

Analysis of The Effectiveness of Cloud-Based Operations Management in Digital SMES

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Abstract: The rapid development of digital technology has encouraged Micro Small and Medium Enterprises (MSMEs) to adopt cloud-based operational management systems. This study aims to analyze the effectiveness of cloud technology implementation in supporting the operational activities of digital-based MSMEs, especially in the aspects of work efficiency, decision making, and adaptation to market changes. The method used is a qualitative approach with case studies on several MSMEs that have implemented cloud systems in the operational management. Data were collected through in-depth interviews, direct observation, and documentation of operational activities. The results show that the use of cloud-based systems has a positive impact on increasing operational efficiency, data transparency, and flexibility in resource management. In addition, MSMEs that utilize this technology tend to be more adaptive to market dynamics and faster in responding to customer needs. However, there are also some challenges, such as limited digital literacy and dependence on a stable internet connection. In conclusion, cloud-based operational management is an effective solution for digital-based MSMEs, although a sustainable mentoring and training strategy is needed for optimal and sustainable implementation.

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Introduction

In the era of rapid technological advancement, cloud computing has emerged as a transformative force, particularly for small and medium-sized enterprises (SMEs). The flexibility, scalability, and cost-efficiency of cloud-based solutions have provided digital SMEs with unprecedented opportunities to streamline operations, enhance productivity, and respond more agilely to market demands. Cloud-based operations management enables businesses to monitor workflows, manage resources, and coordinate activities in real time, offering a competitive advantage in a highly dynamic digital landscape.

Despite these advantages, the adoption of cloud technologies is not without challenges. Digital SMEs often face significant barriers such as limited IT infrastructure, cybersecurity risks, lack of skilled personnel, and high initial implementation costs. Additionally, the integration of cloud systems with existing legacy operations can be complex and time-consuming. These challenges can hinder the effectiveness of cloud-based operations management and limit its overall impact on business performance.

Looking ahead, the successful implementation of cloud solutions in SMEs requires strategic planning, ongoing employee training, and the establishment of strong data governance practices. While cloud computing holds considerable potential, its effectiveness varies significantly depending on organizational readiness, sector-specific demands, and the chosen cloud architecture.

However, despite the growing adoption of cloud-based solutions, limited research has been conducted on evaluating their effectiveness specifically within the context of digital SMEs. Most existing studies focus on large enterprises or generic technological benefits, leaving a research gap in understanding how cloud operations impact SMEs' performance metrics, decision-making processes, and adaptability.

Therefore, this study aims to analyze the effectiveness of cloud-based operations management in digital SMEs, with a focus on identifying key success factors, potential drawbacks, and practical implications for digital business transformation.

Cloud-based operation management systems are progressively becoming indispensable tools for Small and Medium Enterprises aiming to thrive in the digital economy, providing a scalable and cost-effective alternative to traditional on-premise solutions (Thakurta, R., & Mohapatra, 2018). These systems offer a centralized platform for managing various business functions, including customer relationship management, supply chain management, and financial operations, leading to enhanced efficiency and better decision-making (Siregar, R., & Sudarmanto, 2023a). The adoption of cloud-based solutions enables SMEs to streamline their processes, reduce operational costs, and improve their overall competitiveness by providing access to real-time data and analytics, thereby fostering more informed strategic decisions. Moreover, the flexibility and scalability of cloud-based systems allow SMEs to adapt quickly to changing market conditions and customer demands, which is critical for sustainable growth (Okeke, 2024). Furthermore, cloud-based operation management systems facilitate better collaboration and communication among employees, regardless of their location, promoting a more agile and responsive organizational structure. In essence, cloud-based solutions are not just about cost savings; they represent a fundamental shift in how SMEs can operate and compete in an increasingly digital world (Omokhoa et al., 2024).

