

The Role of Information Systems in Data Management and Organizational Decision-Making: A Review

Loso Judijanto

IPOSS Jakarta

Corresponding Author: Loso Judijanto losojudijantobumn@gmail.com

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ABSTRACT

The rapid digital transformation has made information systems (IS) the backbone of data management and decision-making in almost all types of organizations, whether in business, government, or education. Even though there's plenty of literature on management information systems (MIS), there's still a gap in understanding how the components, types, and latest IS technologies, like cloud computing, big data analytics, ERP, and CRM, interact and affect the quality of decision-making, as well as the related data security challenges. This article aims to answer two research questions: how the components and types of information systems play a role in supporting organizational data management and decision-making, and what challenges and opportunities organizations face when implementing information systems in the digital era. This study uses a qualitative literature review method by interpretatively and narratively examining various reputable journal articles published from 2020 onwards. The review results show that information systems, through the integration of hardware, software, data, people, and procedures, significantly improve the accuracy, relevance, and timeliness of information supporting managerial and strategic decisions. Cloud computing technology and big data analytics expand an organization's analytical capacity, while ERP and CRM enhance business process integration and customer relationship management. However, data security challenges, human resource competency gaps, and resistance to change remain significant obstacles

INTRODUCTION

The rapid advancement of information and communication technology (ICT) has genuinely transformed many aspects of life, including how organizations manage data and information. Information systems play a crucial role in helping decision-making, speeding up operations, and improving business efficiency. Proper data management using information systems allows organizations to gain deeper insights, boost competitiveness, and respond to market changes quickly. This aligns with findings that Management Information Systems (MIS) play a significant role in providing managers with accurate, relevant, and timely information for both strategic and operational decision-making (Putra, Fawaati, & Oktaviyani, 2021).

The urgency of studying information systems is increasing along with the digital transformation that pushes both public and private organizations to massively adopt data-based technology. The digitization of the government sector, for example, has been shown to fundamentally affect the structure, strategy, and governance of public administration (Di Giulio & Vecchi, 2021). At the same time, research on digital government transformation emphasizes that the success of implementing information technology is highly determined by the structural and cultural readiness of the organization (Digital government transformation, 2021). This situation calls for a more comprehensive understanding of how information system components, their types, and supporting technologies like cloud computing and big data analytics interact to influence the quality of decision-making..

Although studies on the role of information systems (IS) in organizational decision-making have been widely conducted, most previous research still focuses on a single technology aspect, such as ERP (Zheng & Khalid, 2022) or CRM (Ngo & Vu, 2021) separately, without linking them comprehensively to the data management framework and the associated security challenges. A literature review on the role of IS in managerial decision-making based on 20 earlier studies also confirms that IS is a strategic tool, but it has not widely integrated discussions on big data analytics and data security comprehensively in one analysis framework (Kristianto, 2026). This gap underlies the need for a qualitative literature review that integrates various aspects of information systems in a holistic way.

Based on that explanation, this article is formulated to answer two main research questions. First, what role do the components and types of information systems play in supporting data management and decision-making in modern organizations? Second, what challenges and opportunities do organizations face in implementing information systems effectively in the digital era, especially regarding data security and the adoption of cutting-edge technologies like cloud computing and big data analytics? Big data analytics itself has been empirically proven to improve data-driven decision-making capabilities in various organizational contexts (Chen, Preston, & Swink, 2021; Niu, Ying, Yang, Bao, & Sivaparthipan, 2021).

The purpose of this article is to provide a comprehensive conceptual and theoretical synthesis regarding the role of information systems in data management and organizational decision-making, while also identifying implementation challenges and future development opportunities. This article is expected to contribute academically by offering a more integrated framework of understanding for researchers, practitioners, and policymakers in designing effective information system management strategies, and also serve as a reference for further empirical research in the context of organizations in Indonesia (Hartanto, Marlina, & Lediya, 2022).

