



Web-Based Management Information Systems: Innovation in Data and Information Management

Nu'aiman Ahmad¹, Ulyatul Annisa Destanti², Berlian Aprilia Putri Senti³, Jihan Afiyah⁴, Juliana Salsabila⁵, Vania Aisya Falikhati⁶ Nasya Azzahratul Ain⁷, Maulida Azzahra Putri⁸, Elliza Tiffany Avvendi⁹, Siti Solekhah¹⁰, Mansur Chadi Mursid¹¹

¹⁻¹¹ UIN K.H Abdurahman Wahid Pekalongan

e-mail: vania.aisya.falikhati24144@mhs.uingusdur.ac.id

Article Info

Article history:

Received June 03, 2026

Revised June 22, 2026

Accepted June 28, 2026

Keywords:

Data Management, Digital Transformation, Information Systems, Management Information Systems, Web Based Systems

ABSTRACT

This study discusses the development of a web-based Management Information System (MIS) as an innovation in managing data and information in the digital era. The rapid growth of information technology encourages organizations to improve efficiency, accuracy, and effectiveness in processing information. A web-based MIS plays an important role in supporting organizational activities because it allows data to be managed in real time, integrated, and easily accessed through internet technology. The purpose of this study is to analyze the concept, development, components, benefits, challenges, and implementation of web-based MIS in several fields such as education, healthcare, government, and business organizations. The research uses a qualitative descriptive method with a literature study approach by reviewing books, journals, and scientific articles related to management information systems and digital transformation. The results of the study show that web-based MIS can improve operational efficiency, accelerate decision-making, increase data accuracy, and support better coordination between organizational units. In addition, technologies such as cloud computing, big data analytics, artificial intelligence, and the Internet of Things (IoT) further strengthen the role of MIS in modern organizations. However, the implementation of MIS also faces several challenges, including high implementation costs, data security risks, human error, and dependence on technology. Therefore, organizations need proper infrastructure, qualified human resources, and effective management strategies to maximize the benefits of web-based MIS.

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



Article Info

Article history:

Received June 03, 2026

Revised June 22, 2026

Accepted June 28, 2026

Keywords:

Manajemen Data, Transformasi Digital, Sistem Informasi, Sistem Informasi Manajemen, Sistem Berbasis Web

ABSTRACT

Penelitian ini membahas pengembangan Sistem Informasi Manajemen (SIM) berbasis web sebagai sebuah inovasi dalam pengelolaan data dan informasi di era digital. Pesatnya perkembangan teknologi informasi mendorong organisasi untuk meningkatkan efisiensi, akurasi, dan efektivitas dalam mengolah informasi. SIM berbasis web berperan penting dalam mendukung aktivitas organisasi karena memungkinkan data dikelola secara real-time, terintegrasi, dan mudah diakses melalui teknologi internet. Tujuan penelitian ini adalah menganalisis konsep, pengembangan, komponen, manfaat, tantangan, serta implementasi SIM berbasis web di berbagai bidang seperti pendidikan, kesehatan, pemerintahan, dan organisasi bisnis. Penelitian ini menggunakan metode deskriptif kualitatif dengan pendekatan studi literatur melalui penelaahan buku, jurnal, dan artikel ilmiah yang berkaitan dengan sistem informasi manajemen dan transformasi digital. Hasil penelitian menunjukkan



bahwa SIM berbasis web mampu meningkatkan efisiensi operasional, mempercepat pengambilan keputusan, meningkatkan akurasi data, serta mendukung koordinasi yang lebih baik antarunit organisasi. Selain itu, teknologi seperti komputasi awan (cloud computing), analitik big data, kecerdasan buatan (artificial intelligence/AI), dan Internet of Things (IoT) semakin memperkuat peran SIM dalam organisasi modern. Namun demikian, implementasi SIM juga menghadapi beberapa tantangan, seperti tingginya biaya implementasi, risiko keamanan data, kesalahan manusia (human error), serta ketergantungan terhadap teknologi. Oleh karena itu, organisasi memerlukan infrastruktur yang memadai, sumber daya manusia yang kompeten, serta strategi manajemen yang efektif untuk memaksimalkan manfaat dari SIM berbasis web.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Vania Aisya Falikati

UIN K.H Abdurrahman Wahid Pekalongan

Email: vania.aisya.falikhati24144@mhs.uingusdur.ac.id

INTRODUCTION

The business world is currently undergoing profound changes as a result of the development of digital transformation. Digital transformation is no longer understood simply as the process of using technology in business activities, but as a comprehensive change that impacts how organizations create value and maintain their existence. Digital technology is triggering disruption that is changing competitive patterns, consumer behavior, and the overall structure of industries. In this situation, organizations cannot simply adapt passively but must be able to respond to change with appropriate strategies to remain relevant in the market. The inability to face these changes can cause companies to be left behind and lose competitiveness due to their reliance on outdated systems and business models that are no longer in line with current developments. Digital transformation also demands internal changes within organizations. The transformation process is not only related to the implementation of technology but also involves adjustments to strategy, organizational structure, and work culture. Organizations need to build capabilities to manage change effectively, including improving the competency of human resources to adapt to new technologies. Furthermore, companies must be able to overcome various obstacles, such as resistance to change and limitations of existing systems. Thus, digital transformation is a complex process and requires comprehensive organizational readiness to produce a positive and sustainable impact [1].

As digital transformation advances, companies are increasingly leveraging information technology to improve business performance. The use of technologies such as artificial intelligence, cloud computing, the Internet of Things, and data analytics offers significant opportunities for companies to increase operational efficiency and flexibility in the face of changing business environments. These technologies enable the automation of work processes, increased accuracy in data processing, and accelerated decision-making. By optimally utilizing technology, companies are not only able to increase productivity but also respond to market dynamics more quickly and accurately. In this context, a Management Information System (MIS) is a crucial element supporting information management within an



organization. A Management Information System (MIS) functions as a system that integrates various business activities into a structured whole, making it easier for companies to manage data and information. Through a Management Information System (MIS), the resulting information becomes more accurate, relevant, and quickly accessible to management. This is crucial in supporting decision-making processes, both at the operational and strategic levels. Furthermore, a Management Information System (MIS) helps improve coordination between organizational units, making work processes more efficient and focused [2].

Innovation in Management Information Systems also has a significant impact on improving company performance and profitability. With an integrated system, companies can reduce operational costs through work process efficiency and minimize errors in data processing. Furthermore, MIS enables companies to develop services that are more tailored to customer needs, thereby increasing customer satisfaction and loyalty. Furthermore, MIS innovation also opens up opportunities for companies to create new business models that are more adaptive to market changes. Thus, the role of MIS is not only limited to information processing, but also serves as a strategic tool in creating competitive advantage. On the other hand, the development of digital technology has also led to an increase in the amount of data generated by organizations on a very large scale. This data has complex characteristics, both in terms of quantity, speed, and diversity. This condition requires companies to have the ability to manage and analyze data effectively. In this case, Big Data Analytics Capability (BDAC) is a crucial capability that companies must possess to process data into valuable information that can be used in strategic decision-making. BDAC is not only related to technical capabilities in data processing, but also includes the organization's ability to integrate technological resources, people, and business processes. With this capability, companies can generate deeper insights into consumer behavior, market trends, and potential risks. Furthermore, implementing BDAC also enables companies to increase innovation and operational efficiency through optimal data utilization. Therefore, data analytics capabilities are a critical factor in determining a company's success in facing competition in the digital era [3].

By integrating digital transformation, Management Information System innovation, and data analysis capabilities, companies can build more adaptive and sustainable business systems. These three aspects are interrelated and inseparable in supporting organizational success in the modern era. Companies that can optimally utilize technology and data will have a greater opportunity to grow and win the competition. Conversely, companies that fail to keep pace with technological developments and manage their data effectively will struggle to maintain their existence amidst increasingly fierce business competition.