Analyzing the effectiveness of cloud-based operation management requires a comprehensive understanding of its impact on various aspects of SME operations, ranging from technological readiness to organizational structure and environmental factors. The decision to adopt cloud-based Enterprise Resource Planning systems, for instance, is influenced by factors such as relative advantage, top management support, technology readiness, competitive pressure, and trading partner pressure (Bhatti, 2017). This suggests that SMEs must carefully evaluate their internal capabilities and external environment before embarking on cloud adoption to ensure a successful implementation. Furthermore, the role of service providers and internal top management support cannot be overstated, as they collectively contribute to building a conducive environment for cloud ERP adoption by clarifying ambiguities and fostering confidence in the technology (J et al., 2023). Therefore, understanding the reasons behind adoption and non-adoption is crucial for enhancing strategies related to cloud ERP. (AL-Shboul, 2018; Zamzeer et al., 2020). In addition to these factors, the integration of Artificial Intelligence into cloud-based platforms is further revolutionizing SME operations by offering tools for real-time data insights and predictive analytics, which can lead to more efficient inventory management, improved customer service, and better-targeted marketing campaigns (Ahmad & Lucas, 2024). Cloud-based operation management systems also enhance productivity and improve service quality by automating routine tasks and providing predictive maintenance, thereby freeing up human resources for more strategic and creative endeavors (Iyelolu et al., 2024).

The implementation of cloud-based operation management systems presents unique challenges and opportunities for SMEs, particularly regarding data management, security, and compliance with regulatory requirements. While cloud solutions offer scalability and cost-effectiveness, SMEs must address concerns related to data privacy, security breaches, and vendor lock-in to fully realize the benefits. It is crucial for SMEs to implement robust security measures, such as encryption, access controls, and regular security audits, to protect sensitive data stored in the cloud. Furthermore, SMEs should carefully evaluate the service level

agreements offered by cloud providers to ensure that they meet their specific needs and requirements. Overcoming these challenges requires a multi-faceted approach that includes investing in employee training, establishing clear data governance policies, and carefully selecting cloud providers with a proven track record of security and reliability. Additionally, fostering an environment that embraces change and innovation is essential for successful adoption, as resistance to change is a common barrier in many organizations (Okeke et al., 2024). The initial investment required to develop, purchase, and integrate AI systems can be prohibitive (Iyelolu et al., 2024). However, the potential of AI to boost productivity and reduce operational costs in the long term often outweighs the initial financial burden. The automation of tasks through AI presents another obstacle, with concerns about job displacement and the need for workforce retraining. (Oluwafisayo, 2024).

Looking ahead, the future of cloud-based operation management for digital-based SMEs is poised for continued growth and innovation, driven by advancements in Artificial Intelligence, machine learning, and edge computing. These emerging technologies are enabling SMEs to unlock new levels of efficiency, automation, and personalization, further enhancing their competitiveness in the digital marketplace. The integration of AI into cloud platforms allows SMEs to automate tasks, optimize processes, and gain real-time insights into their operations, leading to better decision-making and improved business outcomes (Drydakis, 2022). Moreover, the rise of edge computing is enabling SMEs to process data closer to the source, reducing latency and improving the performance of cloud-based applications, particularly in areas such as Internet of Things and real-time analytics. Cloud computing helps in reducing the cost of operations, as cloud service providers offer pay-as-you-go services that eliminate the need for investment in hardware and software. As AI technologies improve, they will become more adept at understanding context and nuances in human communication, leading to more natural and effective interactions (Iyelolu., 2024). In addition, organizations should focus on training, recruiting, and retaining employees with AI technology expertise (Lu et al., 2022). SMEs that embrace these technological advancements and invest in developing the necessary skills and infrastructure will be well-positioned to thrive in the increasingly digital and data-driven economy (Drydakis, 2022).

Research Method

This study employs a qualitative case study approach to explore the effectiveness of cloud-based operations management in digital SMEs. The qualitative design allows for an in-depth understanding of organizational practices, challenges, and perceptions related to cloud adoption and usage.

Case Selection and Sampling Strategy The research involved five digital SMEs located in Jakarta and Bandung, Indonesia, selected using purposive sampling. The selection criteria included: (1) active use of cloud-based systems for at least one year, (2) digital-native or digitally-transformed SMEs, and (3) willingness to participate in in-depth interviews. These cases represent various sectors including e-commerce, creative services, and digital consulting.

Data Collection Instruments and Procedure Data were collected through semi-structured interviews, supported by direct observations and document analysis. A standardized interview guide was developed to explore key themes such as system functionality, employee adaptation, managerial perceptions, and operational impacts. Each interview lasted between 45 to 60 minutes and was conducted either online or in person, depending on participant availability.