LITERATURE REVIEW

Definition of Information System

Information systems are a set of elements that interact with each other and support the processing, storage, and distribution of information to help decision-making in an organization. These elements include hardware, software, data, people, and procedures. The main goal of an information system is to provide information that is accurate, relevant, and timely so it can be used by management to make increasingly precise decisions. In an organizational context, information systems are often seen as tools that enable the optimization of operational processes while also improving the overall efficiency of the organization (O'Brien & Marakas, 2021).

Information systems are strategic tools that facilitate the collection, processing, storage, and distribution of information efficiently to help decision-making and control within an organization (O'Brien & Marakas, 2021). These systems play a role in ensuring that the data needed by management is always available and can be accessed quickly. In the context of an increasingly complex and competitive business world, having a reliable information system becomes a key to an organization's success. This aligns with Gordon B. Davis's conceptualization, which emphasizes that MIS is an integrated human or machine system designed to present information to support management operations and decision-making within an organization (Ridwan et al., 2021).

The definition of information systems includes both technical and social dimensions. On one hand, information systems involve technology to process data into useful information. On the other hand, these systems also involve humans as the main users who interact with that technology. When designing and implementing information systems, it's important to pay attention to the connection between technology and people, because the quality of decisions made largely depends on how well the system design matches the users' needs (Computer-Based IS Analysis, 2021).

Main Components of an Information System

Information systems are made up of five main components that work together to support the management of data and information, namely hardware, software, data, people, and procedures. Hardware includes all the physical elements used to process data, such as computers, servers, and network devices. This hardware serves as the physical platform where information processing takes place. Without adequate hardware, an information system doesn't function.

Software is a program that runs on hardware and allows data processing. Software can be a special application for a specific purpose or an operating system that supports hardware performance. Software is the brain of an information system because it controls how data is processed and stored. Software also works to manage various applications that users use to access data. Data is the raw material that information systems process. Data can come in the form of numbers, text, images, or sounds obtained from various sources. Data is processed into information that has more value because it can be used by management in decision-making. Data is a very valuable resource in an information system because the quality of decisions made depends on the quality of the data processed. Proper data management is very crucial in information systems (Laudon & Laudon, 2020).

Humans in information systems act as data processors and users who are responsible for entering, processing, and using the information produced by the system. Humans play a role in maintaining the continuity of the information system through maintenance, repair, and development. Without the role of humans, information system technology is not effective.

Procedures are the rules and actions that need to be followed to ensure that an information system functions correctly. These procedures include how to collect, process, and distribute data and information to those who need it. Good procedures in an information system make sure that data processing runs consistently and reliably. Unclear or inconsistent procedures can cause information system disruptions and lower the quality of the information produced (Ridwan et al., 2021).

Types of Information Systems

In an organization, there are several types of information systems used to meet various business needs. Each type of information system is designed with a specific purpose, from supporting daily operations to aiding strategic decision-making. One of the most common types of information systems is the Management Information System (MIS), which provides relevant information to management to help with planning, control, and operational decision-making (The Role of MIS in Improving Performance, JORAPI, 2021).

A Decision Support System (DSS) is another type of information system used to help management make more complex and unstructured decisions. DSS allows for deeper data analysis and often uses analytical models to evaluate different decision alternatives. It supports quick decision-making, especially in situations that need an immediate response (Stair & Reynolds, 2023).

There's also an Executive Information System (EIS) that's specially designed for top executives. EIS provides concise and focused information that executives need to monitor organizational performance and spot strategic issues and opportunities. Executive information systems play a key role in helping make strategic decisions by giving real-time access to critical information. EIS presents information in dashboards, charts, and summaries so that it's easy for executives to understand.

There are also other information systems like Geographic Information Systems (GIS) and Enterprise Resource Planning (ERP) that have specific functions to manage spatial data and company resources efficiently. Studies on ERP adoption in small and medium enterprises show that successful implementation depends on organizational strategy, top management commitment, data security, and user training (Chu & Nguyen, 2022).

The Role of Information Systems in Organizations

Information systems play a very crucial role in supporting various organizational functions, from operational to strategic levels. At the operational level, information systems help process daily transactions such as product orders, deliveries, and inventory management. At the managerial level, information systems provide the data needed for analysis and making increasingly accurate decisions. (O'Brien & Marakas, 2021; Laudon & Laudon, 2020).