METHODS

This research uses a qualitative descriptive method with a literature study approach. The study focuses on analyzing the development and implementation of web-based Management Information Systems (MIS) in managing data and information in the digital era. Data were collected from various secondary sources such as books, scientific journals, articles, and previous research related to management information systems, digital transformation, big data, cloud computing, and web-based technology.

The literature study method was chosen because it allows the researcher to understand theories, concepts, and current developments related to MIS comprehensively. The collected data were analyzed using descriptive analysis techniques by identifying, comparing, and interpreting information from various references. The analysis process was carried out through several stages, including data collection, data classification, data interpretation, and drawing conclusions.

This study also examines the implementation of MIS in different sectors such as



education, healthcare, government, and business organizations to understand the benefits and challenges of web-based systems. The research aims to provide a clearer understanding of how MIS contributes to improving organizational efficiency, decision-making, and data management processes in the modern digital environment.

RESULTS AND DISCUSSION

Basic System Concepts and Data Information Concepts

The basic system concept, which explains the interrelationships between components, processes, and objectives, is closely related to the implementation of web-based Management Information Systems. In this context, a web-based management information system is a concrete implementation of a system consisting of various elements such as users, software, databases, and internet networks, which interact to achieve a specific goal, namely producing accurate and relevant information.

The structure and processes within the system, as previously described, are also reflected in web-based systems. The system structure is visible in components such as servers, databases, and user interfaces, while the processes encompass the data processing flow, from input and processing to output in the form of information that can be accessed in real time. With web technology, this process is faster, more integrated, and accessible anytime and anywhere.

Furthermore, the concepts of data and information are at the core of web-based management information systems. Data, initially in the form of raw facts, is collected through various methods and then processed by the system into information that is useful for management. In a web-based system, data processing is automated and computerized, increasing accuracy, reducing errors, and accelerating decision-making.

The system development described previously is also highly relevant in this context. A web-based management information system is the result of a system development process aimed at improving manual or conventional systems into more modern and efficient systems. Web-based innovation allows for increased flexibility, accessibility, and data integration across organizational units.

Therefore, the basic concepts of systems, data, and information form the primary foundation for developing a web-based Management Information System. Without a thorough understanding of the system, data, and their processing processes, the developed system will not be able to produce quality information. Therefore, the implementation of a web-based management information system can be considered a form of innovation that optimizes the system's function in processing data into useful information for the organization [4].

Understanding information systems, understanding information, understanding management systems, and the definition of information data management

The term "system" refers to a collection of interconnected and interacting components. Meanwhile, "information" can be understood as meaningful data. Based on these two definitions, an information system can be described as a human-designed system, consisting of various components within an organization, with the primary purpose of producing and presenting information.

Table 1. Definition of information systems

No	Ahli (Year)	Definition of Information Systems
----	-------------	-----------------------------------



1	Alter (1992)	An information system is a combination of work procedures, information, people, and information technology that is organized to achieve goals in an organization.
2	Turban, McLean, dan Wetherbe (1990)	An information system is a system that collects, processes, stores, analyzes, and disseminates information for a specific purpose.
3	Bodnar dan Hopwood (1993)	An information system is a collection of hardware and software designed to transform data into useful information.
4	Gelinas, Oram, dan Wiggins (1990)	An information system is a man-made system consisting of computer-based and manual components to collect, store, manage data, and provide information to users.
5	Wilkinson (1992)	An information system is a framework that coordinates resources (human and computer) to transform input into output in the form of information to achieve organizational goals.

Terdapat berbagai definisi mengenai sistem informasi sebagaimana dijelaskan pada Tabel 1. Dari beragam definisi tersebut, dapat disimpulkan bahwa sistem informasi melibatkan sejumlah unsur seperti manusia, teknologi, informasi, dan prosedur kerja. Sistem ini juga mencakup proses pengolahan data menjadi informasi, yang bertujuan untuk mencapai target atau sasaran tertentu[5].

Information is a collection of data or facts that have been processed and organized in such a way that they have meaning for the recipient. Data that has been processed into information can provide useful information, understanding, and knowledge to the user. Therefore, information plays a crucial role in an organization or agency.

According to Zakiyudin, information is data that has been processed to increase the knowledge of its users. Meanwhile, Koniyo (2007:7) argues that information is data that has been processed into a form that is useful for the user. Based on these various opinions, it can be concluded that information is data that has been processed, shaped, or adapted to specific needs, thus providing benefits to the user. Essentially, information is the result of data processing that produces more useful knowledge to achieve specific goals. Information is said to be valuable if it provides more benefits than just raw data.

Furthermore, H.M. Jogyanto, in his book "Analysis and Design of Information Systems with a Structured Approach," states that information is data that has been processed into a form that is meaningful to the recipient and has real value to support decision-making, both now and in the future. A similar opinion was also expressed by Gordon B. Davis in his book Basic Framework of Management Information Systems, which explains that information is data that has been processed into a useful and valuable form, so that it can be used in decision making, both for the present and the future[6].

The term management comes from the English word "management," which is rooted in the word "to manage," which means to organize or manage. In general, management can be understood as a way of directing, guiding, and coordinating people within an organization so that the work performed can achieve predetermined goals. Various experts have provided definitions that reinforce this understanding. Harold Koontz and O'Donnell state that management is concerned with achieving goals through others. George R. Terry explains that



management is a process that encompasses planning, organizing, implementing, and supervising, utilizing science and art to achieve goals. The Encyclopedia of Social Sciences views management as the process of implementing specific, pre-planned goals.

Mary Parker Follett emphasizes that management is the art of getting things done through others. Thomas H. Nelson views management as a blend of science and art in combining ideas, resources, and people to produce useful products or services. Meanwhile, G.R. Terry and James A.F. Stoner both emphasize that management encompasses the processes of planning, organizing, leading, and supervising, utilizing all organizational resources. Oei Liang Lie also added that management involves activities ranging from planning to monitoring resources, especially human resources, to achieve specific goals.

Based on these various opinions, it can be concluded that a management system is a unit consisting of various interrelated components and processes, such as planning, organizing, implementing, and monitoring, used to manage resources effectively and efficiently to achieve organizational goals. A management system integrates people, methods, and other resources into a structured mechanism to optimally achieve goals[7].

Definition of Data Management: Data management has been an essential part of human life since ancient times. In early times, humans recorded and processed information using various media such as stone walls, clay, papyrus, and paper. This recording practice was also utilized by ancient scientists such as Ptolemy and Archimedes to collect and analyze data for scientific purposes. Entering the 19th century, the development of data management advanced with the invention of punch cards, which enabled data storage in binary format. Then, in the early 20th century, computers began to be used to automatically manage data. Over time, advances in information technology and the internet brought major changes in how data is stored and processed, such as through the use of databases, cloud technology, and big data analytics. Today, data management is crucial in various fields, including business, science, healthcare, and government.

In general, data management is a series of activities that include collecting, storing, processing, and organizing data so that it can be transformed into useful information for users. Data itself is a collection of raw, unprocessed facts or figures, while information is the result of processed data that has been analyzed to have meaning and value. The main difference between data and information lies in the processing and interpretation process. Data must be processed first to produce useful information, especially to support decision-making. Therefore, proper data management is essential to producing accurate and reliable information[8].

History and Development of Web-Based Management Information Systems

The development of web-based Management Information Systems (MIS) reflects a major shift in how organizations understand, manage, and utilize information. In practice, these systems have evolved not only with technology but also with the increasingly complex needs of organizations. From simply recording data to becoming systems capable of supporting strategic decision-making, MIS has undergone significant transformation through several stages of evolution.

1) Initial Phase: Manual System and Digitalization Foundation (Developed Version)

In its early stages of development, information management within organizations relied heavily on manual methods, such as bookkeeping, paper archives, and other physical documents. These systems essentially served only as storage for information for later retrieval when needed. However, this approach failed to consider efficiency, speed of access, or long-term data accuracy.

