can provide greater flexibility for MSMEs in adopting AI without major investment in infrastructure. This supports the findings of Beckmann et al. (2016), which states that cloud-based platforms can be a major driver of digital transformation for MSMEs.

Another study by Fountaine et al. (2019) noted that organizations that successfully adopt AI typically have a strong collaborative ecosystem. DIHs, in this case, play a key role in creating such a collaborative ecosystem, particularly through the development of training programs and the provision of infrastructure.

This literature review shows that collaboration between AI Platform and DIHs is a strategic approach to accelerate the digital transformation of MSMEs. Through the integration of AI services supported by DIHs, MSMEs can overcome resource limitations and increase their competitiveness in the digital era.

3. METHODOLOGY

This study aims to analyze and review literature related to collaboration between AI Platforms and Digital Innovation Hubs (DIHs) in enhancing digital transformation in Micro, Small, and Medium Enterprises (MSMEs). To achieve this goal, a qualitative research approach with a literature review method is used as the main strategy in exploring, summarizing, and analyzing various relevant previous studies.

This study uses a qualitative approach with a literature review design to identify and evaluate key findings from previous studies relevant to the collaboration between AI platforms and DIHs and its impact on the digital transformation of MSMEs. This approach was chosen because it provides an in-depth understanding of the development of theory and practice in the field being studied, without the influence of variables or direct experiments (Snyder, 2019).

The literature sources used in this study consist of scientific journal articles, research reports, books, and publications from institutions that focus on digital technology, innovation, and MSMEs. The literature search was conducted through academic databases using keywords such as "AI in SMEs," "digital innovation hubs," "digital transformation," and "AI adoption in small businesses." The selected literature must be relevant and published within the last 5 to 10 years to ensure that the data obtained reflects the latest developments in this field (Torraco, 2016).

The inclusion criteria for studies included in this review include: a) Articles discussing the application of AI in MSMEs, b) Studies exploring the role of Digital Innovation Hubs (DIHs) in supporting technology adoption by MSMEs, c) Research covering the impact of AI and DIHs collaboration on MSMEs in the digital transformation sector, d) Articles published in internationally indexed journals or reports produced by leading research organizations.

The data collection process begins with a literature search using the academic databases mentioned earlier. After that, relevant articles will be selected based on inclusion and exclusion criteria. This process is carried out systematically to ensure that each study included in this review has relevance and significant contribution to the understanding of the collaboration between AI Platforms and DIHs in enhancing the digital transformation of MSMEs. Literature that meets the criteria will be read thoroughly to summarize key findings that can provide insight into the topic being studied.

Once the literature has been collected, the next step is to conduct a thematic analysis to identify key patterns in the adoption of AI in MSMEs and the role of DIHs in supporting this process. Thematic analysis involves coding texts, where each article is categorized into emerging themes, such as challenges to AI adoption by MSMEs, benefits of collaborating with

DIHs, and factors influencing the success of MSME digital transformation (Braun & Clarke, 2006). This analysis allows to organize the information found and provide a deeper understanding of the contribution of each element (AI Platform and DIHs) in accelerating the digital transformation process in MSMEs.

After conducting thematic analysis, conclusions will be drawn to describe the main results obtained from the reviewed literature. These conclusions will provide a clearer understanding of the importance of collaboration between AI Platforms and DIHs in enhancing the digital transformation of MSMEs. In addition, this study will provide recommendations for policies and practices that can be implemented to facilitate more effective collaboration in the future.

To ensure the validity and reliability of the study, the literature selection and analysis process was conducted with transparency and following strict methodological standards. All steps taken in this study will be explained in detail, so that readers can assess the objectivity and credibility of the results obtained (Booth et al., 2016).

4. RESEARCH RESULT

This study examines the collaboration between AI Platform and Digital Innovation Hubs (DIHs) in supporting digital transformation in Micro, Small, and Medium Enterprises (MSMEs) with a qualitative literature review perspective. Based on the analysis of various recent studies and literature, there are several key findings that illustrate the important role of these two elements in increasing the competitiveness and sustainability of MSMEs in the digital era.