Additionally, field notes and relevant organizational documents (e.g., cloud usage reports, internal workflow policies) were collected to triangulate findings and enhance data validity. **Data Analysis Techniques** The data were analyzed using thematic coding, following Braun and Clarke's six-phase method. First, interview transcripts were read and re-read to ensure familiarity with the data. Second, initial codes were generated inductively from recurring patterns. Third, the codes were

grouped into broader themes related to cloud effectiveness, barriers, and strategic implementation. NVivo software was used to manage and organize qualitative data.

Ethical Considerations All participants signed informed consent forms prior to data collection. The identities of the companies and participants have been anonymized to protect confidentiality. The effectiveness of cloud-based operation management in digital-based Small and Medium Enterprises represents a critical area of investigation, particularly given the increasing reliance of businesses on digital technologies to enhance their operational efficiencies and competitive positioning. Small and Medium Enterprises are pivotal to economic growth, and their ability to adapt to digital transformation is crucial for sustained success in the modern business landscape (Yusuf., 2024). However, SMEs often face challenges such as limited access to resources and difficulties in scaling operations, making the adoption of cloud-based solutions a potentially transformative strategy (Eyeregba et al., 2024). Cloud-based operation management offers a suite of tools and platforms designed to streamline workflows, improve communication, and provide actionable insights, thereby enabling SMEs to optimize their resource allocation and enhance overall productivity (Omokhoa., 2024; Siregar & Sudarmanto, 2023). The shift towards digital technologies is particularly important for SMEs, enabling them to overcome traditional limitations and compete more effectively (Siregar & Sudarmanto, 2023).

Digital transformation, driven by the adoption of technologies like cloud computing, Artificial Intelligence, and the Internet of Things, is becoming increasingly essential for SMEs to maintain competitiveness and ensure survival in a rapidly evolving market (Yusuf et al., 2024). Cloud-based operation management systems provide a centralized platform for managing various business processes, including supply chain management, customer relationship management, and enterprise resource planning, thereby fostering better integration and coordination across different functional areas. The capacity of these systems to streamline operations, cut costs, and improve customer satisfaction highlights their importance. Moreover, the implementation of AI-driven automation tools within cloud-based platforms can further enhance operational efficiency by reducing human error, accelerating decision-making processes, and providing real-time insights into business performance (Andayani., 2024). Embracing digital transformation through cloud-based solutions enables SMEs to experiment with innovative business models and services, fostering a culture of continuous improvement and adaptability (Andayani., 2024). Digital payment systems and e-commerce platforms are vital tools for SMEs, expanding their market reach.

The adoption of cloud-based operation management tools offers several key advantages for SMEs, primarily by enabling scalable and flexible operations (Yusuf et al., 2024). Cloud solutions provide SMEs with the ability to access computing resources on demand, eliminating the need for significant upfront investments in IT infrastructure and reducing ongoing maintenance costs. This scalability is particularly beneficial for SMEs experiencing rapid growth, as it allows them to quickly adapt their IT resources to meet changing business demands without incurring substantial capital expenditures (Yusuf et al., 2024). Furthermore, cloud-based solutions enhance collaboration and communication among employees by providing a centralized platform for sharing information and managing projects, regardless of geographical location. Moreover, the enhanced data security features offered by reputable cloud providers can provide SMEs with a more secure IT environment compared to on-premise solutions, protecting sensitive business data from cyber threats and data breaches. Cloud-based financial management tools revolutionize SME operations by offering cost-

effective solutions for accounting, payroll, and CRM. Cloud accounting transforms traditional systems, offering on-demand access to company data globally (Nandi & Banerjee, 2018).

Cloud-based operation management tools also facilitate better decision-making by providing SMEs with real-time visibility into key performance indicators and business analytics. By leveraging data analytics capabilities embedded within cloud platforms, SMEs can gain valuable insights into customer behavior, market trends, and operational inefficiencies, enabling them to make more informed decisions and optimize their business strategies. The use of social media also allows SMEs to manage interactions with their clients effectively, enhancing financial performance by decreasing marketing costs. Cloud-based ERP systems can improve business competitiveness and offer substantial benefits. Additionally, cloud-based operation management systems often come with built-in compliance and regulatory features, helping SMEs to adhere to industry standards and legal requirements, thereby reducing the risk of penalties and legal liabilities. Cloud solutions offer scalability, allowing businesses to begin with basic functions and expand as required (Okeke., 2024).

