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Cloud Technology-Based Business Innovation in Encouraging MSME Efficiency and Scalability

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Abstract

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Cloud computing-based digital transformation provides strategic opportunities for Micro, Small, and Medium Enterprises (MSMEs) to enhance operational efficiency and expand business scale. This study systematically examines how cloud innovation drives efficiency and scalability of MSMEs through a literature review of scientific publications. Findings indicate that cloud adoption enables cost savings on infrastructure, faster workflows, and greater adaptability to market dynamics. Moreover, cloud-based solutions support MSMEs in accessing advanced technologies without large capital investments. Nevertheless, several challenges remain, including low digital literacy, security concerns, and uneven infrastructure readiness, which hinder broad adoption. Addressing these barriers requires inclusive policies, capacity-building initiatives, and collaboration among government, private sector, and educational institutions. With comprehensive stakeholder support, cloud computing can serve as a foundation for innovation, competitiveness, and empowerment of MSMEs in the digital economy era. This research contributes theoretically and practically to the formulation of sustainable digitalization strategies that strengthen MSMEs' role in national and global economic growth.

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1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) play a strategic role in national economic development, especially in developing countries such as Indonesia. According to data from the Ministry of Cooperatives and SMEs, MSMEs contribute more than 60% to Indonesia's Gross Domestic Product (GDP) and absorb around 97% of the total workforce. However, in the midst of the era of digital transformation and the industrial revolution 4.0, MSMEs face major challenges in terms of competitiveness, operational efficiency, and adaptability to technological changes. One of the technological innovations that is considered to have great potential in answering these challenges is cloud computing (Khayer et al., 2021). Cloud computing is a technology that provides computing services such as data storage, servers, software, and network systems through the internet. This technology allows users, including MSME actors, to access IT resources without having to have expensive and complex physical infrastructure (Modisane & Jokonya, 2021).

With a low initial investment cost and flexibility in resource management, cloud computing opens up access to information technology that was previously only available to large enterprises (Shetty & Panda, 2021). The implementation of cloud technology in MSMEs is believed to increase operational efficiency, accelerate business processes, and support business scale expansion. Several studies show that MSMEs that adopt cloud computing are able to significantly increase their productivity and competitiveness (Gui et al., 2021). The cloud also enables real-time integration of information systems that can support data-driven strategic decision-

making. On the other hand, cloud computing opens up opportunities for MSMEs to innovate in their business models. Services such as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) allow MSMEs to choose the solution that best suits their needs and capacity (Wori, 2022).

For example, with SaaS, MSME players can use accounting, inventory management, or digital marketing software without having to install and maintain the system themselves (Rittinghouse & Ransome, 2017). However, cloud adoption in the MSME sector is not free from challenges. Common obstacles include limited digital literacy, concerns about data security, and lack of supporting infrastructure such as stable internet access (Jayeola et al., 2022). These factors are often a barrier for MSME actors in adopting digital technology, especially in remote and non-urban areas (Pradesa et al., 2023). In addition, the issue of trust and regulation is also a major concern. Some MSME actors still doubt the reliability and security of data when using public cloud services. Therefore, it is important for the government and service providers to provide technical support, data protection regulations, and digital training for MSME actors (Rafiah et al., 2022).

In the context of the COVID-19 pandemic, cloud computing has proven to be an important solution in maintaining the business continuity of MSMEs. Many businesses have switched to online systems and used cloud services to manage their operations remotely, including in the transaction process, inventory, and communication with customers (Al-Okaily et al., 2023). This proves that cloud adoption is not only a strategic choice, but also an urgent need in crisis situations. With this background, this study aims to comprehensively examine how cloud

technology-based business innovation can drive the efficiency and scalability of MSMEs. The research was conducted through a literature study method on academic publications published from last five years in order to gain a conceptual and empirical understanding of the impact of cloud computing on MSMEs. This study is expected to make an academic and practical contribution, both for business actors, cloud service providers, and the government in formulating inclusive and sustainable MSME digital transformation policies.