1. The Role of AI Platforms in Digital Transformation of MSMEs

AI platforms have been shown to play a significant role in the digital transformation of MSMEs. Various studies have shown that MSMEs that adopt AI-based solutions, such as big data analytics, machine learning, and automation, can optimize their operations, improve decision-making, and respond to market changes faster (Zeng et al., 2021). AI platforms enable MSMEs to increase efficiency and reduce costs through the automation of routine tasks, such as inventory management, marketing, and customer service (Liu et al., 2020). Research by Binns and George (2022) shows that the integration of AI into MSME business models provides significant competitive advantages, especially in terms of personalizing customer service and improving user experience.

However, despite its great potential, AI adoption among MSMEs still faces various challenges, such as lack of technical knowledge, budget constraints, and uncertainty regarding

the results that can be obtained from this technology investment (Khan et al., 2023). Therefore, many MSMEs need additional support to harness the full potential of AI.

2. The Role of Digital Innovation Hubs (DIHs) in Supporting AI Adoption

Digital Innovation Hubs (DIHs) serve as a bridge between advanced technologies and business actors, especially MSMEs, who need guidance in adopting new digital technologies. DIHs provide a range of services including training, consulting, and access to technology resources needed to accelerate digital adoption. Research by Petrovic et al. (2021) shows that DIHs play an important role in facilitating collaboration between MSMEs and technology providers, as well as providing space for testing and implementing AI-based solutions that are tailored to the specific needs of MSMEs.

DIHs also help MSMEs overcome obstacles related to the lack of digital skills. For example, training initiatives and mentoring programs organized by DIHs can improve the digital capacity of MSMEs and help them integrate new technologies more effectively (Kraus et al., 2022). Furthermore, DIHs also play a role in introducing digital business models that can be adapted by MSMEs to increase their competitiveness in the global market (Todorova et al., 2021).

3. Collaboration between AI Platforms and DIHs in Improving Digital Transformation of MSMEs

Collaboration between AI Platforms and DIHs provides important synergies in supporting the digital transformation of MSMEs. For example, AI Platforms provide advanced technology solutions, while DIHs provide the training and mentoring needed to maximize the potential of the technology. Research by Ghosh and Laskar (2022) revealed that partnerships between AI platforms and DIHs can accelerate the digitalization process of MSMEs by providing access to advanced technology and practical support tailored to their needs.

A study by Wang et al. (2023) also showed that this collaboration creates an ecosystem that supports the growth of innovation in MSMEs, enabling them to adapt more quickly to technological changes and tap into the potential of the digital market. DIHs working with AI platforms can help MSMEs understand how to implement the technology in their business context, which in turn improves MSMEs' long-term performance and sustainability (Hossain & Quaddus, 2021).

However, this collaboration also has challenges, especially related to the diversity of MSME capacities. Some MSMEs may be more ready to adopt advanced technologies, while others may require more intensive support to get started. Therefore, research by Zhang et al.

(2023) emphasizes the importance of a tailored approach, which takes into account the needs and capabilities of each MSME.

4. Impact of Collaboration on MSME Performance

In terms of impact, various studies have shown that MSMEs involved in collaboration with DIHs and utilizing AI technology experience significant improvements in operational efficiency, cost reduction, and improved customer experience (Lee et al., 2021). On the other hand, this digital transformation also opens up opportunities for MSMEs to enter the global market in a more effective way, through e-commerce platforms and digital marketing driven by AI-based data analytics (Martínez & Lozano, 2020).

In addition, research by Zhang & Liu (2022) shows that MSMEs that utilize this collaboration are better able to adapt to global economic changes, innovate their products and services, and increase their competitiveness in an increasingly digitally connected market.

Based on the results of the literature analysis conducted, it can be concluded that the collaboration between the AI Platform and Digital Innovation Hubs (DIHs) has great potential in supporting the digital transformation of MSMEs. Although there are challenges in terms of technology adoption and integration, the synergy between the two can accelerate the digitalization process, increase operational efficiency, and open up wider market opportunities for MSMEs. Therefore, it is important to continue to support and expand MSME access to AI platforms and DIHs so that they can compete in the global digital market.