While the benefits of cloud-based operation management are substantial, SMEs must also consider potential challenges and risks associated with adoption. One significant concern is data security and privacy, as entrusting sensitive business data to a third-party cloud provider introduces potential vulnerabilities to cyberattacks and data breaches. SMEs need to carefully evaluate the security policies and compliance certifications of cloud providers to ensure that their data is adequately protected. The risk of vendor lock-in is another critical consideration, as switching between cloud providers or returning to an on-premise system can be complex and costly (Ionescu & Diaconita, 2023). To overcome resource constraints and lack of in-house expertise, SMEs depend on external services (Ma et al., 2021). Moreover, SMEs need to ensure that their employees have the necessary skills and training to effectively utilize cloud-based tools and platforms, which may require investments in training programs and skill development initiatives. Addressing the shortage of employees with specialized skills, such as data scientists, is crucial for the successful use of predictive analytics.

Predictive analytics can provide significant advantages for SMEs, enabling them to forecast market trends, improve customer insights, and optimize business operations (Ahmad & Lucas, 2024). However, the successful implementation of cloud-based operation management requires careful planning, execution, and ongoing monitoring. SMEs should conduct a thorough assessment of their business needs and IT infrastructure to identify the most suitable cloud-based solutions for their specific requirements. SMEs should also establish clear goals and metrics for measuring the success of their cloud initiatives and regularly monitor their progress to ensure that they are achieving the desired outcomes. Furthermore, SMEs need to foster a data-driven culture within their organization, encouraging employees to embrace data analytics and use insights to inform their decision-making processes (Ahmad & Lucas, 2024). Larger companies use big data and analytics to dominate the business world, thus SMEs must implement Business Analytics to keep up and remain competitive (Kasiri et al., 2024).

SMEs that use predictive analytics to plan their workforce needs more effectively can optimize staffing levels based on demand forecasts, avoiding both under- and overstaffing (Campbell, & Oyinloye, 2024). Artificial intelligence and machine learning advancements are closely related to the future of predictive analytics in SMEs (Ahmad & Lucas, 2024). As AI technology develops, predictive models will become more complex. SMEs will need to develop internal data skills to fully use predictive analytics to support strategic decision-making, improve operational

efficiency, and promote long-term growth in an increasingly competitive market (Ahmad & Lucas, 2024). SMEs must address issues relating to data quality, skill shortages, and ethical considerations in order to fully realize the benefits of predictive analytics. SMEs must also be prepared to navigate the changing landscape of data privacy regulations, such as Europe's General Data Protection Regulation, and ensure compliance as the usage of predictive analytics becomes more widespread (Ahmad & Lucas, 2024). To maintain a country's economic stability, the continuous growth of SMEs are paramount (Lu et al., 2022).

Cloud computing offers SMEs the computing power required to gather, process, and evaluate enormous datasets, as well as to create complex algorithms. AI enables SMEs to develop defense mechanisms and define solutions against adversities (Drydakis, 2022). SMEs may find themselves at a disadvantage in an increasingly data-driven environment; however, AI-driven business analytics are becoming increasingly vital for SMEs as AI technology gets more accessible and economical (Ocran., 2024). SMEs can evaluate client behavior, streamline operations, and make data-driven decisions by utilizing AI-driven insights (Ahmad & Lucas, 2024).

Result and Discussion

The findings of this study are organized into three main themes derived from thematic coding: (1) operational efficiency, (2) implementation challenges, and (3) strategic adaptation.

1. Operational Efficiency

All five SMEs reported a significant improvement in day-to-day operational processes after adopting cloud-based systems. Respondents highlighted increased speed and accuracy in task execution:

"With the cloud platform, our inventory updates in real-time. We no longer have delays between warehouse data and the online store," (Participant A, e-commerce SME).

Another participant emphasized workflow integration:

"Previously, we used different apps for different tasks. Now, everything is centralized, and we can manage projects and finances from one dashboard," (Participant C, digital consulting firm).

2. Implementation Challenges

Despite these advantages, SMEs faced technical and organizational hurdles during adoption. The most common issue was lack of internal IT expertise:

"We had to outsource everything at first. None of our team members had cloud experience," (Participant B, creative services SME).

Others mentioned high dependence on internet connectivity, which posed operational risks in certain locations:

"When our connection is unstable, even basic coordination becomes a problem," (Participant D, content production agency).

