

Utilization of Cloud Computing Technology in Improving Data Efficiency of Startups

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ABSTRACT

The development of digital technology encourages startups to look for efficient solutions in data management. One technology that is widely adopted is cloud computing, as it offers flexibility, cost efficiency, and scalability. However, there are not many studies that specifically examine its impact on data efficiency in startups in Indonesia. This research aims to analyze how the use of cloud computing improves operational efficiency and data management in startups, while identifying challenges and best practices in its implementation. The method used is a qualitative case study approach involving several startups using cloud services in Indonesia as the main informants. The results show that cloud adoption has a positive impact on accelerating data access, improving team collaboration, and IT cost efficiency. Cloud also provides added value in terms of data security and scalability. Nevertheless, obstacles such as limited human resources and dependence on service providers are still the main obstacles. In conclusion, cloud computing is proven to be a strategic solution in improving data efficiency in startups, as long as it is balanced with organizational readiness and the right implementation strategy.

Keywords: cloud computing, data efficiency, startups

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INTRODUCTION

The rapid development of information technology in the past two decades has driven a significant transformation in the way companies manage data and information technology (IT) infrastructure (Subramanyam, 2021). One of the main innovations in today's digital era is cloud computing (Al-Mutawa & Saeed Al Mubarak, 2024), which allows companies to store, manage, and process data through internet-based services without having to rely on expensive and complex internal physical infrastructure. This technology offers a number of advantages, including scalability, cost efficiency, flexibility in resource management, and real-time data access (Islam et al., 2023). In line with the increasing need of enterprises for adaptive and efficient IT solutions, the adoption of cloud services continues to show a significant growth trend (Golightly et al., 2022). According to a Gartner report (2024), global public cloud usage is expected to increase by 20.4%, with a projected market value of USD 678.8 billion by 2025. This data indicates that cloud computing has



become an important foundation in digital transformation across industry sectors, including startups that rely heavily on technology to support efficiency and competitiveness (Godavarthi et al., 2023).

In the midst of the dynamic development of digital technology, startups are faced with major challenges in terms of resource management, especially in terms of funding and the availability of reliable human resources in the field of information technology (Rokhadi et al., 2023). Capital constraints often limit startups' ability to build and maintain conventional IT infrastructure, such as physical servers and in-house data centers, which require high initial investment and operational costs (Srivastava & Tyagi, 2025). In addition, limited expertise in information systems management and data security can also increase operational risk (Ngoc Thach et al., 2021), including potential data loss, vulnerability to cyber-attacks, and slow access to information needed in real-time (Aslan et al., 2023). On-premise data management is also often an obstacle in terms of scalability and collaboration, especially when the company experiences rapid growth (Mušić et al., 2024). In this context, cloud computing emerges as a relevant and strategic solution for startups (Schuhmacher et al., 2021). With its lightweight, flexible, and subscription-based characteristics, this technology allows startups to access reliable data storage and processing services without the need for large upfront investments, while providing ease of system integration and scalability according to evolving business needs (Lindström et al., 2024).

The utilization of cloud computing technology provides various strategic benefits for startups in the face of limited resources and high competitive pressure (Muhic et al., 2023). With cloud computing, startups can access computing services such as data storage, virtual servers, and cloud-based software without the need to own or manage their own hardware (Rawat & Bhandari, 2023). This directly reduces the initial investment burden and maintenance costs of technology infrastructure, and allows for more efficient budget allocation for other business development needs. In addition, cloud computing supports the improvement of operational efficiency and data management through automation features, regular backups, and the ability to monitor and manage data centrally and in real-time (AL-Jumaili et al., 2023).

The integration capabilities between systems offered by cloud service providers also help startups accelerate the process of innovation and product development, so that time-to-market can be cut significantly (Osinachi Deborah Segun-Falade et al., 2024). In the context of intense competition, the speed of responding to market needs is an important advantage for startups (Mirghaderi et al., 2023). According to a McKinsey report (2023), startups that strategically adopt cloud computing can save up to 30% of their total information technology operating costs, while increasing the flexibility and resilience of their digital systems in the long run. These benefits make cloud computing not just a technology alternative, but an essential foundation in building an efficient, adaptive, and growth-ready startup (Kam Wong, 2022).

Although the adoption of cloud computing continues to increase in various sectors, including among startups, scientific studies that specifically examine the effect of this technology on the efficiency of data management at the startup scale in Indonesia are still relatively limited. Most of the existing studies tend to focus on the technical aspects of cloud implementation or on large companies with established IT infrastructure (Cresswell et al., 2022). In fact, the characteristics and needs of startups are very different, especially in terms of flexibility, scalability, and cost efficiency (Olek, 2023). On the other hand, data is a critical asset in business decision-making and product innovation in startups, so the effectiveness of its management has direct implications for the Company's competitiveness (Shahid & Sheikh, 2021). Therefore, research is needed that exploratively and contextually examines the extent to which the use of cloud computing can improve efficiency in data management in start-up companies, especially in the local context of Indonesia, which has its own digital infrastructure challenges. This research is expected to fill the gap in the literature and make a practical contribution to the development of technology strategies among startups.