As organizational activity increased, the volume of data generated also grew larger and more complex. This led to manual systems beginning to exhibit significant limitations. Data



retrieval processes became time-consuming due to the need to be performed individually, the risk of document loss or damage increased, and errors in recording often went undetected early. As a result, the resulting information became less reliable for supporting operational activities and decision-making.

The development of computer technology then became the starting point for a transformation in information management. Organizations began adopting computer-based systems to replace some manual processes, particularly in data storage and processing. However, at this stage, the systems used were still limited and standalone. Each part of the organization typically had its own system without any interconnectedness between units, resulting in inefficient data exchange.

The primary function of the system at this stage focuses more on basic data processing, such as input, storage, and simple report generation. The system has not been designed to perform in-depth analysis or support strategic decision-making. In other words, the technology used still serves as an administrative tool, not a valuable source of information for management.

From an academic perspective, the development of information systems at this stage is also still in its infancy. Research tends to focus on conceptual introduction, basic technology development, and exploring the benefits of computer use in organizations. Bibliometric studies indicate that scientific publications during this period have not developed consistently and are still general in nature, not yet leading to complex system integration. This indicates that MIS at this stage is still in the process of establishing a conceptual foundation that will serve as a foundation for development in the next phase[9].

2) Transition Phase: Switching to Web-Based Systems and Operational Efficiency (Developed Version)

With the rapid development of network and internet technology, information systems have begun to undergo fundamental changes, from local-based systems to web-based systems. This transition represents a crucial milestone in the evolution of Management Information Systems (MIS), as it not only changes the technology used but also the way organizations manage and utilize data. At this stage, organizations are beginning to realize that manual and semi-digital systems are no longer capable of meeting increasingly complex operational demands. The need for fast information access, data accuracy, and ease of information sharing are the primary reasons for the transformation to web-based systems. By utilizing web technology, data is no longer tied to a specific device or location but can instead be accessed flexibly via the internet.

The implementation of web-based systems has had a significant impact on increasing operational efficiency. Data management becomes more structured due to the systematic design of the system, minimizing errors in recording. Furthermore, the risk of data loss can be reduced because the systems are generally equipped with improved storage and backup mechanisms. Another advantage of web-based systems is their ability to support simultaneous use by multiple users (multi-user). This enables more effective collaboration between organizational units, as each user can access and update the same data directly. This results in faster and more focused work coordination.

Furthermore, the concept of real-time data processing was introduced during this phase. Information can be updated and accessed immediately without the lengthy processes associated with manual systems. This significantly supports operational activities that require speed and accuracy, especially in dynamic work environments. With these advantages, the role of MIS began to shift. Previously, it served solely as a data recording tool, but in this phase, MIS began to contribute to improving work efficiency, streamlining information flow, and supporting coordination between units within the organization.

3) Integration Phase: MIS as an Integrated and Structured System (Developed Version)



Subsequent developments demonstrated that organizations needed not only fast and efficient systems but also systems capable of comprehensively integrating various data sources. During this phase, MIS evolved into more complex and structured systems, where various functions within the organization began to be linked into a single, integrated system. The importance of integration emerged because data scattered across various units was often difficult to utilize optimally. Disconnected information can lead to data inconsistencies, duplication, and delays in decision-making. Therefore, organizations began developing systems capable of uniting various functions, such as finance, operations, logistics, and human resources, into a single, integrated platform.

During this phase, the approach to system development also changed, becoming more systematic and structured. Methods such as the Waterfall approach began to be widely used to ensure that the systems developed truly met user needs. The development process followed clear stages, from requirements analysis and system design to implementation, testing, and maintenance. This demonstrated that MIS development focused not only on technological aspects but also on process management and system quality. Furthermore, the use of a centralized database became a crucial component in supporting system integration. Data is stored in an organized structure for easy access by various departments. A centralized database maintains data consistency and makes information processing more efficient.

Concurrently, various supporting features have been developed to enhance the functionality of an MIS, such as interactive dashboards that present information visually, automated reports that simplify the reporting process, and monitoring systems that enable continuous performance monitoring. These features help management understand the organization's condition more comprehensively and accurately.

With these developments, an MIS no longer functions solely as a data management tool but has evolved into a control tool that supports the organization's monitoring, evaluation, and planning processes. This system is beginning to play a more strategic role in helping management make informed decisions based on integrated and reliable information[10].

4) Modern Phase: Intelligent Web-Based MIS and Data Analytics (Developed Version)

Entering the increasingly advanced digital era, web-based Management Information Systems (MIS) have undergone significant development, not only technologically but also in their role within organizations. In this phase, MIS no longer merely functions as a data management tool, but has evolved into an intelligent system capable of processing, analyzing, and presenting information in greater depth. Technological advances such as Big Data Analytics, Artificial Intelligence (AI), and real-time data processing are key factors driving this transformation. Organizations are now faced with vast amounts of data with high levels of complexity and velocity. This data originates not only from internal activities but also from various external sources such as digital applications, social media, and sensor-based devices.

In this context, modern MIS are required to be able to manage data quickly and efficiently, and transform it into relevant information in a short time. The system no longer operates passively but actively processes and analyzes data. This enables organizations to not only understand what has happened but also understand patterns and trends that may emerge in the future. Functionally, web-based MIS in this phase has far more advanced capabilities. The system can automatically analyze data without intensive manual intervention, reducing human workload and increasing the accuracy of results. Furthermore, the system can leverage historical data to identify trends and generate predictions that are useful for organizational planning. The resulting information is presented in visual formats, such as graphs and interactive dashboards, making it easier for users, especially management, to understand.

These capabilities bring significant changes to the decision-making process. Managers no longer rely solely on intuition or experience, but are supported by measurable data and systematic analysis. This approach is known as data-driven decision-making, where decisions



are based on strong evidence from available data. Furthermore, real-time data processing enables organizations to respond to changes more quickly and accurately, thereby increasing competitiveness in a dynamic environment. However, the success of modern MIS implementation does not solely depend on the sophistication of the technology used. Several other important factors contribute to the system's effectiveness, such as the quality of the processed data, the readiness of human resources to operate and utilize the system, and the governance that regulates data use and security. Inaccurate or poorly structured data can actually produce misleading information.

Furthermore, organizations need to ensure proper integration between systems and a work culture that supports optimal technology utilization. Without such support, even sophisticated systems have the potential to provide less than optimal benefits and can even become a burden to the organization. Thus, in this modern era, web-based MIS not only functions as an operational tool but has become a strategic component that plays a vital role in supporting decision-making, increasing efficiency, and driving innovation within an organization[11].

5) Future Phase: Cloud-Based Adaptive SIM, IoT, and Automation (Under Development)

Given the current direction of technological development, web-based Management Information Systems (MIS) are expected to continue evolving toward systems that are increasingly adaptive, intelligent, and capable of operating automatically. This change is influenced not only by organizational needs but also by advances in digital technology, which are increasingly integrated into various aspects of life. One of the key trends driving this transformation is integration with the Internet of Things (IoT). Unlike previous systems that largely relied on human input, in this phase, data is also generated directly by various interconnected physical devices, such as sensors, machines, and other smart devices. This allows the system to continuously acquire data without having to wait for manual input.

The integration of MIS and IoT opens up significant opportunities for improving the accuracy and speed of information management. Monitoring processes can be conducted in real time, allowing organizations to directly understand operational conditions and take action more quickly. Furthermore, data generated from physical devices tends to be more objective, reducing the potential for human error. In the context of industrial management, the implementation of IoT also enables the integration of digital systems and physical processes, creating a more efficient and coordinated workflow. In addition to IoT, the development of cloud computing is also a crucial factor in shaping future MIS. Cloud technology enables systems to store and process data centrally while remaining accessible from multiple locations. This provides organizations with significant flexibility, particularly in supporting remote work and cross-regional collaboration. Furthermore, cloud utilization helps organizations reduce infrastructure costs and increase system scalability according to needs.