3. Strategic Adaptation and Learning

Some SMEs demonstrated a high level of strategic adaptation by aligning cloud systems with their business goals:

"We now track project KPIs on a daily basis and use that data to adjust our marketing and resource planning," (Participant E).

However, other SMEs treated cloud tools as isolated technical solutions rather than integrated systems, leading to underutilization.

Discussion

These findings confirm that cloud-based operations management can significantly enhance efficiency and integration in digital SMEs, particularly in managing workflows, data visibility, and collaborative tasks. This aligns with previous literature emphasizing the agility and scalability offered by cloud technologies (Marston et al., 2011; Sultan, 2013).

However, this study reveals that the effectiveness of cloud implementation is highly contingent upon organizational readiness and digital literacy. The observed lack of in-house expertise echoes challenges identified by Low et al. (2011), who argued that human capital limitations remain a critical barrier for SMEs in emerging markets.

Another key insight is the uneven strategic alignment across firms. While some SMEs used cloud analytics to guide real-time decisions, others did not fully integrate cloud functions into broader business processes. This gap suggests a need for post-adoption support and capacity building, especially in digital strategy.

Finally, although previous studies often focus on technical aspects of cloud adoption, this research highlights the socio-organizational dimensions, such as staff adaptation, trust in digital systems, and reliance on external vendors.

The integration of cloud-based operation management systems represents a significant paradigm shift for Small and Medium Enterprises operating within the digital realm, fundamentally altering how these businesses manage their resources, processes, and overall operational workflows (Omokhoa., 2024). Cloud-based solutions offer a compelling value proposition, enabling SMEs to overcome traditional limitations associated with on-premises infrastructure, such as high upfront costs, complex maintenance requirements, and scalability constraints (Yusuf., 2024). These systems facilitate enhanced collaboration, streamlined communication, and improved data accessibility across different departments and geographical locations, fostering a more agile and responsive organizational structure (Siregar & Sudarmanto, 2023). Digital transformation often requires SMEs to rethink traditional business models and adopt a more agile, customer-centric approach (Yusuf., 2024). The adoption of cloud technologies empowers SMEs to leverage advanced functionalities, including real-time data analytics, automated workflows, and integrated reporting dashboards, which contribute to improved decision-making, enhanced operational efficiency, and a greater capacity to adapt to changing market dynamics (Yusuf., 2024). Furthermore, cloud-based operation management systems can play a crucial role in enhancing customer relationship management by providing a centralized platform for managing customer interactions, tracking customer feedback, and personalizing customer experiences (Morales et al., 2024). The shift towards data-driven financial systems is transforming how SMEs manage their finances, allowing them to optimize operations, improve decision-making, and increase profitability (Okeke et al., 2024).

The effectiveness of cloud-based operation management is contingent upon several factors, including the specific needs and characteristics of the SME, the choice of cloud platform and applications, and the quality of implementation and training (Yusuf., 2024). Selecting a system tailored to the specific requirements of the SME is critical for successful implementation (Okeke et al., 2024). SMEs must carefully assess their existing infrastructure, business processes, and technical capabilities to identify the most suitable cloud-based solutions (Ma et al., 2021). Furthermore, the successful adoption of cloud-based operation management necessitates a well-defined implementation strategy, encompassing data migration, system integration, user training, and ongoing support. Business competitiveness can be improved and can provide a significant benefit for

businesses when using information and communication technologies (J et al., 2023). Moreover, the security and privacy aspects of cloud-based operation management must be carefully considered, with appropriate measures implemented to protect sensitive data and ensure compliance with relevant regulations. Additionally, it is essential to foster a culture of continuous improvement and adaptation within the organization to maximize the long-term benefits of cloud-based operation management.

The benefits of cloud-based operation management extend beyond cost savings and operational efficiency, encompassing improvements in innovation, scalability, and business resilience (Abualkishik et al., 2020). Cloud platforms provide SMEs with access to a wide range of advanced technologies, such as artificial intelligence, machine learning, and big data analytics, which can be leveraged to develop new products and services, personalize customer experiences, and gain a competitive edge (Andayani., 2024). The ability to automate repetitive tasks can also drive productivity improvements, allowing businesses to scale operations without proportionally increasing labor costs. Moreover, cloud-based systems offer enhanced business continuity and disaster recovery capabilities, ensuring that critical data and applications remain accessible even in the event of unforeseen disruptions. Cloud computing has significantly lowered prices and enabled the design of integrated solutions specifically for SMEs (Ragazou., 2023).