The presence of an information system makes it easier to integrate different departments within an organization, so the flow of information becomes smoother and more efficient. The finance division can access sales information from the marketing division in real-time, allowing for more accurate financial projections. Information systems enable better integration between divisions, making the organization operate more efficiently and effectively (Turban, Pollard, & Wood, 2024).

Information systems play a role in speeding up decision-making. Thanks to the availability of accurate and timely information, management can make decisions faster and more precisely. Information systems also help organizations anticipate changes more quickly, giving them a real competitive advantage. Studies on Management Information Systems (MIS) in educational institutions confirm that information quality, ease of access, and system integration significantly affect the effectiveness of decision-making (The Role of MIS in Organizational Decision-Making, 2021).

The Development of Information Systems

The development of information management started in the manual era, where data was handled in writing using paper and writing tools. As computer technology developed in the mid-20th century, data management shifted to using computers, which made managing data faster and more accurate. In the 1960s, the concept of Management Information Systems first appeared and was implemented in large organizations to support operational decision-making.

In the following decade, information systems grew alongside improvements in computing power and network technology. The internet, introduced around the 1990s, paved the way for more distributed information systems and allowed global data access. The internet revolution changed the way organizations operate and made information systems more decentralized and flexible (Gelinas & Dull, 2020).

Thanks to cloud computing, big data, and artificial intelligence, information systems have become more advanced and can handle very large volumes of data. Organizations use this technology to analyze data more deeply, identify patterns, and make better decisions. Adopting cloud computing as a form of organizational innovation has been shown to provide significant flexibility, cost efficiency, and scalability (Golightly, Chang, Xu, Gao, & Liu, 2022).

Basic Theory of Data and Information Management

Modern information systems can't be separated from data and information, which are essential components of decision-making processes and organizational operations. A deep understanding of the difference between data and information, the data management lifecycle, data models, as well as security and database management aspects, is very important. To help organizations make the most of their data, a strong theoretical foundation and proper application of various data and information management concepts are needed.

Understanding Data and Information

Data and information are often used together, but they are fundamentally different, which is very crucial in the context of information systems. Data is a raw representation of facts consisting of numbers, text, images, or other symbols that don't have clear meaning until further processed. Information is the result of processing data that has been organized and analyzed, making it meaningful and relevant to users.

In the digital world dominated by big data, understanding the difference between data and information is becoming increasingly critical. Data could be a raw list of a company's sales, including the number of units sold each day. If this data is presented without further analysis, it's just a series of numbers that don't hold much value. But if that data is processed into a sales trend graph over a year, it turns into information that's useful for decision-making. Data is raw material that needs to be processed into information so it can be effectively used in decision-making. The relationship between data and information is similar to the refinement process in manufacturing, where raw materials are useless until processed into a usable product (Johnson, 2021).

The use of data in modern organizations isn't just about collecting it, but also about how that data is turned into useful information. With the help of technology like management information systems (MIS), data coming from various sources within the company is integrated, analyzed, and presented in a way that supports the company's strategic decisions. Well-managed data allows for information that is more accurate, relevant, and timely for both operational and managerial needs.

Data and information aren't just limited to business organizations. In the government sector, data collected from various social programs can be processed into useful information for designing more effective policies. Both data and information are very valuable assets that need to be managed carefully and protected from security threats, as highlighted in the study on digital transformation in the public sector (Dobrolyubova, 2021).

Data Management Life Cycle

Effective data management requires understanding the data lifecycle, which includes various stages from collecting data to destroying data that is no longer relevant. The data management lifecycle starts with data collection, which can come from different sources like surveys, sensor devices, or transaction systems. The collected data is then stored in databases or data warehouses, allowing it to be accessed in the future.