Furthermore, future MIS will increasingly rely on automation and artificial intelligence. Systems will no longer function simply as tools awaiting commands, but will instead be able to act proactively. For example, systems can automatically detect anomalies or problems, provide solution recommendations based on data analysis, and optimize business processes without the need for direct human intervention. This capability is supported by the development of machine learning algorithms, which enable systems to learn from existing data and continuously improve their performance over time. Thus, MIS is not only an information management tool but also acts as a system capable of "thinking" and assisting organizations in making more intelligent decisions.

With these developments, the role of MIS is undergoing significant changes. While previously, MIS served solely as an operational support tool, in the future, this system will become a central control system that integrates various aspects of the organization. MIS will be able to connect data from various sources, analyze it quickly, and provide appropriate



responses to changes. Overall, the web-based MIS of the future will be a system that is not only adaptive to change but also capable of anticipating organizational needs. This makes MIS a key element in maintaining organizational sustainability and competitiveness amidst increasingly dynamic technological developments[12].

SIM Components and Their Domains

A Management Information System (MIS) has several key components that work together to collect, store, process, and disseminate information within an organization. These components include hardware, software, databases, networks and communications infrastructure, human resources, and procedures and policies[13].

1) Hardware

- **Server**

A server is a computer specifically designed to process requests and provide data to other computers on a network, called clients. Servers play a crucial role in storing data and applications, with processing capabilities and storage capacities far greater than those of personal computers. Servers can be used as central storage for information, databases, and applications, accessible to all users within an organization. According to Patel et al. (2022), modern servers are equipped with high-performance processors and large amounts of memory to support big data-based applications and cloud computing[13].

- **Personal Computer**

Personal computers (PCs) are used by individuals to access and process information. In MIS, PCs serve as end-user devices for accessing data and applications provided by servers. Modern PCs have fast processors, large memory capacities, and high graphics capabilities to run resource-intensive applications, such as data analysis and graphic design. According to L. Chen et al. (2023), advances in PC technology allow users to operate more complex applications with higher processing speeds[13].

- **Storage Devices**

Storage devices function to store data securely and efficiently. These devices include hard disk drives (HDDs), solid-state drives (SSDs), and network-attached storage (NAS). HDDs and SSDs are used as primary storage in computers and servers. SSDs offer better speed and durability than HDDs, albeit at a higher price. NASs are used as centralized storage that can be accessed by multiple devices on a network. According to H. Zhang et al. (2021), SSD and NAS technology continue to evolve, offering greater capacity and faster data transfer speeds[13].

- **Input/Output Devices**

Input/output devices allow users to interact with the system. Input devices such as keyboards, mice, and scanners are used to enter data. Output devices such as monitors and printers are used to display and print information. Jones and Williams (2023) state that advances in I/O technology have increased the convenience and efficiency of device use, including through the advent of touchscreens and high-speed printers[13].

2) Software

Software is a crucial component of a Management Information System (MIS), facilitating information processing and supporting various business functions within an organization. In MIS, software can be categorized based on its function, such as operating systems, application software, database software, and network software. Each type plays a crucial role in ensuring the information system runs effectively and efficiently[14]. Types of Software:

- **Operating System**

An operating system is the basic software responsible for managing computer hardware resources and providing various services to application software. The operating system



acts as a bridge between the user and the hardware, allowing multiple applications to run simultaneously and utilize resources optimally. According to Y. Wang et al. (2022), modern operating systems are designed to support distributed and service-oriented computing environments, and are equipped with features such as virtualization and enhanced resource management[14].

- **Application Software**

Application software is designed to help users complete specific tasks, such as document processing, data analysis, and project management. In the context of MIS, application software encompasses various business solutions such as ERP (Enterprise Resource Planning), CRM (Customer Relationship Management), and business analytics applications. Liu et al. (2023) demonstrate that effective application software integration can improve operational efficiency and support decision-making by providing accurate, real-time data[14].

- **Database Software**

Database software is used to build, organize, and manipulate databases. Databases are a crucial component of MIS because they facilitate efficient data storage and retrieval. A Database Management System (DBMS) provides tools for defining data structures, managing user access, and maintaining data integrity. According to research by L. Zhang & Chen (2021), modern database technologies such as in-memory databases and distributed databases have improved system performance and scalability.

- **Network Software**

Network software functions to enable communication and data exchange between computers on a network. These components include network protocols, network management software, and network security software. Reliable network software is crucial to support connectivity and collaboration across an organization. Smith et al. (2023) emphasize the need for secure and stable network software to address increasingly complex cybersecurity threats.

3) Database

A database is a core component of an MIS, serving as a central repository for data used by various applications and business processes. In addition to storing data, a database also provides an efficient mechanism for accessing, organizing, and processing information required by users and applications across the organization.

4) Communication Network and Infrastructure

Network and communications infrastructure are critical elements of a Management Information System (MIS) because they enable the rapid, secure, and efficient exchange of information across an organization. A robust infrastructure helps improve collaboration, accelerate decision-making, and support overall organizational operations[15].

- **Main Network Components**

- a) Router: Connects multiple networks and routes data to reach its destination efficiently.
- b) Switch: Connects devices within a LAN and manages data traffic at the data link level.
- c) Communication Protocol: Rules for exchanging data, such as TCP/IP, HTTP, and FTP.
- d) Access Point: Allows wireless devices to connect to a network and extends its coverage[15].

- **The Role of Networks in SIM**

- a) Communication and Collaboration: Enables rapid communication through email, video conferencing, and collaboration platforms.



- b) Data and Application Access: Provides real-time access so decisions can be made faster and more accurately.
- c) Data Security: Provides protections such as firewalls, encryption, and intrusion detection systems.
- d) New Technology Support: Modern networks support 5G and IoT for fast connectivity and smart devices that can automatically share data[15].

5) SIM Components in the Informatics Field

Networks or telecommunications are a critical component of Management Information Systems (MIS) because they serve as the primary medium for data exchange and information dissemination. In the digital age, networks are not only a means of communication but also a core infrastructure that supports the integration, management, and distribution of data and information across an organization[16]. The role of networks can be seen in two main areas:

- **Data Domain**

- a) Collects, sends, and integrates data from various sources into a central system.
- b) Supports centralized database management, reducing duplication and increasing consistency.
- c) Enables data integration through technologies such as cloud computing and distributed systems, enabling real-time data access from multiple locations.
- d) Facilitates data distribution optimization through robust bandwidth management[16].

- **Information Domain**

- a) Distributing information quickly, timely, and accessible from various locations through web-based systems or network applications.
- b) Ensuring information quality (accuracy, relevance, and timeliness) through reliable network infrastructure.
- c) Network quality (e.g., through QoS parameters) directly impacts the speed and accuracy of information received by users[16].

In addition to these benefits, networks face challenges, particularly in terms of data security. Threats such as hacking and data breaches require organizations to implement robust network security strategies, including encryption, firewalls, and authentication. Networks also support the development of advanced information systems such as big data and AI, which require large and stable data transmission capacity[16].

6) SIM technology infrastructure database and information

Technology infrastructure is a crucial foundation in management information systems (MIS), serving to support the processing, storage, and distribution of data, transforming it into useful information for the organization. This infrastructure comprises hardware, software, communication networks, and interconnected digital platforms. In recent developments, IT infrastructure serves not only as an operational tool but also as a driving force for innovation and competitive advantage for digitally-driven organizations. Research published in the International Journal of Information Management supports this by stating that IT infrastructure is a crucial factor in supporting digital transformation and information systems integration in today's organizations[17].

A data-driven management information system focuses on utilizing data as the primary source in the decision-making process. Information obtained from various sources is processed into accurate, relevant, and timely data. In this regard, innovations such as big data, artificial intelligence (AI), and the Internet of Things (IoT) play a crucial role in improving the quality of information systems. Recent research shows that implementing data-driven technology in MIS can create more accurate, real-time information and support strategic



decisions for organizations[17].