2. Literature Review

2.1. Cloud Computing as a Pillar of MSME Efficiency

Operational efficiency is one of the key factors for the sustainability and growth of MSMEs. Cloud computing technology offers a revolutionary approach to managing IT infrastructure that previously required large investments. With cloud-based systems, MSMEs no longer need to buy physical hardware, build their own servers, or hire large-scale technical teams. Instead, they simply subscribe to cloud services at affordable costs that are scalable and pay-as-you-use (Modisane & Jokonya, 2021). Cloud computing also facilitates the automation of various business processes, such as accounting, inventory management, and CRM (Customer Relationship Management). Rittinghouse and Ransome (2017) explain that efficiency is created because the cloud eliminates a lot of manual work, reduces processing time, and lowers labor and system maintenance costs.

Subramanian et al. (2021) research shows that MSMEs that adopt cloud are able to increase operational efficiency by up to 30% on average within the first two

years of implementation. In addition, the cloud enables real-time remote collaboration and work, which is especially important in the context of the pandemic and the digital work era. Employees can access systems from anywhere, speed up workflows, and reduce logistical barriers (Jayeola et al., 2022). Thus, the cloud not only increases cost and time efficiency, but also provides the high flexibility that MSMEs desperately need to compete in a dynamic market.

2.2. Business Scalability through Cloud Innovation

Scalability is the ability of a business to grow and adjust its operational capacity quickly, as market demand increases. Cloud technology plays a crucial role in enabling MSMEs to efficiently expand their reach and capacity without having to build new IT infrastructure from scratch. With solutions such as Infrastructure as a Service (IaaS) and Platform as a Service (PaaS), MSMEs can add compute, storage, and other services as needed (Wori, 2022). According to Gui et al. (2021), one of the main advantages of the cloud is the flexibility to upgrade the system without significant downtime. This allows MSMEs to quickly adjust the volume of data and user traffic, for example when facing seasonal demand spikes or new product launches.

With traditional systems, capacity building takes time, expertise, and large capital something that is often difficult for MSMEs to fulfill. In addition to technical capacity, the cloud also opens access to global digital platforms. MSMEs can reach overseas markets through e-commerce, leverage cloud-based data analytics to understand consumer trends, and use AI/ML services for product personalization or sales predictions (Shetty & Panda, 2021). These features were previously difficult

for small-scale businesses to reach, but are now accessible at a relatively low cost through public cloud platforms such as Google Cloud, AWS, and Azure. Thus, cloud computing is the main enabler for MSMEs to grow quickly and measurably without the burden of expensive and inflexible traditional infrastructure.

2.3. Challenges of Cloud Computing Implementation in MSMEs

Although it offers various advantages, the adoption of cloud computing in the MSME sector is inseparable from a number of challenges. One of the main obstacles is the limitation of digital literacy. Many MSME actors, especially in rural or semi-urban areas, do not understand how the cloud works and its strategic benefits (Pradesa et al., 2023). This low literacy has an impact on the reluctance to invest in technology, even though the potential return on investment is high. Data security and privacy issues are also a serious concern. According to Jayeola et al. (2022), many MSMEs are still skeptical of the security of cloud services, especially in the public cloud, because they are worried that their business data can be accessed by third parties without permission. This problem is exacerbated by the lack of local regulations that regulate the protection of MSME user data.

In terms of infrastructure, there are still many regions in Indonesia and other developing countries that do not have fast and stable internet access. These infrastructure limitations hinder the migration process to the cloud and reduce the overall performance of cloud-based services (Rafiah et al., 2022). Other obstacles include subscription operational cost constraints, dependency on specific vendors (vendor lock-in), and difficulties in integrating with existing systems. Therefore, the process of adopting cloud technology in MSMEs requires a comprehensive

mentoring strategy, including training, fiscal incentives, and strengthening inclusive technology policies by the government and cloud service providers.