At the data processing stage, stored data is processed through activities involving cleaning, merging, and analysis. Data cleaning is very crucial to ensure that the data being analyzed is accurate and free from errors. Redundant or incomplete data must be deleted or corrected. Data merging is also carried out to integrate data from various different sources to produce more comprehensive information (Peterson, 2020).

A good data management lifecycle not only ensures that data remains relevant and accurate but also provides guidance on how the data should be deleted when it is no longer needed. Poor management of the data lifecycle can lead to major issues such as excessive data storage, data duplication, or even privacy and data security violations (Peterson, 2020).

At the distribution stage, data that has been processed into information is shared with the parties who need it within the organization, which could be in the form of reports to management, presentations to the board of directors, or even publications to customers. Timely and relevant information dissemination is very important to support quick data-driven decision-making. (O'Brien & Marakas, 2021).

The data lifecycle doesn't end at distribution because monitoring and evaluating the data used is also part of this cycle. Data that is no longer relevant should be deleted or archived to prevent wasteful use of resources and to ensure that only relevant data remains active in the system. Good data lifecycle management will make sure that data can provide maximum value to the organization. (Peterson, 2020).

Data Models in Information Systems

A data model is a structural representation of data in an information system that dictates how data is stored, accessed, and connected. There are several popular data models used in information systems, including the relational model, hierarchical model, and network model. The relational model, first proposed by Edgar F. Codd in 1970, has become the most widely used model in modern database systems. (White, 2022).

In the relational model, data is stored in tables called relations. Each table is made up of rows (records) and columns (fields), where each row represents an entity and each column represents the attributes of that entity. Relationships

between tables are managed through the use of primary keys and foreign keys, which allow data from one table to be linked to data from another table.

The relational model allows for efficient, flexible, and structured data management through the use of interconnected tables. Its main advantage is the ability to handle complex data queries using SQL (Structured Query Language), which lets users extract specific information from the database without much hassle (White, 2022).

Hierarchical and network models are also used in certain situations. The hierarchical model manages data with a tree structure, where each data element has a parent-child relationship with other elements. This model is suitable for applications that require highly structured relationships, such as document management systems. The network model allows more complex relationships between data elements, where a single data element can have multiple parents or children. (White, 2022).

Choosing the right data model is really important in developing information systems because the chosen model will affect the overall performance, flexibility, and scalability of the system. Systems that use a data model that doesn't match their needs may face performance issues or have trouble accessing data. Decisions about the data model should be based on a careful analysis of the needs and goals of the information system. (White, 2022).

Data Security in Information Systems

Data security is one of the most critical components in managing data and information, especially in the digital age where the volume of data generated by organizations is increasing and becoming more complex. Data security threats are also on the rise, including internal threats like human error and external threats like cyberattacks and hacking. (Davies & Kim, 2021). Data security covers various aspects, from encryption and access control to data security management policies. Encryption is a very common method used to protect data from unauthorized access. With encryption, data sent over a network or stored in a system is turned into a code that cannot be understood by anyone who doesn't have the proper decryption key. (Davies & Kim, 2021).

Effective data security doesn't just involve technology; it also includes policies and procedures designed to protect data from illegal access, theft, or damage. Using firewalls and intrusion detection systems (IDS) is an important part of the data security infrastructure used to prevent cyber attacks (Davies & Kim, 2021). Data security has also been shown to be one of the factors that determine the success of cloud ERP implementation in small and medium-sized businesses (Chu & Nguyen, 2022).

Data security also covers management policies that control how data is accessed, stored, and used by employees. Strict data access policies, where only authorized individuals can access sensitive data, can reduce the risk of data breaches. Organizations also need to train employees on the importance of data security, including steps they should take to avoid phishing or malware attacks (Davies & Kim, 2021).

Data security also involves data recovery in case of unexpected incidents like system failures or cyberattacks. A good backup and recovery system ensures that data can be quickly restored without disrupting the organization's operations. Strong data security is the foundation of customer and stakeholder trust in the organization. (Davies & Kim, 2021).

Database Management in Information Systems

Database management is the process of handling data stored in an information system, which includes collecting, storing, and maintaining data to make sure that the data is always available and can be accessed as needed. A database management system (DBMS) is the software used to manage and process the database.