5. DISCUSSION

This study examines the collaboration between artificial intelligence (AI) platforms and Digital Innovation Hubs (DIHs) in supporting digital transformation in Micro, Small, and Medium Enterprises (MSMEs). Based on the results of the analyzed literature, there are important conclusions regarding how these two elements play a role in improving the performance and competitiveness of MSMEs in the digital era. The following discussion will discuss these findings, accompanied by comparisons from relevant previous studies.

1. The Role of AI Platforms in Improving MSME Operational Efficiency

AI platforms have been shown to improve the operational efficiency of MSMEs, enabling them to automate business processes, manage big data, and improve analytics-based decisions. Liu et al. (2020) highlighted how AI platforms can help MSMEs with the automation of processes such as inventory management, transaction processing, and customer service. Research by Binns and George (2022) also showed that the use of AI in digital marketing improves MSMEs' ability to reach a wider audience in a more efficient manner. Therefore, the

adoption of AI enables MSMEs to reduce operational costs and improve the quality of customer service.

However, on the other hand, research by Khan et al. (2023) revealed that MSMEs face obstacles in adopting AI, especially related to limited technical knowledge and limited resources. This is in accordance with the findings of research by Kraus et al. (2022) which states that many MSMEs do not yet have the ability to implement AI technology optimally due to a lack of understanding of the technology.

2. The Role of Digital Innovation Hubs (DIHs) in Supporting Digital Transformation of MSMEs

Digital Innovation Hubs (DIHs) act as facilitators that assist MSMEs in adopting and implementing advanced digital technologies. According to Petrovic et al. (2021), DIHs provide various services that are much needed by MSMEs, such as training, consulting, and access to the right technology resources. For example, DIHs can provide a space for MSMEs to test and implement AI solutions in their business context. In addition, DIHs also play an important role in providing support to overcome barriers to digital technology adoption, such as the lack of digital skills found in most MSMEs (Todorova et al., 2021).

In fact, a study by Ghosh and Laskar (2022) shows that DIHs have the ability to create an innovation ecosystem that supports MSMEs. Through collaboration with various parties, including technology providers, universities, and research institutions, DIHs can create networks that support the development and implementation of new technologies in MSMEs. This is very relevant to the findings of research by Wang et al. (2023) which states that DIHs can accelerate the digital transformation process in MSMEs by providing access to technology and trained human resources.

3. Collaboration between AI Platform and DIHs in Accelerating Digital Transformation of MSMEs

Collaboration between AI platforms and DIHs shows strong synergy in increasing technology adoption among MSMEs. Research by Hossain and Quaddus (2021) explains that this collaboration creates an ecosystem that connects technological innovation with practical applications that suit the needs of MSMEs. Through this partnership, MSMEs gain access to advanced technologies and the practical support needed to utilize these technologies in their business operations. This is in line with the findings of Zhang and Liu (2022), who emphasized that collaboration between AI and DIHs helps MSMEs to overcome the technology gap and increase their competitiveness.

Furthermore, research by Martínez and Lozano (2020) highlights that this partnership provides a major competitive advantage for MSMEs, especially in terms of increasing service personalization and expanding market reach. This is because AI enables deeper data analysis, which helps MSMEs understand customer preferences and design more targeted products or services. This collaboration also accelerates the adoption of technology, which is essential for MSMEs to compete in the ever-growing global digital market.

However, despite the many benefits, research by Zhang et al. (2023) shows that not all MSMEs can effectively utilize this collaboration. Some MSMEs may face obstacles in accessing the necessary resources, both in terms of costs and technical capabilities. This is compounded by the diversity in the capacities of existing MSMEs, where some MSMEs are more ready to adopt advanced technologies while others require a more structured and needs-based approach.

4. Challenges in Collaboration and Implementation of AI Technology in MSMEs

Although the collaboration between AI and DIHs offers great potential, there are some challenges in its implementation. Research by Zeng et al. (2021) shows that most MSMEs face difficulties in obtaining the resources needed to implement new technologies. In addition, another obstacle is resistance to change, which often occurs among MSME entrepreneurs who are more conservative in adopting new technologies.