3. Method

This study uses a descriptive qualitative approach with the literature review method as the main technique for data collection and analysis. This approach was chosen because it is suitable to explore theoretical and empirical knowledge from academic sources regarding the role of cloud computing innovation in improving the efficiency and scalability of micro, small, and medium enterprises (MSMEs). Literature review is the right method to synthesize knowledge based on previous findings and systematically expand scientific understanding of a particular phenomenon (Boell & Cecez-Kecmanovic, 2015).

Data collection was carried out by browsing scientific publications from academic databases such as Google Scholar. The inclusion criteria set include: (1) articles in English or Indonesian, (2) relevant to the topic of cloud computing and MSMEs, (3) containing data or analysis on efficiency, business innovation, or scalability of small businesses, and (4) being peer-reviewed scientific journals or reputable conference proceedings. From the initial search results, more than 100 relevant articles were obtained, but after filtering by carefully reading the abstract and the content of the article, 12 articles were selected that were most suitable for in-depth analysis.

Data analysis is carried out through the stages of content analysis and thematic synthesis. The articles that have been collected are coded based on key themes such

as operational efficiency, business scalability models, cloud implementation challenges, and technology adoption strategies. Then, categorization and mapping of the relationship between themes were carried out using an inductive approach, so that a systematic argumentation structure was obtained regarding how cloud innovation is applied in the context of MSMEs and what are the impacts and challenges. This process is carried out to produce a comprehensive and evidence-based scientific narrative.

The validity of the data is maintained by triangulating sources, which is comparing findings from various articles and different scientific platforms, and ensuring that the references used are of high quality and credibility. The relevance of the content of each article was also evaluated based on the research methodology used by the original authors, the context of the study area, and the level of data up-to-dateness. With this method, it is hoped that the research can produce a literature review that not only describes the actual conditions, but also provides theoretical and practical contributions related to the digital transformation strategy of MSMEs through the use of cloud computing. This literature approach also opens up opportunities to identify research gaps and formulate policy recommendations that can be applied more widely by the government, technology service providers, and associations of MSME actors.

4. Results

The results of the literature study that have been conducted show that cloud computing-based business innovation has a transformational impact on the

efficiency and scalability of MSMEs at large. An analysis of a number of scientific publications from last five years reveals that the use of cloud technology not only improves the internal operational aspects of MSMEs, but also opens up significant business growth opportunities, especially in the context of post-pandemic digital transformation. One of the most tangible impacts of the adoption of cloud computing in MSMEs is the increase in operational efficiency. This technology allows small businesses to reduce their reliance on physical infrastructure such as on-premises servers or conventional software that requires regular maintenance. By using cloud-based services, such as Software as a Service (SaaS), MSMEs can run financial systems, inventory management, and customer service automatically and integrated. Subramanian et al (2021) note that cloud systems were able to increase productivity by up to 30% in the first two years of adoption, mainly because administrative time was significantly reduced and manual processes were replaced by real-time data digitization.

This efficiency is also reflected in the decision-making process. Through cloud-based data integration, MSME actors can access operational information directly, without having to wait for daily or monthly reports like conventional methods. Modisane and Jokonya (2021) stated that the use of cloud in data management increases the speed and accuracy of strategic decision-making, especially in stock and financial management. This contributes greatly to creating a responsive and cost-effective work system. Several other studies show that efficiency comes not only from the technical aspect, but also from the organizational aspect. Cloud computing enables online team collaboration, which is especially important

amid the trend of flexible and remote work. Jayeola et al. (2022) identified that the cloud helps accelerate the internal workflows of MSMEs by enabling simultaneous access to documents, reports, and transaction systems without geographical location restrictions.