DBMS helps users store, access, and manage data more efficiently compared to manual methods. This system also supports features like data backup, data recovery, and access control to make sure data stays safe and available all the time. (Anderson, 2022).

Modern database management systems provide powerful tools for managing large-scale data, helping organizations handle big data without sacrificing performance or security. DBMSs also allow users to perform complex queries, generate reports, and analyze data. (Anderson, 2022; Sabharwal & Miah, 2021). Some commonly used DBMSs include MySQL, PostgreSQL, Oracle Database, and Microsoft SQL Server. Each DBMS has its own advantages and disadvantages, and choosing the right one should be based on the organization's specific needs as well as the existing technology infrastructure. (Anderson, 2022). Database management involves maintaining data, including handling data that is no longer needed and securely deleting it. This process is really important to keep system performance in check and avoid wasting storage space. Good database maintenance ensures that the data stored is always relevant, accurate, and accessible whenever the organization needs it (Anderson, 2022).

Effective database management also supports data analytics, which allows organizations to extract insights from data to make better decisions. Robust big data analytics capabilities have been shown to uncover hidden insights in both structured and unstructured data to support the organization's strategic decisions (Sabharwal & Miah, 2021). Good database management is key to the success of information systems in supporting operations and strategic goals.

METHODOLOGY

This article is written using a qualitative literature review (QLR) approach, rather than a systematic literature review (SLR), because the goal of the research is not to conduct a comprehensive quantitative mapping of all existing literature with rigid search protocols (like PRISMA), but rather to build a deep conceptual and interpretative understanding of the role of information systems in data management and organizational decision-making. This approach aligns with the characteristics of a qualitative literature review, which emphasizes reflective reading, iterative reading and writing, and the development of a coherent conceptual narrative based on the main themes emerging from the literature (Kalpokaite & Radivojevic, 2021).

The research procedure was carried out through several stages, namely determining conceptual keywords (such as information systems, decision making, big data, cloud computing, ERP, CRM, and data security), searching for reputable national and international journal articles published since 2020, and selecting articles based on thematic relevance and source credibility. Unlike SLR, which requires strict and replicable inclusion-exclusion criteria, QLR allows researchers the freedom to perform thematic analysis and interpretative narrative synthesis of the literature under review, as highlighted in various contemporary literature review designs that distinguish between narrative, integrative, and systematic approaches (Durai, 2021; Cho, 2022).

Data analysis in this study was carried out through a process of data reduction, theme categorization, and conceptual synthesis of findings from various collected articles. The researchers built logical connections between themes, such as information system components, advanced technology, and implementation challenges, and then arranged them into a coherent narrative that answers the research questions that had been formulated. This kind of integrative approach is considered suitable for topics that are multidisciplinary and rapidly evolving like information systems, as it allows for cross-field knowledge synthesis without being stuck in the stricter methodological limits of an SLR (Cho, 2022).

RESULTS AND DISCUSSION

Information System Practice in Data and Information Management

The implementation of information systems is a critical element in managing data and information. Using information systems not only makes data processing and analysis easier but also boosts operational efficiency across various sectors. (O'Brien & Marakas, 2021; Turban, Pollard, & Wood, 2024).

Implementation of Information Systems in Business

The implementation of information systems in modern businesses is changing the way companies manage their daily operations. In the past, many organizations relied on manual processes for data processing, which led to mistakes and delays in decision-making. With advanced ICT, many companies are turning to information systems to improve operational efficiency and effectiveness. One important example is the use of Enterprise Resource Planning (ERP) systems, which integrate various business functions like finance, production, marketing, and HR into one platform.

The main advantage of an ERP system is its ability to provide real-time and accurate information to management. This information is crucial for helping make strategic decisions and reducing the potential for mistakes that could negatively affect organizational performance (Jones, 2021). Studies on the conceptual framework of ERP adoption and business intelligence in small and medium-sized enterprises confirm that integrating these two systems can improve the quality of information available for decision-making (Zheng & Khalid, 2022). These findings answer part of the first research question, showing that information systems like ERP directly contribute to better decision quality through cross-functional data integration.