This obstacle is also explained by Ghosh and Laskar (2022), who stated that there is a large gap in understanding between technology providers and beneficiaries (MSMEs). This causes a mismatch between the technology offered and the actual needs faced by MSMEs. Therefore, it is important for DIHs and technology providers to make deeper adjustments and mapping of MSME needs so that the collaboration can be more effective.

5. Impact of Collaboration on MSME Performance

Based on the existing findings, the collaboration between AI platforms and DIHs has a significant positive impact on MSME performance. Research by Lee et al. (2021) shows that MSMEs involved in this collaboration experienced improvements in operational efficiency and the ability to respond to market changes more quickly. With the support of DIHs and AI solutions, MSMEs can reduce operational costs and improve customer experience, which in turn improves their competitiveness in the market.

In fact, according to research by Petrovic et al. (2021), this collaboration also allows MSMEs to take advantage of global market opportunities through digital platforms and e-commerce, driven by AI-based analytics. This is very important, considering that many

MSMEs that previously only operated in local markets now have the opportunity to grow internationally.

Based on the discussion results, it can be concluded that collaboration between AI platforms and Digital Innovation Hubs (DIHs) can have a significant positive impact on the digital transformation of MSMEs. Although there are challenges in the adoption and implementation of technology, the synergy between the two opens up great opportunities to improve the efficiency, competitiveness, and sustainability of MSMEs. Therefore, it is important for the government and related institutions to continue to provide support to MSMEs in the form of training, access to technology, and financing to accelerate their digital transformation.

6. CONCLUSION

Based on the results of qualitative literature review research on Collaboration of AI Platforms and Digital Innovation Hubs to Improve Digital Transformation of MSMEs, it can be concluded that collaboration between artificial intelligence (AI) platforms and Digital Innovation Hubs (DIHs) has great potential in accelerating digital transformation of MSMEs. AI platforms provide operational efficiency solutions that can improve productivity and competitiveness of MSMEs through process automation, data analysis, and personalization of customer service. On the other hand, DIHs act as facilitators that provide technical support, training, and resources needed for the implementation of digital technology.

Collaboration between AI and DIHs offers a mutually beneficial synergy, where DIHs help MSMEs overcome challenges in implementing advanced technologies such as AI. Through DIHs support, MSMEs can take advantage of new technologies without being hampered by limited resources or technical knowledge. In many cases, this collaboration also allows MSMEs to reach a wider market, both nationally and internationally, through the use of e-commerce and digital platforms.

However, despite the great benefits, there are a number of challenges in implementing this technology among MSMEs, such as limited access to technology, high implementation costs, and resistance to change in some MSMEs. In addition, differences in the capacity and digital readiness of MSMEs are factors that need to be considered to ensure the success of implementing this collaboration.

Overall, the collaboration between AI platforms and DIHs can have a positive impact on MSMEs, especially in terms of increasing their competitiveness and business sustainability in the growing digital market.

7. LIMITATION

Several limitations were found in this qualitative literature review study, including: Literature Limitations: Although many studies have discussed technology adoption among MSMEs, literature that specifically discusses collaboration between AI platforms and DIHs in the context of MSMEs is still limited. Some studies focus more on AI adoption or the role of DIHs separately, so the direct relationship between the two in improving MSME digital transformation has not been widely discussed.

Geographical Limitations: Most of the studies analyzed in this review come from European and Asian contexts, focusing on more technologically advanced countries. This limits understanding of the challenges and successes of AI and DIHs adoption in developing country MSMEs, where infrastructure and levels of technological readiness may differ.

Methodological Limitations: This study relies on sources available in the literature, which do not always include first-hand experience or more in-depth case studies. Therefore, there may be bias in the selection of literature used, and the results may not fully reflect the situation on the ground.

Variation in MSME Size: MSMEs encompass a wide range of business types and sizes, with widely varying needs and resources. This study did not differentiate between different types of MSMEs, so some findings may not be fully relevant to all types of MSMEs.

Rapid Technological Change: Digital technologies, especially AI, are evolving rapidly. Some of the research used in this review may not fully reflect the latest technologies or current approaches to the use of AI and DIHs.

Thus, for further research, more in-depth studies involving field research, data collection from MSMEs with varying levels of digital readiness, and a more focused approach on developing countries are needed to understand more specific challenges and opportunities in that context.

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