THE ROLE OF MANAGEMENT INFORMATION SYSTEMS IN OPTIMIZING DATA RESOURCES THROUGH CLOUD COMPUTING TECHNOLOGY

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Abstract

The rapid advancement of information and communication technology has fundamentally transformed how organizations manage their data resources. In today's digital era, data is no longer considered a mere supporting element but a strategic asset that determines organizational competitiveness and sustainability. Management Information Systems (MIS), when integrated with cloud computing technology, offers a modern solution to optimize data collection, storage, processing, and analysis in real-time. This study aims to examine the role of MIS in optimizing data resources through a qualitative literature review approach. The findings indicate that cloud-based MIS enhances operational efficiency, reduces infrastructure costs, facilitates cross-functional collaboration, and strengthens data-driven decision-making. Moreover, this integration supports small and medium enterprises (SMEs) and government institutions by providing affordable and scalable systems. Nevertheless, issues related to data privacy, cybersecurity, and regulatory compliance remain critical challenges that must be addressed through strict data protection policies. This study recommends that organizations develop a cloud-based digital transformation strategy aligned with long-term MIS planning. Further research is suggested to empirically evaluate the effectiveness of cloud-based MIS implementation across various industrial sectors.

Keywords: *Management Information System, Cloud Computing, Data Optimization, Operational Efficiency, Digital Transformation.*

INTRODUCTION

The rapid development of information and communication technology has changed the way organizations manage resources, including information. In this digital era, information is no longer considered a mere supporting element, but has become a strategic asset that determines the competitiveness and sustainability of an organization. This is marked by the increasing dependence of organizations on data in various operational aspects, ranging from human resource management, finance, logistics, to customer service. As the volume of massive data increases, both structured and unstructured, the challenges in data management are becoming increasingly complex. Data spread across various work units and storage formats can cause inconsistencies, duplications, and even loss of important information if not managed properly. Therefore, modern organizations require a system that is adaptive, integrated, and able to handle information dynamics in real time. One solution that is widely applied in this context is the Management Information System (MIS). MIS is an information technology-based system designed to collect, store, process, and present information to support managerial decision making. With MIS, organizational leaders can obtain accurate, relevant, and timely data so that decisions taken are more focused and strategic. In addition, MIS also supports long-term planning, internal control, and improving overall operational efficiency. However, conventional MIS implementation has various limitations. Limited local infrastructure, high cost requirements, lack of flexibility in data access, and limitations in storage capacity are often obstacles that hinder the optimization of the system. This is where the role of cloud computing technology becomes very relevant. Cloud computing, or cloud computing, is an internet-based information technology service model that allows users to access various IT resources such as data storage, software, and computing capacity flexibly and scalably without the need to have physical infrastructure directly. This model provides significant advantages, such as cost efficiency, increased scalability, flexibility of time

and place, and the ability to accommodate very rapid data volume developments (Erl, Puttini & Mahmood, 2013). The integration of MIS and cloud computing creates a modern information system that is more responsive to organizational needs. According to Wijoyo et al. (2024), the combination of cloud-based MIS can accelerate data flow between departments, facilitate cross-functional team collaboration, and provide real-time monitoring and analytics capabilities. This not only increases internal efficiency but also helps organizations respond to market changes more quickly and accurately. In addition, cloud-based systems allow for automatic system updates, consistent software version management, and reduced dependence on internal technical teams. In the context of small and medium-sized organizations (SMEs), this is an advantage in itself because it can reduce the cost of system implementation and maintenance which is generally high in conventional approaches. On the other hand, the use of cloud technology also brings its own challenges, especially in terms of security, data privacy, and compliance with applicable regulations. Organizations must seriously consider cybersecurity aspects in designing cloud-based information systems so that sensitive data is not easily accessed by unauthorized parties. Considering the various potential benefits and challenges, it is important to conduct an in-depth study on how the integration of MIS and cloud computing technology can be implemented optimally, especially in the context of managing organizational data sources. This study aims to systematically describe the role of MIS in optimizing data sources through cloud computing technology and its implications for organizational efficiency, productivity, and competitiveness.