The Customer Relationship Management (CRM) system also plays a crucial role in helping companies manage interactions with customers. CRM allows companies to track every contact with customers, which can be used to improve service and personalize offers for them. Thanks to the CRM system, companies can analyze consumer data including purchase history, preferences, and feedback. This not only boosts the customer experience but also helps companies identify better marketing opportunities. Empirical research shows that implementing CRM significantly contributes to improving customer agility and overall company performance (Ngo & Vu, 2021; Guerola-Navarro, Oltra-Badenes, Gil-Gomez, & Gil-Gomez, 2021).

Modern CRM systems come with analytics features that help companies understand customer behavior and design more effective marketing strategies. Companies that use CRM effectively can boost customer loyalty and drive sales growth. CRM dimensions like focusing on key customers, knowledge management, and CRM-based technology have been shown to positively impact the quality of organizational services (Al Mashahedi, Zhang, & Harjan, 2021).

Implementing information systems also helps improve collaboration among teams within an organization. Thanks to integrated systems, every team member can access the same information and collaborate on projects more easily. This reduces duplicated efforts and increases team productivity. Using integrated communication and collaboration tools also helps speed up decision-making processes and facilitates collective problem-solving (Turban, Pollard, & Wood, 2024).

Implementing an information system also comes with its own challenges. Some companies might have trouble integrating the new system with existing ones. Training employees to use the new system also takes time and resources. Good change management is super important during the information system implementation process to make sure the transition goes smoothly and effectively, as shown in studies on ERP implementation in various small and medium-sized businesses that highlight the importance of top management commitment and user training (Frogeri, Portugal Júnior, Piurcosky, & Silva, 2022).

Latest Technology in Information Systems

The latest technologies like cloud computing, big data, and artificial intelligence (AI) have brought a revolution to information systems, especially in how data is managed, processed, and analyzed. Cloud computing allows companies to securely store and access data remotely without relying on expensive physical infrastructure. With cloud services, companies can save on investment costs and speed up data processing (Zhang, 2020). Studies on the adoption of cloud computing as an organizational innovation confirm that the main drivers of adoption are cost efficiency and scalability (Golightly et al., 2022). Using cloud computing also gives companies the flexibility to access applications and data from anywhere and at any time. This is especially important with the increasing trend of remote work. The subscription-based financing model in cloud computing allows companies to reduce upfront investments and quickly adapt to changing needs. A study on the development of cloud-based management information systems for SMEs in Indonesia shows that this strategy can improve operational efficiency, expand market access, and boost business competitiveness (Hartanto, Marlina, & Lediya, 2022).

Besides cloud computing, big data plays a crucial role in supporting information systems. Big data allows companies to analyze very large and diverse volumes of data to gain deeper insights. Data obtained from various sources such as social media, online transactions, and IoT sensors can be processed to improve understanding of customer behavior, market trends, and operational efficiency. The Optimized Data Management using Big Data Analytics (ODM-BDA) framework has been proven to enhance organizational effectiveness and the quality of decision-making analysis (Niu, Ying, Yang, Bao, & Sivaparthipan, 2021).

By analyzing big data, companies can identify patterns that aren't visible in traditional data. Retailers can use big data analytics to understand consumer preferences and design offers that fit better. AI gives companies the ability to automate data analysis, make predictions, and smartly optimize operations. The capabilities of big data analytics, supported by data-driven insights, have been shown to contribute to improved organizational performance, including in the context of the circular economy and supply chain (Li, Lin, Ouyang, & Luo, 2021; Chen, Preston, & Swink, 2021).

The use of technology like machine learning in big data analysis allows companies to make increasingly accurate predictions based on empirical data. This way, companies can plan production, inventory management, and marketing strategies better. However, applying this technology also requires employees to have enough skills and knowledge to make the most of it, as highlighted in a thematic review on big data analytics capabilities in organizations (Sabharwal & Miah, 2021).