The role of information technology infrastructure in data and information management is crucial, particularly in ensuring speed of access, security, and data integrity. Adequate infrastructure enables institutions to manage large volumes of data efficiently and in a structured manner. Furthermore, the implementation of information technology service management, such as IT Service Management (ITSM), can improve the quality of information system services and the effectiveness of data management. Research shows that the use of an IT management framework can improve system performance and the quality of information services within an organization[18].

The integration of cutting-edge technology and information systems is a key element in improving an organization's efficiency and effectiveness. Connected systems enable rapid data exchange between organizational units, supporting better collaboration and decision-making. Studies using bibliometric analysis show that the integration of information systems and digital technology has a significant impact on improving organizational performance and the effectiveness of business processes[19].

Furthermore, technological infrastructure plays a significant role in information-based asset management. Information systems enable organizations to manage assets more systematically and accurately through the use of integrated data. These systems enable organizations to monitor, assess, and make decisions regarding assets more efficiently. Research indicates that implementing technology-based information systems for asset management can improve operational efficiency and data accuracy within organizations[20].

The rapid development of digital technology has driven many organizations to implement a data-driven approach to information systems management. Currently, the latest information technology infrastructure focuses on the use of big data analytics, cloud computing, and artificial intelligence to improve data quality and speed decision-making. Global research trends also show a significant increase in the topic of data analytics and digital infrastructure in the development of data-driven information systems. This demonstrates that IT infrastructure now plays not only a supporting role but also a strategic element in organizational transformation in the digital age[21].

7) Benefits of Management Information Systems (MIS)

Web-based Management Information Systems (MIS) play a crucial role in supporting organizations in managing data and information in a more optimal, integrated, and efficient manner. This system allows users to easily access information anytime and anywhere as long as they are connected to the internet, enabling more flexible work activities and faster information flow. A management information system's primary function is collecting, processing, storing, and presenting data, which is used as the basis for organizational decision-making.

Furthermore, implementing a web-based system can reduce operational costs by minimizing paper use and accelerating various administrative processes. In terms of security, data can be better managed through login features, user access restrictions, and a systematically organized database. The presence of digital dashboards and reports also facilitates management in periodically monitoring, evaluating, and supervising organizational activities[22].

8) Types of Management Information Systems in Data Management

In general, types of Management Information Systems (MIS) are classified by function and management level. However, in the context of web-based data management, each system can be understood as part of an interconnected flow, from raw data to strategic information[23].

- **Transaction Processing System (TPS)**

The TPS serves as the starting point for data management. This system handles routine and



operational transaction data, such as sales, payments, or user input in web-based systems. At this stage, the data is still in its raw form, so the primary focus of the TPS is ensuring that it is recorded accurately, quickly, and in real time. Without a good TPS, other systems will lack valid data for further processing. This aligns with research showing that web-based systems can improve the speed and accuracy of transaction data processing within an organization[22].

- **Management Information System (MIS)**

While the TPS collects data, the MIS processes it into more structured information. The MIS not only presents data but also summarizes and organizes it into easy-to-understand reports. In web-based systems, the MIS typically takes the form of a dashboard that allows users to quickly view the organization's status. Thus, the MIS serves as a bridge between operational data and managerial information needs.

- **Decision Support System (DSS)**

A DSS takes the data management process to a more complex stage, namely analysis. This system not only displays data but also helps users understand the meaning behind it. Through a DSS, data can be processed using specific analysis models, resulting in insights such as predictions, comparisons, or recommendations. In a web-based context, a DSS becomes even more flexible because it allows for interactive analysis[23].

- **Executive Information System (EIS) / Executive Support System (ESS)** EIS/ESS is the final stage in data management, presenting information in a concise and strategic format. The information presented has typically undergone a selection and simplification process, making it easily understood by upper management. In web-based systems, EIS often takes the form of visualizations such as graphs and performance indicators that can be accessed in real time.

- **Office Automation System (OAS)**

OAS has a distinct role, supporting data management in administrative activities. This system assists in the recording, storage, and distribution of data in the form of digital documents. In a web-based system, OAS facilitates collaboration because data can be accessed and shared online without the constraints of time and space.

- **Knowledge Management System (KMS)**

A Knowledge Management System (KMS) plays a role in managing knowledge derived from previously processed data and information. This system ensures that information is not just used once but can be stored and reused. In data management, a KMS is crucial because it helps organizations build a sustainable knowledge base.

- **Enterprise Resource Planning (ERP)**

ERP functions as a system that integrates all data from various parts of an organization into a single platform. In the context of data management, ERP ensures that the data used is consistent and integrated. Being web- or cloud-based, ERP enables real-time data access by various parties, thus supporting coordination and efficiency within the organization. This is further supported by research showing that web-based system integration can improve data management efficiency within an organization[24].

When viewed holistically, these types of MIS do not stand alone, but rather form a data management cycle. The TPS functions as the data collector, the MIS as the processor, the DSS as the analyzer, and the EIS as the information presenter. The key difference in a web-based system lies in its ability to integrate all these processes in real time. This makes data management faster, more accurate, and more accessible, thereby improving the quality of the resulting information[24].

9) **Data Processing Cycle and the Role of Web-Based Management Information Systems (MIS) at the Management Level**



- **Data Processing Cycle in Web-Based Management Information Systems (MIS)**

The data processing cycle is a series of steps taken to transform raw data into useful information for an organization. With technological advancements, Management Information Systems (MIS) are now widely developed and web-based, enabling data processing to be conducted online, in real time, and integrated. The resulting information is used to support operational activities, supervision, and management decision-making[25].

According to basic theory, the data processing cycle consists of three main stages: input, processing, and output. However, developments in information systems have added several additional stages, resulting in origination, input, processing, output, distribution, and storage[26].

- a) **Data Collection (Origination)**

The initial process related to data in a management information system is data collection. Data is obtained from various sources, both internal and external, such as business transactions, surveys, observations, or Internet of Things (IoT) devices. In a web-based MIS, data collection can be done through digital forms, online applications, or integrated internet-based systems. This data can be in the form of numbers, text, images, or videos, and is often still in its raw form[25]. In data processing cycle theory, this stage is called origination, which is the process of recording data into basic documents or input media[26].

- b) **Data Input**

The next step is entering the data into the system. In a web-based MIS, the collected data is entered through a web form, an online application, or a system connected to the internet, allowing the data to be stored in real time.

- c) **Data Storage and Management (Storage)**

Once data is entered, it is typically stored in a centralized database to ensure security and availability. In web-based MIS, storage is performed via a server or cloud database. Technologies such as a Database Management System (DBMS) are used to organize and structure the data so that it can be easily accessed and managed[25]. In data processing cycle theory, this stage is called storage, which is the process of storing data or processing results for reuse in subsequent processes[26].

- d) **Data Processing**

The next stage is processing the raw data into meaningful information. This process can include calculations, grouping, filtering, sorting, classification, and data analysis. In a web-based MIS, data processing is automated and fast, resulting in accurate, real-time information[26]. For example, daily sales data is processed into a monthly report showing sales trends, best-selling products, and customer behavior patterns[25].

- e) **Information Presentation (Output)**

The processed information is then presented in an easy-to-understand format, such as tables, graphs, web-based interactive dashboards, or written reports. This output becomes the primary result of the management information system, which users will then utilize.

- f) **Information Distribution**

The resulting information is then distributed to relevant parties, such as managers, operational staff, company leaders, or business partners. In a web-based MIS, information is distributed over the internet, allowing users to access it quickly and flexibly, depending on their access rights.

- g) **Utilizing Information for Decisions and Strategy**

The final stage is utilizing information for decision-making and strategic



planning. In a web-based MIS, information can be accessed in real time, helping management make faster, more accurate, and data-driven decisions. The information obtained can be used to improve operational efficiency, develop marketing strategies, evaluate performance, and identify new business opportunities[25].

- **The Role of Web-Based Management Information Systems (MIS) at the Management Level**

Web-based Management Information Systems (MIS) are designed to support a wide range of organizational activities, from daily operations to strategic decision-making. Web technology allows information to be accessed online, in real time, and flexibly, increasing work effectiveness at every level of management[25].