This research aims to systematically explain the impact of cloud computing utilization on the efficiency of data management in startup companies. The main focus is on how this technology contributes to improving operational effectiveness, accelerating data processing, and reducing information technology infrastructure costs that are often a burden for startups with limited resources. In addition, this research also aims to provide strategic recommendations regarding the appropriate utilization of cloud technology, both from a technical, managerial, and economic perspective, to support the growth and increase the competitiveness of startups in the digital era.

METHODOLOGY

This research uses a qualitative approach with a case study design to explore in depth how the use of cloud computing technology impacts the efficiency of data management in startup companies. This approach was chosen because it allows researchers to understand phenomena contextually, especially in a startup environment that has unique and dynamic characteristics. The research is exploratory-descriptive in nature, with the unit of analysis being several startups in Indonesia that have implemented cloud computing services in their operational activities. Subject selection was done purposively, with the following criteria: (1) active startup status, (2) has been using cloud computing services for at least one year, and (3) willing to provide information through interviews and documentation.

Data was collected through three main techniques: in-depth interviews, observations, and documentation studies. Semi-structured interviews were conducted with key informants such as startup founders, IT managers, or CTOs, to gain in-depth perspectives on the adoption process and the impact of cloud technology on data efficiency. Passive observations were made of data management activities where possible, while documentation covered secondary

data such as internal reports, IT policies, or cloud platforms used by startups. The main instrument in this study was the researcher himself, who was equipped with an interview guide and observation sheet.

Data were analyzed using thematic analysis techniques, which included data reduction, coding, pattern identification, and reflective inference. This analysis aimed to find the main themes related to efficiency, such as operational cost savings, increased data access speed, and information system flexibility. To ensure data validity, the research applied source triangulation techniques (interviews, observations, and documentation), confirmation of results to informants (member checking), and recording the research process in detail (audit trail). With this methodology, the research is expected to provide a complete and relevant picture of the utilization of cloud computing in supporting data efficiency in the Indonesian startup sector.

RESULTS AND DISCUSSION

A. Overview of Cloud Computing Utilization in Startups

The utilization of cloud computing by startups has shown an increasing trend in recent years, along with the need for efficient, flexible, and easily accessible information technology systems. The results of interviews and documentation show that the majority of startups in this study rely on services from global cloud providers such as Amazon Web Services (AWS), Google Cloud Platform (GCP), and Microsoft Azure. The selection of these providers generally considers aspects of reliability, scalability, data security, and adequate technical support. In terms of service models, startups generally adopt Software as a Service (SaaS) for business application needs such as project management, team collaboration, and financial services, while Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) are used by startups that have an internal technology team and need more flexibility in building and managing backend systems.

The initial motivation for the adoption of cloud technology by startups is largely driven by resource limitations, especially in terms of IT infrastructure investment and skilled personnel. Cloud computing allows them to avoid large initial costs in purchasing servers, hardware, as well as maintaining local systems. In addition, startups value speed in the deployment and application development process, which can be significantly shortened through cloud platforms. Flexibility is also a key factor as startups can customize storage and computing capacity as needed, without having to add physical assets. Cloud implementation is done in stages, usually starting from data storage needs, then progressing to data processing and system integration. Overall, these findings show that the use of cloud computing is not only an efficient technical solution, but also part of a digital adaptation strategy that is crucial for the sustainability and growth of startups in the midst of competitive and fast-changing market dynamics.

B. Impact on Operational Efficiency

The utilization of cloud computing has proven to have a significant impact on increasing operational efficiency in startup companies. One of the dimensions of efficiency that is most felt by startup players is the acceleration of time in data processing and access. With a cloud-based data storage and management system, the process of searching, processing, and distributing information can be done in real-time without location or device barriers. This speed is crucial, especially for startups engaged in digital services, finance, or e-commerce, where data-based decision-making must take place quickly and accurately. In addition, the use of the cloud directly encourages increased team collaboration through the various collaborative work features provided, such as simultaneous document editing, shared dashboards, and automatic notification systems. This strengthens cross-divisional coordination, especially in the remote working model that many startups are now adopting.