Big data requires advanced analytical tools to identify hidden patterns, market trends, and future predictions that can't be found through traditional analysis. Big data analytics capabilities allow organizations to uncover hidden insights and make data-driven decisions that boost business performance and competitiveness (Awan, Shamim, Khan, Zia, Shariq, & Khan, 2021; Li et al., 2022).

Challenges and Opportunities in Data Management in the Digital Era

Managing data in the digital era doesn't escape complex challenges, but it also opens up big opportunities for organizations. One of the main challenges is the constantly increasing volume of data. Data is generated every second from various sources, including social media, business transactions, and IoT devices. This requires organizations to have infrastructure that can handle and process large amounts of data (Niu et al., 2021; Sabharwal & Miah, 2021).

Another challenge that needs to be addressed is data security. Data breaches and cyberattacks are serious threats to organizations worldwide. Companies need to take proactive steps to protect their data, including implementing encryption, regular software updates, and training employees on good data security practices. Companies that enforce strict data security policies can significantly reduce the likelihood of data breaches (Morgan & Hall, 2020; Davies & Kim, 2021).

On the other hand, this challenge also brings opportunities for organizations to innovate. With the growing need for effective data management, many companies are starting to adopt the latest technologies like AI and machine learning in analyzing data. These technologies not only support faster and more efficient data processing but also help companies gain deeper insights into consumer behavior and market trends (Niu et al., 2021; Li, Lin, Ouyang, & Luo, 2022).

Another opportunity comes from the growing interest in data analytics. As the complexity of data companies face increases, the need for skilled professionals in data analytics also rises. This creates high demand for training and education in analytics, meaning organizations need to invest in improving data literacy, analytical capabilities, and continuous learning to make the most of digital transformation (Sabharwal & Miah, 2021; Tangi et al., 2021).

Collaboration between various organizations and stakeholders in sharing data can be a strategic opportunity. By sharing data, companies can gain broader insights and create more effective solutions for the challenges they face. This also opens the door for strategic partnerships and further innovation. A similar phenomenon can be seen in the government sector, which is driving the digital transformation of public services through cross-agency data interoperability (Digital government transformation, 2021; Dobrolyubova, 2021).

In facing challenges and taking advantage of opportunities, it is important for organizations to develop a holistic data management strategy. This includes strong security policies, adequate technology infrastructure, and training and skills development for employees. In this way, organizations can not only survive but also grow in this challenging digital era (Fischer, Heuberger, & Heine, 2021)

Prerequisites for Effective Information System Implementation

Implementing an information system effectively requires several organizational, technical, and human prerequisites. On the organizational side, top management commitment is a key factor in the successful adoption of technology, as shown in a study on cloud ERP adoption in small and medium enterprises that identified organizational strategy, leadership commitment, data security, training, and organizational culture as five key success factors (Chu & Nguyen, 2022). Without strong leadership support, any technology investment risks not delivering optimal results.

From a technical perspective, network infrastructure readiness, compatibility between old and new systems, and cyber security reliability are absolute prerequisites. Studies on critical success factors of ERP show that leadership, effective change management, and end-user training are positively correlated with successful system implementation (Subbarao & Khan, 2022). Additionally, the competence of human resources in operating and maintaining information systems also determines the sustainability of benefits that the organization gains from such technology investments.

Another important prerequisite is the organization's cultural readiness to adapt to a new, more data-driven way of working. Organizations that successfully integrate information systems into their business processes tend to have a culture that is open to change and encourages evidence-based decision making, as highlighted in a study on public sector digitalization that emphasizes the importance of alignment between technology, agency, and governance (Di Giulio & Vecchi, 2021).

Analysis and Synthesis to Answer Research Questions

Regarding the first research question, which is about how the components and types of information systems play a role in supporting data management and organizational decision-making, literature review results show that this role is multidimensional. At the foundational level, the five components of information systems (hardware, software, data, people, and procedures) work synergistically to ensure the availability of accurate and timely information. At the functional level, types of information systems like MIS, DSS, EIS, ERP, and CRM each contribute to different stages of decision-making, ranging from routine operational decisions to long-term strategic decisions (Putra et al., 2021; Zheng & Khalid, 2022; Ngo & Vu, 2021).