- a) **Operational Level**

Operational-level users are responsible for the organization's daily activities. They use web-based MIS to record transactions, manage inventory, monitor deliveries, and compile routine reports through an online system. Examples of users at this level include administrative staff, warehouse personnel, and cashiers. Web-based MIS makes operational work faster and more efficient, reducing manual errors[25].

- b) **Middle Management**

Middle-level managers utilize web-based MIS to analyze data and compile operational reports. The information obtained can be accessed in real time to monitor work unit performance, make tactical decisions, and oversee the implementation of company policies. Examples of users at this level include department heads, supervisors, and department managers.[25]

- c) **Top Management**

Top management uses web-based MIS to support strategic and long-term decision-making. Information is presented in summaries, graphs, and web-based executive dashboards for easy understanding. Through this system, top management can identify opportunities and challenges, and determine the organization's policy direction based on available data[25].

- d) **External Parties**

In addition to internal use, web-based MIS can also be utilized by external parties such as suppliers, business partners, and customers. They gain limited access through an online portal to monitor order status, conduct transactions, or exchange data. This can increase transparency and collaboration between the organization and external parties[25].

10) SIM placement in various fields

- **Sistem Enterprise Resource Planning (ERP)**

An Enterprise Resource Planning (ERP) system is an information system designed to integrate various activities and resources within an organization into a single system. Through ERP, various business functions such as finance, production, marketing, human resources, and logistics can be interconnected on a single, centralized platform. This creates a more coordinated flow of information, enabling operational activities to run more efficiently, consistently, and easily monitored[27].

In its implementation, ERP consists of several main components. The finance module manages accounting processes, prepares financial reports, and controls budgets. The production module supports production planning, raw materials management, and oversees manufacturing processes to ensure they meet targets. The human resources (HR) module manages employee data, from recruitment and payroll to training.



Furthermore, the logistics module deals with supply chain management, inventory, and distribution. Meanwhile, the sales and marketing module assists in managing sales activities, maintaining customer relationships, and supporting the implementation of marketing strategies[27].

The use of ERP offers a number of benefits to organizations. One of these is data integration, where all information from various departments can be accessed in a single system, reducing data discrepancies. Furthermore, ERP can improve operational efficiency because many processes are automated, reducing repetitive work. From a decision-making perspective, ERP provides real-time data, enabling management to make faster and more accurate decisions. This system also encourages better coordination between departments because all parties use the same data source. Furthermore, ERP is flexible because it can be developed according to the needs and growth of the organization. Some examples of ERP systems widely used in the industrial world include SAP ERP, Oracle ERP Cloud, and Microsoft Dynamics 365[27].

- **Customer Relationship Management (CRM)**

Customer Relationship Management (CRM) has undergone significant developments along with advances in information systems in the digital era. Modern CRM is a strategic approach that integrates technology, processes, and human resources to comprehensively manage customer relationships. This emphasizes that CRM functions not only as a technology system but also as a business strategy for building long-term relationships with customers. Within the context of information systems, CRM plays a crucial role in managing customer data in an integrated manner. This system enables organizations to collect, store, and analyze customer data more effectively. Research shows that a good CRM implementation can significantly increase customer satisfaction and loyalty. Furthermore, the analytical capabilities supported by information systems have also been shown to significantly impact business performance. Data integration is key in information system-based CRM[28]. Organizations that are able to integrate data from various channels have better revenue performance. Technological support such as artificial intelligence and machine learning also further strengthens CRM functions, particularly in personalized service and predicting customer behavior. The success of CRM in information systems is greatly influenced by data quality, technology integration, and the organization's analytical capabilities. With this support, companies can improve customer retention and build stronger relationships. Furthermore, social media integration and the implementation of an omnichannel strategy also make customer interactions more consistent and relevant. Overall, information systems are the main foundation in developing modern CRM. Through the use of data, process automation, and analytical technology, CRM can help organizations better understand customer needs and improve business efficiency and performance. However, its effectiveness still depends on how the system is implemented and tailored to the organization's needs[28].

- **Sistem Informasi Akademik (SIKAD)**

The role of Management Information Systems (MIS), particularly in the form of Academic Information Systems (SIKAD), plays a significant role in improving the quality of education. Based on various research findings, SIKAD not only assists with administrative management but also has a direct impact on the learning process and the overall quality of educational services. In the learning process, the use of SIKAD has been proven to increase efficiency and effectiveness. The use of systems such as Dapodik simplifies the management of educational data, allowing for



a more structured teaching and learning process. With the support of technology such as computers and internet networks, teachers and students can more easily access the information they need. This ultimately impacts the quality of learning and educational services[29].

From a service perspective, SIAKAD plays a role in providing fast and accurate information to all parties, including students, parents, and educators. This system generally covers the management of academic, financial, curriculum, and student data. The quality of educational services can be assessed through several aspects, such as reliability, responsiveness, assurance, empathy, and tangible evidence. With an integrated information system, these services become more consistent and easily accessible. Furthermore, SIAKAD also encourages innovation in learning methods. The use of digital platforms such as e-learning can improve interaction between teachers and students, and supports more flexible assignment and evaluation implementation[29].

This technology can also be combined with learning approaches such as HOTS (Higher Order Thinking Skills), thus not only assisting administration but also enriching the learning process.

In terms of institutional management, information systems are a crucial tool for decision-making. An integrated information system helps schools formulate more appropriate policies because it is supported by complete, real-time data. This information can also be used to evaluate school performance and design strategies to improve the quality of education. SIAKAD also contributes to increased administrative efficiency[29].

The use of systems such as e-learning and digital administration applications can accelerate data processing, archiving, and the new student admission process. In addition to greater efficiency, the use of these systems also reduces errors and minimizes paper use. Overall, the implementation of SIAKAD has a positive impact on the quality of education. Information systems can improve service quality and ease user access to information. However, successful implementation still depends on infrastructure readiness, human resource capabilities, and the system's suitability to the educational institution's needs. Therefore, SIAKAD development needs to be carried out sustainably to maximize its benefits[29].

- **Sistem Informasi Manajemen Rumah Sakit (SIMRS)**

Healthcare services are essentially efforts undertaken individually or in an organized manner to maintain, improve, and restore public health. In practice, these services take various forms and types, depending on the organizational system, scope of activities, and intended service targets. However, in their implementation, hospitals often face obstacles, particularly related to the complex patient care process. One frequently encountered problem is uncertainty in the care process due to an incompletely integrated system. This situation prevents patient information from being accessed quickly and accurately by each service unit, potentially hampering service quality[30].

To address this, the implementation of a Hospital Management Information System (SIMRS) is necessary. SIMRS is an integrated information system used to manage all hospital activities, from patient care and medical records to medication management, to financial and human resource administration. With SIMRS, data management becomes more structured and supports a more effective service process. The importance of SIMRS use is also supported by regulations, such as Law No. Law No. 36 of 2009 concerning Health and Government Regulation No. 46 of 2014 stipulate that every health care facility must have an adequate information system. This



demonstrates that information systems are no longer merely a support system but have become a primary requirement in health care management[30].

In practice, the implementation of a SIMRS (Hospital Information System) provides various benefits, such as accelerating the service process, improving data accuracy, and facilitating coordination between units. Furthermore, SIMRS can also be used as a basis for decision-making because it provides more comprehensive and integrated data. However, the implementation of SIMRS in several hospitals is still suboptimal. For example, some modules are still incomplete, such as those for polyclinic services, which are still handled manually. Furthermore, integration between departments, such as between filing and registration units, has not been well-functioning, resulting in manual retrieval of medical record documents. This situation indicates that the utilization of information systems is not yet fully maximized. On the other hand, SIMRS also plays a role in measuring patient satisfaction and supporting hospital performance evaluation. The resulting data can be used by management for analysis, although in some cases it may require additional processing using other applications such as SPSS[30].