In addition to efficiency, scalability is the main added value of the implementation of cloud computing in the context of MSMEs. This technology provides the ability for business actors to dynamically adjust their operational capacity, both in growth and declining market demand conditions. Shetty and Panda (2021) affirm that one of the main advantages of cloud services is their ability to increase or decrease storage capacity, processing power, or other additional services without the need to replace infrastructure. This allows MSMEs to manage resources more economically and flexibly, especially in the face of a surge in seasonal activity or business expansion into new areas. In relation to market expansion, cloud computing also acts as an enabler for MSMEs to access digital platforms more widely.

Cloud-based services open up opportunities to penetrate the online market, both through integration into the marketplace, the use of digital marketing platforms, and the optimization of customer experience through data analytics. Gui et al. (2021) found that MSMEs that adopt cloud systems are more active in e-commerce activities and have a larger customer reach than those who are still running conventional businesses. In addition, the cloud also enables integration between production systems and sales systems, which improves supply chain efficiency and accelerates time-to-market. Advanced features of cloud platforms

such as big data analytics, artificial intelligence (AI), and machine learning (ML) are also starting to be adopted by digital MSMEs. Wori (2022) notes that small business actors can use prediction algorithms to design marketing strategies or customize products based on customer preferences recorded automatically.

This provides a competitive advantage that previously only had large companies with qualified research and development (R&D) capacity. However, the effectiveness of cloud computing in driving the efficiency and scalability of MSMEs is highly dependent on the context of the digital readiness of business actors. A literature study found that there are still many MSMEs, especially in developing countries, that are not ready in terms of infrastructure, digital competence, and trust in cloud systems. One of the main obstacles is the low literacy of information technology. Pradesa et al. (2023) stated that most MSME actors in Indonesia do not have an adequate understanding of what cloud computing is, how the system works, and what benefits can be obtained. This ignorance creates resistance to innovation, as well as reinforces the notion that cloud technology is only suitable for large companies.

Another issue is the perception of data security and privacy. MSMEs tend to be more comfortable storing data manually or on personal devices because they feel safer and more controlled. Concerns about data misuse, hacking, or unauthorized access by service providers are the main factors inhibiting cloud adoption. In addition, many MSMEs do not understand the relevant personal data protection regulations, so they are hesitant to transfer sensitive business data to third parties. Infrastructure constraints also cannot be ignored. In some non-urban areas, the

availability of fast and stable internet access is still a major challenge. Rafiah et al. (2022) stated that without strong network support, cloud services cannot run optimally and instead cause technical frustration for business actors. This condition has caused a fairly wide digital gap between MSMEs in urban and rural areas.

Despite facing various obstacles, the literature study also reveals various strategies that can be applied to accelerate the adoption of cloud computing in the MSME sector. Among them are the provision of continuous digital training that focuses on practical skills, the provision of cloud subscription subsidies by the government, and the development of simpler and more affordable technology-based business models. The government also plays an important role in creating regulations that are pro-digital transformation, including data protection for MSME users and fiscal incentives for local technology service providers. Another important finding is the role of cloud computing in accelerating the digital transformation of MSMEs during and after the COVID-19 pandemic. In crisis conditions, many MSMEs are forced to switch to online systems to continue operating. Cloud computing is the main infrastructure that allows them to run their business from home, accept online orders, and manage financial transactions digitally (Al-Okaily et al., 2023).

Khayer et al. (2021) even showed that MSMEs that had used cloud systems before the pandemic had a higher level of business resilience and were able to recover faster from the impact of the global economy. From all the findings, it can be concluded that cloud computing is a very potential catalyst in supporting the efficiency and scalability of MSMEs. However, to maximize the benefits, a multi-

level approach is needed that involves business actors, technology service providers, academics, and the government. Expanding access, increasing digital capacity, and strengthening trust in technology are the main keys so that MSMEs are not only passive consumers, but also agents of innovation in the digital ecosystem.