LITERATURE REVIEW
Management Information System (MIS)

Management Information System (MIS) is an information technology-based system that functions to collect, process, store, and present information to support decision-making activities in an organization. MIS includes information from all parts of the organization, from daily operational data to strategic information used by top management in designing long-term policies. According to Gardenia and Widy (2024), MIS not only provides relevant and timely information, but also plays an important role in supporting internal control and evaluation of organizational performance. The information generated by MIS allows organizations to monitor business activities comprehensively and make continuous improvements based on data (continuous improvement).

SIM has several main components, namely:
- Hardware such as servers, computers, and network devices;
- Software used to process data;
- Database as a place to store data;
- Procedures that govern the flow of information workflow;
- Human resources (HR) as users and managers of the system.

According to Laudon and Laudon (2020), MIS can be divided into three levels based on its use, namely: Transaction Processing System (TPS) for operational management, Management Information System (MIS) for middle management, and Executive Information System (EIS) for strategic decision making. With the right implementation of MIS, organizations can improve the efficiency of work processes, speed up response times to problems, and improve the accuracy of information used in decision making. In the era of digital transformation, MIS integrated with other technologies such as cloud computing and big data analytics is very important in creating an agile and data-driven organization.

Cloud Computing Technology

Cloud computing is an internet-based computing model that allows users to access information technology (IT) resources such as servers, storage, databases, software, andother services on-demand without having to own or manage physical infrastructure directly. This technology provides high flexibility and allows organizations to adjust service capacity according to their actual needs.

According to Erl, Puttini, and Mahmood (2013), cloud computing is divided into three main categories of services:
1. Infrastructure as a Service (IaaS): provides basic infrastructure services such as servers, storage, and networking.
2. Platform as a Service (PaaS): provides a development platform that can be used to build, test, and manage applications.
3. Software as a Service (SaaS): offers web-based applications that can be accessed directly by users without the need for installation.

Cloud technology also comes in three deployment models: public cloud, private cloud, and hybrid cloud, each of which has advantages and disadvantages related to cost, control, and data security. Fatmah et al. (2024) added that cloud computing supports cross-platform and device collaboration, enabling real-time data integration across departments and different geographic locations. This facilitates collaboration on cross-functional projects and accelerates business processes.   In addition, this technology also supports operational efficiency by reducing the workload of internal IT infrastructure and minimizing maintenance costs. In the long term, cloud computing helps organizations become more agile in responding to market changes and customer needs.

Data Source Optimization

Data source optimization refers to the process of increasing the utility of data through technical and managerial approaches so that data can provide maximum contribution to achieving organizational goals. This process includes various stages, starting from systematic data collection, safe and efficient storage, integration between data sources, to the use of analytical tools to transform raw data into valuable information. In the context of modern organizations, data optimization is not only about quantity, but also quality and speed of access. Data that is scattered and not integrated will be a burden, not an asset. Therefore, coordinated data management technology and strategies are needed to ensure that the data used truly supports the decision-making process. The integration of cloud computing technology is an important element in the data optimization process. Cloud provides an elastic and scalable storage platform, and supports parallel data processing using Artificial Intelligence (AI) and Machine Learning (ML) based algorithms. By implementing a cloud-based analytics system, organizations can run predictive and prescriptive analysis to forecast business trends and design more accurate data-driven strategies. As stated by Fatmah et al. (2024), the use of cloud technology in information system project management results in increased speed and accuracy in data processing. This creates significant efficiency in the workflow and reduces the possibility of human error in the data entry or interpretation process. Thus, data source optimization cannot be separated from the organization's ability to utilize MIS strategically and integrate it with cloud computing technology. This combination creates a data-centric work environment that supports efficiency, effectiveness, and innovation in information management.