Overall, the SIMRS plays a crucial role in improving the quality of healthcare services. However, its success depends heavily on the completeness of the system, the level of integration between units, and the human resource capabilities required to operate it. Therefore, the development and utilization of SIMRS need to be continuously improved to support more optimal healthcare services[30].

- **E-Government**

In today's era of technological advancement, the use of information technology has become a necessity in various sectors, including government. In this context, the government is required to carry out its functions effectively to realize good governance. The concept of good governance began to develop in Indonesia during the reform era as a response to various problems of the previous era, such as weak social control and the dominance of centralized power. However, in practice, the implementation of this concept has not been optimal, so the government continues to strive to make it the foundation of government administration[31].

One such effort is the implementation of an e-Government-based Management Information System (MIS). E-Government is the use of information and communication technology in the provision of public services, both as a medium for information delivery and as a means of communication between the government and the public, the business world, and between government agencies. The implementation of e-Government in Indonesia was officially encouraged through Presidential Instruction No. 3 of 2003 concerning national policies and strategies for e-Government development. In practice, e-Government initially took the form of simple services, such as providing information through government websites. With technological advancements, these services have evolved into more active interaction channels, such as email, online complaint services, and other digital communication platforms. This demonstrates that information systems play a crucial role in increasing transparency and accessibility of public services. In terms of organizational performance, the implementation of computer-based MIS has been proven to help employees complete their work more quickly and efficiently compared to manual systems. Furthermore, information systems also play a supporting role in decision-making. The information generated must be relevant, accurate, and timely to be used as a basis for policy-making, especially since government decisions directly impact the interests of the wider public.

E-Government also serves as a means of faster information dissemination[31].



Through the use of the internet and websites, the public can easily access various information related to public services without having to visit the relevant agencies in person. Furthermore, information systems also support government operational activities, such as report preparation and data management, thus making them more efficient in terms of time and effort. However, e-Government implementation still faces several obstacles. These include limited technological infrastructure, a lack of human resource capacity to manage the system, and suboptimal data management. Furthermore, there are still weaknesses in management and work processes, such as unprepared regulations, a lack of thorough planning, and budget constraints in some agencies.

Overall, e-Government plays a crucial role in supporting a more transparent, efficient, and responsive government. However, to maximize its benefits, readiness is required across various aspects, including technology, human resources, and policies that support its implementation[31].

11) Advantages and Disadvantages of SIM

- **Advantages of Management Information Systems**

- a) **Efficiency**

Management Information Systems (MIS) play a significant role in improving organizational operational efficiency through business process automation and data integration. Through the implementation of MIS, various activities such as data processing, report preparation, and information distribution can be carried out more quickly and accurately compared to manual methods.

Numerous studies have shown that the use of MIS can improve business process efficiency because the system provides fast, relevant, and integrated information, thus supporting interdepartmental coordination within the organization[32]. Furthermore, MIS also contributes to minimizing duplication of work and accelerating the flow of information, ultimately improving overall operational effectiveness and efficiency.

- b) **Accuracy**

Management Information Systems (MIS) play a crucial role in improving data accuracy through the use of structured and integrated databases. Data processed in MIS generally undergoes a validation process, thereby reducing recording errors and data inconsistencies that often occur in manual processes.

Research findings indicate that MIS significantly improves information quality, particularly in terms of accuracy, speed, and relevance. This improved information quality contributes to more accurate and accountable decision-making[33]. Thus, organizations can avoid the risk of decision-making based on invalid or inaccurate data.

- **Disadvantages of Management Information Systems**

- a) **Cost**

Implementing a Management Information System (MIS) requires a relatively large investment, including the procurement of hardware and software, as well as a system development process tailored to the organization's needs. Furthermore, organizations must allocate a budget for human resource training to enable them to operate and utilize the system optimally.

Numerous studies indicate that implementation costs are a major barrier to MIS adoption, especially for organizations with limited resources[34]. These costs arise not only during the initial implementation phase but also continue to arise in the form of maintenance, upgrades, and system adjustments to maintain relevance to



technological developments and organizational needs.

b) Dependence on Technology

The implementation of a Management Information System (MIS) makes organizations highly dependent on technology to carry out their operational activities. This dependence has the potential to create obstacles if system disruptions occur, such as errors, server downtime, or network failures. These conditions can disrupt work processes and reduce organizational productivity.

Furthermore, the effectiveness of a Management Information System (MIS) is heavily influenced by the readiness of the technological infrastructure and the competence of human resources. If any of these aspects is not functioning optimally, system performance will be disrupted and unable to deliver the desired results. Therefore, successful MIS implementation requires reliable technological support and human resources with adequate skills to operate the system[35].

12) Challenges and Risks of Management Information Systems

• **Data Security**

Management Information Systems (MIS) store and manage large amounts of data, making them vulnerable to various security threats, such as data leaks, hacking attacks, and misuse of information by unauthorized parties. These risks increase with the increased reliance of organizations on digital systems to support daily operations.

Recent research shows that increasing the use of digital systems must be accompanied by strengthening information security systems. This is because organizational data is both a strategic asset and highly vulnerable to external and internal threats. Therefore, implementing a MIS requires a comprehensive security mechanism to maintain the confidentiality, integrity, and availability of organizational data[36].

• **Human Error**

Even though Management Information Systems (MIS) are supported by automated technology, the human factor remains a potential source of error. Human error can manifest itself in various forms, such as data input errors, user misunderstanding of system features, and system use that does not comply with established operational procedures. These errors can result in inaccurate information, thus affecting the decision-making process.

Research shows that human resources are a key determinant of successful MIS implementation. Therefore, adequate training, competency development, and effective monitoring mechanisms are necessary to minimize potential errors and ensure optimal system utilization[35].

• **Implementation Costs**

Besides being a weakness, cost is also a major challenge in implementing a Management Information System (MIS). Organizations need to allocate budgets not only for initial implementation costs such as hardware, software, and system integration but also for system development and upgrades as technology evolves.

This ongoing investment is crucial to ensure the system remains relevant, secure, and capable of supporting the organization's operational needs.

Several studies indicate that high investment requirements are a factor influencing the success of MIS implementation. Organizations with limited financial resources often face challenges in ensuring the continuity of system management and development, impacting the effectiveness and sustainability of MIS use in the long term[37].

• **System Dependence**

High reliance on Management Information Systems (MIS) can create vulnerabilities for organizations, particularly when system failures occur. Disruptions such as device



failures, software errors, or network outages can disrupt business processes that rely heavily on these systems. This situation has the potential to reduce productivity and disrupt the smooth operation of the organization.

Furthermore, research shows that reliance on technology is a major challenge in MIS implementation. Rapid technological developments require organizations to continually adapt and update their systems. If organizations fail to keep pace with these developments, MIS performance can decline and no longer optimally meet operational needs[34].

CONCLUSION

Based on the analysis conducted, it can be concluded that web-based Management Information Systems (MIS) play a vital role in supporting data and information management in the digital age. The evolution of information technology has driven a shift from manual methods to integrated, real-time, and data-driven systems, thereby enhancing operational efficiency, the accuracy of information, and the quality of decisions made within organizations. MIS is not merely a tool for processing data but has evolved into a strategic system capable of providing insights through data analysis, supporting innovation, and strengthening an organization's competitiveness.

Furthermore, the success of MIS implementation is significantly influenced by the readiness of technological infrastructure, data quality, and human resource capabilities. Although it offers many benefits, an MIS also faces various challenges such as high implementation costs, reliance on technology, and data security risks. Therefore, effective management, maximum system integration, and strengthening of security measures and user training are necessary to ensure the system is utilized optimally. Thus, a web-based MIS becomes a key factor in supporting the sustainability and progress of an organization amid increasingly rapid technological advancements.