The implementation of cloud technologies to enable new business formation and new product development creates newly found speed and opportunity for multinational small and medium businesses (Hugos & Hultzky, 2012). Cloud computing offers SMEs opportunities to innovate with new business models, products, and services that might be unattainable due to resource limitations (Andayani., 2024). Cloud technologies, such as machine learning algorithms and robotic process automation, enable businesses to automate repetitive and mundane tasks (Iyelolu et al., 2024). By automating these tasks, companies can focus on strategic initiatives, accelerate innovation, and improve overall productivity. The pay-as-you-go model of cloud computing allows SMEs to access advanced technologies and scale their resources as needed without significant upfront investments (Jamshidi et al., 2013). This flexibility helps SMEs to experiment with new ideas, optimize resource allocation, and bring innovative solutions to market faster (Nandi & Banerjee, 2018).

While the potential benefits of cloud-based operation management are substantial, SMEs may encounter several challenges during the adoption process, including concerns about data security, vendor lock-in, and integration with existing systems. These challenges can include data security, integration complexities, lack of knowledge, and regulatory compliance. To address these concerns, SMEs should carefully evaluate the security policies and compliance certifications of cloud providers, implement robust data encryption and access control mechanisms, and establish clear service level agreements. A lack of trust, data residency issues, and concerns about offline functionality can also impede cloud adoption (Shetty & Panda, 2020). Additionally, SMEs should adopt a phased approach to cloud migration, starting with non-critical applications and gradually expanding their cloud footprint as they gain experience and confidence. Cloud-based operation management is an approach that allows firms to access and store data and programs over the Internet instead of installing and storing data on a computer's hard drive or server. This gives better access to applications and is used to store files on different devices (Avram, 2014).

Cloud-based ERP systems are being adopted by SMEs due to relative advantage, top management support, technology readiness, competitive pressure and trading partner pressure (Bhatti, 2017). However, the motivation regarding the adoption of these systems in SMEs is relatively low in developing countries (Awan et al., 2021). Many SMEs do not have the resources,

expertise, or time to implement and manage complex IT systems (Aisyah, 2012). Cloud ERP providers need to intensify their efforts to build a progressive environment for their services that will eliminate any ambiguity regarding this type of technology (Zamzeer et al., 2020). SMEs must consider several key factors in the adoption of cloud-based ERP systems, including compatibility with existing software and the ability to scale as the business grows (Okeke et al., 2024). Support from both service providers and top management within the company play an important role in whether a firm adopts cloud ERP services (J et al., 2023). This includes selecting systems with customization options, investing in employee training, and starting with core financial functions to ensure a smooth transition (AL-Shboul, 2018; Okeke et al., 2024; Salim & Jaffar, 2020; (Zamzeer et al., 2020).

Data was collected from 136 decision maker senior executives, and IT managers in SMEs in the Republic of Iraq (J et al., 2023). To address the issues of the adoption of AI, SMEs often grapple with limited financial resources, which can hinder their ability to invest in AI technologies and infrastructure (Iyelolu et al., 2024). The lack of internal expertise in AI and data science further compounds the problem, making it challenging for SMEs to develop and implement AI solutions effectively (Eyeregba et al., 2024). To overcome these challenges, SMEs need to focus on building partnerships with technology providers, investing in employee training, and leveraging cloud-based AI services to minimize upfront costs (Yusuf et al., 2024). SMEs should carefully evaluate the AI strategies implemented by large organizations and consider formulating new AI strategies tailored to their specific needs and resources (Lu et al., 2022). Smaller firms may find it difficult to invest in the necessary hardware and software infrastructure to support AI initiatives, as well as to attract and retain the talent needed to develop and manage AI systems (Okeke et al., 2024). The automation process can face obstacles in the form of restricted knowledge and acceptance of automation technologies, limited resources, and the organizational capability to adapt to changes (Oluwafisayo, 2024).

Many SMEs hesitate to adopt these technologies despite the apparent advantages (Andayani et al., 2024). Cloud computing enables small and medium-sized enterprises to respond faster to market and environmental changes. Many SMEs do not have in-house capabilities to manage AI technologies effectively (Yusuf et al., 2024). This often necessitates reliance on external consultants or third-party providers, which can introduce additional costs and operational risks (Yusuf et al., 2024). This approach enables the business to act in a more agile manner, and be more focused on its resources. The use of cloud services improves business performance and provides a competitive advantage for businesses.