METHOD

This study uses a library research method with a qualitative descriptive approach. This method was chosen because it is appropriate for explaining and analyzing concepts, theories, and scientific findings that are relevant to the focus of the research, namely the role of Management Information Systems (MIS) in optimizing data sources through the application of cloud computing technology. Literature studies allow researchers to explore, compare, and synthesize various academic references as a basis for strong and systematic conceptual arguments. A qualitative descriptive approach is used to explore in depth the content of the available literature. Researchers do not collect primary data, but dig up secondary data from credible and verified sources, such as national and international scientific journal articles, reference books, conference proceedings, and policy documents or white papers from trusted institutions.

Data source

The data sources in this study consist of literature published in the period 2013 to 2025, covering the early development to the latest implementation of cloud-based MIS. The selection of this time period aims to obtain a comprehensive understanding of the dynamics of cloud technology and the transformation of information systems in the last decade. The literature used is selected based on the following criteria:
- Relevance to the research topic;
- Availability of full access to the contents of the article;
- The credibility of the publisher or institution;
- Updates and contributions to the development of theory and practice.

Data collection technique

The data collection process is carried out through:
- Online journal database searches, such as Google Scholar, DOAJ, Scopus, and SINTA;
- Study of academic books and book chapters discussing MIS theory and cloud computing;
- Official documents from relevant institutions, such as IT agency research reports, government regulations on data privacy, and digitalization policy documents.

Each reference found is then systematically reviewed to identify key ideas, empirical findings, and relationships between relevant variables or concepts.

Data Analysis Techniques

The collected data was analyzed using a thematic analysis and content analysis approach, with the following stages:

1. Relevant Literature Identification: Scientific literature that has a direct relationship with the main topic (MIS, cloud computing, and data management) is selected and reviewed in depth. In this stage, researchers also note the year of publication, author name, source, and methodology used by each article.
2. Literature Classification by Topic: All references are grouped into thematic categories, such as:
   a. Definition and basic concepts of SIM;
   b. Characteristics and models of cloud computing services;
   c. Data source optimization strategies;
   d. Case study of cloud implementation in MIS.
   3. Mapping the Contribution of Each Source: The researcher maps the contribution of each source to the understanding of the integration of MIS and cloud computing. For example, whether the article discusses advantages, challenges, practical applications, or security aspects.
4. Theoretical Synthesis and Narrative Development: From the results of the classification and mapping, the researcher then developed a structured scientific narrative to explain how the integration of MIS and cloud computing contributes to the optimization of data sources in various organizational sectors.

Validity and Authenticity of Data

Although this study did not involve empirical validation of field data, validity was strengthened through the use of references from credible scientific sources that had gone through a peer-review process. Researchers also triangulated sources by comparing information from various publications discussing similar topics, so that a more objective and comprehensive perspective was obtained. With this method, it is hoped that research can produce in-depth conceptual contributions and can be used as a basis for further research, as well as in decision-making by practitioners in the field of information systems and organizational technology.

RESULTS AND DISCUSSION

The results of the analysis of various literatures show that the integration of Management Information Systems (MIS) with cloud computing technology has a significant impact on organizational performance, especially in data management, decision making, cost efficiency, and operational flexibility. The following discussion elaborates in detail the five main aspects of the impact of this integration.

Operational Efficiency and Cost Savings

One of the main advantages of adopting cloud computing in MIS is significant operational cost efficiency. Organizations no longer need to make large upfront investments in hardware procurement (such as local servers), network infrastructure, and expensive software licenses. With a subscription-based model, organizations can pay according to the scale of their needs (pay-as-you-go), so that expenses become more controlled and flexible. According to Aprillia et al. (2025), the implementation of cloud computing reduces the Total Cost of Ownership (TCO) while increasing Return on Investment (ROI) because the burden of system management and maintenance is shifted to the cloud service provider. This is very beneficial for small and medium enterprises (SMEs) that have limited resources and are unable to build their own data centers. In addition to direct savings, operational efficiency is also increased through automation processes in data management, archiving, and system backup. Time-consuming manual work can be minimized, and IT staff can be focused on other strategic functions.