REFERENCES

- [1] G. Vial, "JOURNAL OF STRATEGIC INFORMATION SYSTEMS".
- [2] J. W. Kang, A. N. Lonbani, Z. Sadeghinejad, and L. Petrov, "History of Research on Big Data Analytic Capability of the Firm," 2026, doi: 10.61978/data.v4i1.1318.
- [3] M. M. Mutoffar, A. Bahar, and F. Mustafa, "The Role of Management Information System Innovation as a Catalyst to Enhance Profitability in the Contemporary Digital Business Era," vol. 13, pp. 172–180, 2024.
- [4] T. Sutabri, *Konsep Sistem Informasi*, Inunk Nast. Yogyakarta: CV ANDI OFFSET (Penerbit ANDI), 2012.
- [5] P. S. Jari and C. Surabaya, "Jurnal Sistem Informasi," vol. 2, pp. 60–65, 2013.
- [6] Fithrie Soufitri, *Konsep Sistem Informasi*. PT Inovasi Pratama Internasional.
- [7] D. Hadion Wijoyo, *Manajemen, Sistem Informasi*, Mada Faisa. ICM Publisher, 2021.
- [8] A. Suparman *et al.*, *Pengenalan Dasar Komputer*. Batam, Indonesia: CV. Rey Media Grafika, 2023.
- [9] A. N. Huda, H. Furkon, H. Firmansyah, M. Zidan, A. Bimo, and W. Yahya, "ANALISIS BIBLIOMETRIK GLOBAL TREN PERKEMBANGAN," vol. 10, no. 4, pp. 2216–2236, 2025.
- [10] A. Info, "Streamlining Inventory Management Through a Web-Based Information System : A Case Study in an Academic Computer," vol. 4, no. 3, pp. 351–365, 2025.
- [11] A. Önden, "A Systemic Approach to Decision Support and Automation : The Role of Big Data Analytics and Real-Time Processing in Management Information Systems," pp. 1–



- 20, 2026.
- [12] X. Mu and M. F. Antwi-afari, "The applications of Internet of Things (IoT) in industrial management : a science mapping review," 2023, doi: 10.1080/00207543.2023.2290229.
 - [13] N. A. Banyal, M. Kom, and D. Anggraini, *Pengantar Sistem Informasi Manajemen*, no. 227.
 - [14] B. W. Aulia, M. Rizki, and P. Prindiyana, "Peran Krusial Jaringan Komputer dan Basis Data dalam Era Digital," vol. 1, no. 1, pp. 9–20, 2023, doi: 10.33197/justinfo.vol1.iss1.2023.1253.
 - [15] I. W. Lahiya and F. Arifin, "Implementation of FDSS (Fuzzy Decision Support System) Sugeno Model in Optimizing Bandwidth Requirement Management of Web-Based Networks," vol. 8, no. November, pp. 171–181, 2023.
 - [16] P. Studi, T. Telekomunikasi, J. T. Elektro, P. N. Sriwijaya, and B. Lama, "Analisis Quality of Service Jaringan Wireless Local Area Network di PT PLN Indonesia Comnets Plus Strategic Business Unit Regional Sumbagsel," vol. 6, no. 2, 2023, doi: 10.32493/jtsi.v6i2.32246.
 - [17] A. P. Yunanda and J. Veri, "Systematic Study : Data and Information Management in Management Information Systems in the Digital Era," vol. 15, no. 02, pp. 401–410, 2025, doi: 10.54209/infosains.v15i02.
 - [18] C. Tjonadi, K. V. W, V. Roselin, V. Natalie, and A. Maulana, "Manajemen Layanan Teknologi Informasi Perusahaan Perseroan Menggunakan Information Technology Infrastructure Library Service Operation : Literature Review," vol. 1, no. 2, pp. 56–62, 2023, doi: 10.54259/jdmis.v1i2.1611.
 - [19] I. I. Systems, "Jurnal EMT KITA," vol. 10, no. 2, pp. 697–707, 2026.
 - [20] U. B. Surabaya, "DESIGN AND CONSTRUCTION OF INFRASTRUCTURE ASSET MANAGEMENT INFORMATION SYSTEMS USING THE RAPID," vol. 9, no. 2, pp. 109–118, 2024.
 - [21] I. Sharma, M. Bamba, B. Verma, and B. Verma, "Mapping The Web Of Knowledge : A Bibliometric Analysis Of Stock Markets Interlinkage," vol. 10, 2025.
 - [22] I. Pendahuluan, "Perancangan Sistem Informasi Manajemen Berbasis Web dalam Pengelolaan Data Siswa," vol. 6, pp. 738–753, 2022.
 - [23] J. M. David Bourgeois, James L. Smith, Shouhong Wang, *Information Systems for Business and Beyond (2019)*. Open Textbooks, 2019.
 - [24] P. Studi, S. Informasi, F. T. Informasi, U. Tarumanagara, and G. Petamburan, "PERANCANGAN SISTEM INFORMASI MANAJEMEN DATA," pp. 1–6.
 - [25] C. Purnama, "Sistem Informasi Manajemen".
 - [26] R. Sanjaya, F. R. Saputra, M. H. Ghiffari, T. Informatika, and U. Pamulang, "Peran Sistem Informasi Manajemen dalam Meningkatkan Efektivitas Pengambilan Keputusan Organisasi," vol. 10, pp. 2134–2138, 2026.
 - [27] M. S. . Santoso, S.Kom. *et al.*, *Buku Ajar Pengantar Informasi*, Efitra. PT. Sonpedia Publishing Indonesia, 2025. [Online]. Available: https://books.google.co.id/books?hl=id&lr=&id=uDxHEQAAQBAJ&oi=fnd&pg=PA1&ots=m_0BESOZR9&sig=wPHvfyGqitHjqwG53pSAQlfgOxI&redir_esc=y#v=onepage&q&f=false
 - [28] L. A. Putri and H. Ali, "Pengaruh Sistem Informasi Terhadap Inovasi Digital , Transformasi Digital , dan Customer Relationship Management (CRM)," vol. 1, no. 3, pp. 117–127, 2024.
 - [29] J. Tahsinia, R. Rismawati, T. Ibrahim, I. Kartika, and O. Arifudin, "Peran sistem informasi dalam meningkatkan mutu layanan pendidikan," vol. 5, no. 7, pp. 1099–1122, 2024.
 - [30] M. S. Pane, N. Fanisya, S. R. Rizkina, and Y. Prinkawati, "Sistem Informasi Manajemen



- Rumah Sakit (SIMRS) Untuk Meningkatkan Mutu Pelayanan Kesehatan Di Indonesia,” vol. 1, no. 3, 2023.
- [31] S. Informasi and M. Sim, “SARANA PENCAPAIAN E-GOVERNMENT,” vol. 14, no. 2, pp. 184–195, 2022.
- [32] D. A. Hasiholta *et al.*, “Peranan sistem informasi manajemen dalam meningkatkan efisiensi proses bisnis organisasi,” vol. 02, no. November, pp. 95–100, 2025.
- [33] M. F. Fadillah, M. Irwan, and P. Nasution, “Manfaat Dan Tantangan Yang Dihadapi Pada Penerapan Sistem Informasi Manajemen Dalam Pengambilan Keputusan Oleh Organisasi,” vol. 2, no. 1, 2025.
- [34] D. Azizan, D. N. Harvie, M. F. Rivai, P. S. R, R. Wulandari, and I. Heidiani, “Sistem Informasi Manajemen : Implementasi , Tantangan , dan Dampak Teknologi (Literature Review),” vol. 2, no. 10, pp. 1867–1869, 2025.
- [35] G. Pitoy, M. Paat, and Y. Rindengan, “EVALUASI KEANDALAN SISTEM INFORMASI MANAJEMEN DALAM Mendukung PROSES BISNIS PERUSAHAAN,” vol. 10, no. 7, pp. 1–8, 2025.
- [36] N. Solekha *et al.*, “ANALISIS DAMPAK PENERAPAN SISTEM INFORMASI,” vol. 2, pp. 17–31, 2025.
- [37] R. R. Novelina and T. P. Sasmita, “Analisis Pengaruh Kualitas Sistem Informasi Manajemen Terhadap Pengambilan Keputusan Strategis Dalam Organisasi,” vol. 4, no. 2, pp. 3610–3619, 2025.