One significant advantage of AI for SMEs is its ability to drive business growth and market expansion (Omokhoa et al., 2025). AI enables data-driven decision-making, which is crucial for SMEs looking to stay competitive in a rapidly changing market environment (Iyelolu et al., 2024). By analyzing market trends, customer behavior, and competitive landscapes, AI algorithms can provide valuable insights that inform strategic decisions and identify new business opportunities (Iyelolu et al., 2024). AI-driven business analytics is becoming increasingly important for SMEs, especially as AI technology becomes more accessible and affordable (Ocran et al., 2024). This makes SMEs more agile, competitive and innovative (Drydakakis, 2022). AI facilitates the automation of routine and repetitive tasks, freeing up human resources for more strategic and creative endeavors (Iyelolu et al., 2024). AI also supports the scalability of operations, allowing SMEs to handle increasing workloads without proportionally increasing costs (Iyelolu et al., 2024).

Conclusion

This study explored the effectiveness of cloud-based operations management in digital SMEs through qualitative case studies of five Indonesian enterprises. The findings reveal that cloud solutions significantly improve operational efficiency by enabling real-time data access, centralized workflow management, and enhanced collaboration across teams. SMEs reported time savings, improved task coordination, and better decision-making capabilities as key benefits.

However, the research also uncovered notable challenges, including limited internal IT expertise, dependency on stable internet infrastructure, and inconsistent strategic integration of cloud systems into broader business goals. These findings highlight that while cloud technologies offer substantial potential, their effectiveness depends on the organization's digital readiness, leadership orientation, and ability to align technology with long-term objectives.

The study contributes to the growing discourse on digital transformation by offering empirically grounded insights specific to SMEs an often underrepresented segment in cloud computing research.

Limitations and Future Research

This study is subject to several limitations. First, the sample size was limited to five SMEs in urban areas of Indonesia, which may not represent the full spectrum of digital SMEs across different regions or sectors. Second, the qualitative approach, while rich in depth, restricts generalizability to larger populations. Third, the research primarily focused on managerial and operational perspectives, with less emphasis on technical metrics or customer-side impact.

Future research could address these limitations by incorporating a larger and more diverse sample, employing mixed-methods designs, or conducting longitudinal studies to track the long-term outcomes of cloud adoption. Additionally, comparative studies between SMEs in different countries or industries may offer broader insights into contextual factors affecting cloud management effectiveness.

The conclusion describes the answer to the hypothesis and / or the purpose of the research or scientific findings obtained. Conclusions do not contain repetitions of the results and discussion, but rather summarize the findings as expected in the objectives or hypotheses.

This analysis highlights that the implementation of cloud-based operations management offers substantial benefits for digital SMEs. By enabling real-time data access, streamlined collaboration, and reduced dependence on costly physical infrastructure, cloud technology significantly enhances operational efficiency and agility.

While challenges remain particularly in areas such as staff training and data security these obstacles are outweighed by the strategic advantages gained. For SMEs operating in an increasingly digital and fast-paced environment, adopting cloud-based systems is not merely a technological upgrade, but a critical step toward staying competitive and responsive to market demands.

As cloud services continue to evolve and become more affordable, the opportunity for digital SMEs to scale and innovate through effective operations management becomes even more attainable. In this context, cloud adoption is no longer optional it is a necessary move to ensure long-term growth and sustainability.

Recommendation

Based on the results of the study on the effectiveness of cloud-based operations management in digital Micro, Small, and Medium Enterprises (MSMEs), several recommendations can be made:

1. For Digital MSME Practitioners: It is recommended that digital MSMEs be more proactive in adopting cloud technology to improve operational efficiency and effectiveness. Training and mentoring related to the use of cloud systems need to be enhanced to maximize the benefits of technology adoption.
2. For the Government and Related Institutions: It is expected that support programs such as training, incentives, and broader access to digital infrastructure be provided to encourage the adoption of cloud technology among digital MSMEs across various regions.
3. For Future Researchers: This study can be further developed by expanding the research objects and variables, such as examining the impact of cloud integration with Artificial Intelligence (AI) or the Internet of Things (IoT) in MSME operations.

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