Furthermore, efficiency is also reflected in the reduction of information technology operational costs. Startups no longer need to allocate large budgets to purchase, maintain, and upgrade physical servers or recruit large numbers of IT staff for internal system management. The subscription-based scheme offered by cloud providers allows for more measurable expenditures and according to the scale of the company's needs. Some informants said that the cost efficiency gained through cloud computing reached more than 30% compared to conventional infrastructure models. This efficiency ultimately allows startups to allocate resources more strategically, both for product development, marketing, and improving service quality to customers. This finding confirms that cloud computing not only supports technical aspects, but also becomes an enabler in driving startup business agility and sustainability.

C. Impact on Data Security and Scalability

In addition to operational efficiency, the utilization of cloud computing also has a positive impact on the aspects of data security and scalability in startups. The majority of startups in this study have a fairly positive perception of data security in cloud services, mainly because leading service providers have generally implemented high encryption standards, layered authentication, and international security certifications such as ISO 27001 and SOC 2. Although in the early stages there were concerns about the risk of leakage or illegal access, consistent usage experience and minimal incidents actually increased user confidence. In fact, some startups revealed that the level of security offered by cloud providers far exceeded what they could achieve if they had to manage the system themselves.

In addition to security, the scalability aspect is a major added value that is very relevant to the dynamics of startup growth. Cloud computing allows companies to flexibly adjust storage capacity and computing needs, both in the face of user spikes and service expansion. Startups no longer need to purchase additional infrastructure every time there is an increase in traffic or data volume, because system capacity can be increased instantly through the cloud provider's dashboard. In addition, the presence of automated backup and disaster recovery features is an important component in maintaining business

continuity. With automated backup mechanisms and quick recovery from system disruptions or data loss, startups can minimize potential operational losses. Overall, the ease of managing security and scalability through the cloud makes this technology not only a technical solution, but also a strategic foundation for startups in building a resilient, adaptive, and long-term oriented business.

D. Cloud Computing Implementation Challenges

While cloud computing offers various advantages for startups, the implementation process in the field is not free from a number of technical and strategic challenges. One of the initial obstacles that many face is the process of migrating data from conventional systems to cloud platforms, which often requires time, resources, and technical expertise that is not fully available within the company. In some cases, limited bandwidth and network infrastructure, especially in areas with unstable internet access, become obstacles in ensuring smooth access to cloud services in real-time. In addition, training staff to understand how the cloud works and management also requires time and investment, especially for newly established startups that do not have a mature organizational structure in the field of information technology.

Another challenge arises from the dependency on the service provider. Startups realize that fully relying on a third party to store and manage data brings its own risks, such as changes in pricing policies, terms of service, or even issues of operational sustainability of the cloud provider. Ongoing subscription fees are also a concern, especially for startups with fluctuating cash flows. In addition, there is an internal competency gap in optimally utilizing cloud features. Many startups only use basic services without exploring advanced features such as analytics, machine learning integration, or auto-scaling, due to limited human resources who master these technologies. Therefore, although cloud computing opens up many opportunities, its successful implementation is largely determined by the startup's internal readiness in technical, financial, and managerial aspects. This presentation is important to provide a realistic picture as well as a strategic consideration for other startups who want to adopt cloud technology.

E. Strategies and Good Practices

A number of startups that have managed to integrate cloud computing effectively point to strategies and good practices that are worth referring to. One common approach is a gradual migration process, starting from non-critical services such as document storage, then progressing to core systems such as customer and transaction data management. The success of this implementation is also supported by a structured team training strategy, both through internal training and cooperation with cloud service providers. Some startups appoint cloud champions or form special units as a liaison between technical and management teams, to ensure that cloud utilization is aligned with business goals. The synergy between technology and management teams

has proven to be a key element in ensuring cloud investments generate real impact on business efficiency and growth.

When compared to previous studies, such as the McKinsey report (2023) that highlighted operational cost savings of up to 30% through cloud adoption, the findings of this research support such claims while adding new context that is relevant at the local level. Different from international studies that emphasize technical aspects, this research contributes by highlighting organizational factors and human resource readiness, especially in the context of Indonesian startups facing infrastructure challenges and limited digital capacity. Thus, this study not only enriches the literature on digital transformation in startups, but also provides practical contributions for policy makers and industry players. Policy implications include the importance of technology incentives for early-stage startups, the development of adaptive cloud implementation guidelines, and the strengthening of needs-based digital training. These strategies are expected to accelerate cloud adoption more evenly and sustainably, while increasing startup competitiveness in the digital era.

CONCLUSION

This research concludes that the utilization of cloud computing significantly improves the efficiency of data management in startups, especially in terms of access speed, team collaboration, and reduced operational costs. In addition, the cloud offers advantages in terms of data security and scalability, although its implementation still faces challenges such as limited human resources, technical constraints, and dependence on service providers. Best practices such as internal training and synergy between teams are key to the successful adoption of this technology. The findings enrich the literature with local context and provide strategic recommendations for decision-makers to drive effective digital transformation in the startup sector.

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