Regarding the second research question, about the challenges and opportunities of implementing information systems in the digital era, the literature synthesis indicates that the main challenges lie in three aspects: data security, gaps in human resource competencies, and resistance to organizational change. The ever-evolving cyber threats demand continuous investment in security infrastructure (Davies & Kim, 2021), while adopting cutting-edge technologies like cloud computing and big data analytics offers prospects for significant cost efficiency and enhanced analytical capacity (Golightly et al., 2022; Niu et al., 2021). These opportunities will be optimal if balanced with the development of HR capabilities and sound data governance.

Overall, the synthesis of various literature highlights that the effectiveness of information systems in supporting organizational decision-making is not solely determined by the sophistication of the technology used, but by the alignment between technology, processes, and people. These findings are consistent with the sociotechnical framework, which emphasizes that the success of information systems depends on the harmonious interaction between the technical and social dimensions of the organization (O'Brien & Marakas, 2021; Fischer et al., 2021), thus fully addressing the aim of this article in providing a comprehensive conceptual synthesis.

CONCLUSIONS AND RECOMMENDATIONS

This article has thoroughly examined the role of information systems in data management and organizational decision-making through a literature review approach. The study results emphasize that information systems, which consist of hardware, software, data, people, and procedures, are an important foundation that enables organizations to manage information accurately, relevantly, and in a timely manner. Various types of information systems, ranging from Management Information Systems (MIS), Decision Support Systems (DSS), Executive Information Systems (EIS), to Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM), each play a specific role in supporting decision-making at different organizational levels.

Answering the first research question, it was found that the role of information systems is multidimensional, covering operational, managerial, and strategic functions. Integration between information system components allows organizations to gain deeper insights and respond to market dynamics more quickly. ERP and CRM technologies in particular have been shown to improve business process efficiency and the quality of customer relationships, while big data analytics and cloud computing technologies expand the organization's analytical capacity in handling the ever-growing volume of data.

Answering the second research question, this study identifies that the main challenges of implementing information systems in the digital era lie in data security, gaps in human resource competencies, and resistance to organizational change. On the other hand, these challenges also create opportunities for innovation through the adoption of cutting-edge technologies like artificial intelligence and machine learning, as well as encourage increased investment in education and data analytics training. An organization's success in facing these challenges largely depends on top management's commitment, technical infrastructure readiness, and a data-oriented organizational culture.

Conceptually, this article emphasizes that the effectiveness of information systems can't be separated from a sociotechnical perspective, which sees technology and humans as two complementary elements. The quality of organizational decision-making ultimately depends on how well an organization can align technology investments with the development of human capabilities and good data governance. This understanding provides a theoretical contribution in the form of an integrative framework that connects information

system components, cutting-edge technology, and implementation challenges into one coherent analysis.

From a practical standpoint, these findings provide guidance for policymakers and organization managers in designing more holistic information system implementation strategies, including strengthening cybersecurity, investing in human resource training, and developing cloud and big data infrastructure that fits the scale and needs of the organization. For public sector organizations, these findings are also relevant in supporting the government's digital transformation agenda, which requires data interoperability and transparent governance.

For future research, it's recommended to conduct empirical studies, both quantitative and qualitative case studies, within the context of organizations in Indonesia to directly examine the relationship between information system components, the adoption of cutting-edge technology, and decision-making quality. Further research also needs to more specifically explore the impact of personal data protection regulations on organizational data management strategies, as well as the role of generative artificial intelligence in transforming decision-making processes in the future. Cross-sector studies, such as comparisons between business, government, and education organizations, would also enrich the understanding of the variations in challenges and strategies for implementing information systems in different contexts.

FURTHER STUDY

This research still has limitations, so further studies are needed on the topic *The Role of Information Systems in Data Management and Organizational Decision-Making: A Review* to improve this research and provide more insights for the authors and readers.

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