Real-Time Data Access and Team Collaboration

Cloud computing offers advantages in terms of mobility and data availability. With cloud-based SIM integration, users can access information from various locations and devices in real-time, as long as they are connected to the internet. This expands the reach of employees and supports remote and hybrid work systems that are now trending post-global pandemic. Raseuki and Nasution (2024) emphasized that cloud-based MIS supports cross-departmental collaboration better because data is stored centrally and synchronized. There is no longer data duplication or different document versions between teams, because all parties work in the same system

simultaneously. Collaboration is also enhanced through integrative features such as collaborative dashboards, automated notifications, and cloud-based project management systems, which speed up task completion and improve coordination between teams.

Impact on MSMEs and Government Agencies

The benefits of the integration of MIS and cloud computing are not only felt by large companies, but also by the Micro, Small and Medium Enterprises (MSMEs) sector and government agencies, including public service institutions at the local level. Rahmawati and Nasution (2024) showed that the use of cloud in MIS helps MSMEs in increasing operational efficiency, accelerating the reporting process, and improving the financial recording system. The ability to store and access business data securely and easily has encouraged transparency and more accurate decision-making, especially in terms of cash flow management and cost control. In the public sector, Ritonga et al. (2025) provide an example of implementing a cloud-based information system in a village office that results in increased efficiency in population administration services, correspondence, and distribution of information to the public. Cloud computing accelerates the public service process and increases accountability and citizen participation due to the openness of online-based information.

Data Security and Privacy

Although cloud computing offers many advantages, the main challenge that is often raised is the issue of data security and privacy. Storing an organization's data on third-party servers poses the potentialrisks such as hacking, data leaks, and misuse of information by unauthorized parties. Sen (2013) stated that to overcome these threats, organizations need to implement a series of policies and protection mechanisms, such as data encryption, authentication. multi-factor, and regular automatic backups. In addition, it is also important to choose a cloud service provider that has been certified internationally, such as ISO/IEC 27001 for information security management. In a regulatory context, organizations must comply with applicable legal provisions, such as the General Data Protection Regulation (GDPR) in the European Union and the Data Protection Act in Indonesia, which regulates user rights and data controller obligations in maintaining the confidentiality and security of information.

Enhanced Analytical Capabilities

The integration of MIS and cloud computing also provides access to advanced data analytics features that can support data-driven decision making processes. Modern cloud systems are generally equipped with visual analytics tools (data visualization), big data processing, and even predictive capabilities through integration with machine learning (ML) and artificial intelligence (AI) algorithms. Widana and Nasution (2024) stated that organizations that utilize this analytical feature can better understand operational patterns and customer behavior, so they can design strategies that are more responsive and adaptive to market dynamics. For example, companies can monitor KPIs in real time, analyze weekly sales, and anticipate risks based on historical trends. This increased analytical capability also enables sharper strategic planning, supply chain optimization, and customer-driven service development. The ability to leverage data as the basis for product and service innovation makes cloud computing a strategic asset in an organization's digital transformation.

CONCLUSION

This study concludes that the integration of Management Information Systems (MIS) with cloud computing technology provides a strategic contribution to optimizing organizational data sources. Through the use of the cloud, organizations gain significant operational efficiency, flexibility in real-time data access, increased collaboration between teams, and faster and more precise data-based decision-making capabilities. In addition to providing a positive impact on large companies, this approach also shows high relevance for MSMEs and government agencies that want to improve the effectiveness of data services and governance. However, the implementation of the cloud is not without challenges, especially related to the issue of security and privacy of information stored on third-party servers. Therefore, organizations need to establish strong data security policies and comply with data protection regulations such as GDPR and the PDP Law. In the long term, digital transformation strategies based on MIS and the cloud must be designed in an integrated manner with the organization's vision and mission, and supported by investment in the development of infrastructure, human resources, and reliable information security systems. To deepen this study, further research is recommended to be conducted empirically to measure the real effectiveness of cloud-based MIS implementation in various industrial sectors, including its impact on productivity, efficiency, and overall organizational success.

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