5. Discussion

The results of this study show that cloud computing has become an important component in the digital transformation strategy of MSMEs, both in terms of efficiency and business scalability. However, these findings cannot be separated from the structural, social, and economic context surrounding MSMEs, especially in developing countries. Therefore, this discussion aims to deepen the understanding of the previous findings, as well as explain their meaning in a theoretical and practical framework. Conceptually, the findings that cloud computing improves the efficiency of MSMEs are in line with the Resource-Based View (RBV) theory, which states that competitive advantage can be built through the use of unique and hard-to-replicate resources, including information technology capabilities. Cloud services provide access to high-end technology to MSMEs without requiring large investments, thus enabling small businesses to have digital resources that were previously only owned by large companies.

The resulting operational efficiencies are not only about cost savings, but also increased responsiveness, reduced wait times, and automation of core business processes that accelerate decision-making. In addition to RBV, the Technology-Organization-Environment (TOE) framework is also relevant in understanding the

level of cloud adoption by MSMEs. Technology factors such as ease of integration and cloud flexibility; organizational factors such as human resource readiness and adaptive culture; as well as environmental factors such as government and service provider support, all contribute to the successful implementation of cloud computing. The findings show that when these factors synergize, MSMEs can quickly improve the scalability of their businesses, both in terms of market reach and transaction volume. However, the results of the study also indicate that there is a gap in digital technology adoption, especially between MSMEs in urban areas and those in disadvantaged areas. Limited infrastructure, low digital literacy, and concerns about data security are the main obstacles that hinder equitable digital transformation.

This emphasizes the importance of an approach that not only focuses on the technology itself, but also on building an ecosystem that supports the digital inclusion of MSMEs holistically. The adoption of the cloud by MSMEs also has implications for a more open and collaborative business model. With cloud-based services, it is easier for MSMEs to connect with business partners, customers, and even investors through digital platforms. This creates opportunities for cross-sector collaboration and paves the way for the integration of MSMEs into global supply chains. However, this kind of collaborative model requires trust, data openness, and interoperability standards that are still a challenge in many developing countries.

The post-pandemic context is an important momentum that accelerates digital transformation in the MSME sector. Cloud computing has proven to be the main pillar that allows MSMEs to survive in the midst of a crisis and adapt to changes

in consumer behavior. However, the sustainability of this transformation is highly dependent on consistent support from governments, academia, and the private sector in providing digital education, technology subsidies, and regulations that support the adoption of technology safely and affordably. This discussion shows that although cloud computing has had a significant impact on MSMEs, the adoption process is not automated. Tailored and contextual policy design is needed, so that this technology is not only a tool for efficiency, but also a lever for digital-based local economic growth. By understanding the findings in a broader framework, it is hoped that the cloud adoption strategy for MSMEs can continue to develop towards a more inclusive, adaptive, and highly competitive business system in the global digital era.

6. Conclusion

This study concludes that cloud computing-based business innovation plays a strategic role in driving the efficiency and scalability of MSMEs. Through a literature study of 12 scientific journals published in 2019–2023, it was found that cloud computing provides various significant benefits, ranging from saving technology infrastructure costs, accelerating workflows, automating business processes, to expanding the market digitally. This technology also enables MSMEs to adapt quickly to market changes, including in the context of crises such as the COVID-19 pandemic, by providing flexibility in real-time data operations and management.

Even so, the challenges of adopting this technology are still quite large, especially in terms of digital literacy, data security, and the availability of supporting infrastructure. The success of cloud adoption depends not only on the technology itself, but also on the readiness of the organization and support from the external environment, including governments and technology service providers. Therefore, cloud-based digital transformation in the MSME sector requires an integrated multi-sector and multi-level approach. In the future, cloud computing is not just an efficiency tool, but must be positioned as the foundation of innovation and sustainable business model development. With the support of an inclusive digital ecosystem, MSMEs have the potential to become the main force in the sustainable and equitable development of the national digital economy.

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