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Information Technology-Based Educational Management Transformation: The Utilization Of School Management Information Systems To Support Principals' Decision-Making

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ABSTRACT

Digital transformation has changed educational management from conventional administrative systems toward technology- and data-based management. School Management Information Systems have become important instruments for integrating data on students, educators, finance, facilities and infrastructure, academics, and other information required by school principals. This study aims to analyze the utilization of School Management Information Systems in supporting principals' decision-making, identify their benefits for educational management, and examine the factors that support and hinder their implementation. The study uses a literature review method with a qualitative descriptive approach. The literature was drawn from scientific journal articles and institutional reports published between 2022 and 2026. The analysis was conducted through identification, classification, comparison, and thematic synthesis. The review indicates that School Management Information Systems contribute to faster access to information, administrative efficiency, data integration, transparency, monitoring, and decision-making support. However, their successful use is influenced by data quality, system interoperability, digital competence, principals' data literacy, technological infrastructure, digital leadership, and information security. The study concludes that information technology transformation in educational management should be directed toward Data-Informed School Management, namely school management that uses data-based information and integrates it with principals' professional competence and contextual judgement.

Keywords: *information technology, management information system, educational management, school principal, decision-making*

INTRODUCTION

Developments in information technology have brought significant changes to the management of educational organizations. Technology is no longer used only as a learning medium, but has also become part of administration, communication, monitoring, evaluation, resource management, and decision-making. This transformation encourages schools to develop management systems that are faster, more integrated, more transparent, and data-based. Digital transformation in education is

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broader than document digitization. Digitization only converts analogue information into digital form, whereas digital transformation changes work processes, organizational structures, communication patterns, services, and decision-making mechanisms. Mukul and Buyukozkan (2023) show that technological developments have produced systemic changes in education that involve technological, process, competency, and organizational dimensions.

OECD (2023) explains that the digital education ecosystem consists of various components, such as student information systems, learning management systems, digital assessment systems, institutional management tools, and other technologies that generate educational data. These systems have strategic value when the information they produce can be used for improvement and decision-making.

UNESCO (2023) also positions Education Management Information Systems as an important part of educational management. A stronger orientation toward targets, accountability, performance, and school autonomy has increased the need for high-quality data. Information systems can help education managers obtain information for planning, resource allocation, monitoring, and evaluation.

Schools generate large amounts of data. These data come from students, educators and education personnel, curricula, learning outcomes, attendance, finance, facilities and infrastructure, school programs, supervision, and administrative services. When such data are managed separately and manually, obtaining information becomes slow and may create inconsistencies. A School Management Information System is one solution to this problem. It integrates technology, people, procedures, and data to produce the information required by the organization. In a school setting, an information system can help principals obtain a faster overview of organizational conditions.

Adhikari, Budhathoki, and Adhikari (2024) explain that Management Information Systems can support school administration, increase efficiency, optimize resources, and provide information for strategic decisions. Information systems therefore function not only as data repositories, but also as managerial tools.

The use of technology in educational management is also related to interoperability. Schools often use several applications, each of which produces its own data. If these applications are not connected, users must enter the same data repeatedly. OECD (2023) shows that limited interoperability prevents educational data from being used optimally and increases administrative burdens. Interoperability allows data from different systems to be exchanged and used consistently. Integrated systems can provide information more quickly and support data-driven decision-making. Therefore, the success of management digitalization cannot be assessed merely by the number of applications used by a school.

In addition to system quality, data quality determines the value of information. Incomplete, outdated, or inaccurate data can cause principals to form an incorrect picture of organizational conditions. Data-based management requires systematic

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mechanisms for data collection, validation, updating, security, and analysis. Decision-making is one of the principal's strategic responsibilities. Principals must determine programs, resource allocation, division of duties, educator development, student services, management of facilities and infrastructure, supervision, and various other policies. These decisions require relevant information. The development of the concept of data-informed decision-making indicates that educational decisions should use data without ignoring professional knowledge. Rojas-Bravo, Fromm, and Carrasco-Ogaz (2024) found that effective data use is influenced by leadership practices, collaboration, access to data, data interpretation, monitoring, and school organizational conditions.

Lee, Camburn, and Sebastian (2025) show that the use of data by school leaders does not automatically produce the same benefits in every context. The type of data used and the organizational context affect the value of information for the decision-making process. This finding reinforces the view that principals need the ability to understand data, not merely access it.

This ability is closely related to data literacy. Through a systematic review of 56 empirical studies, Lee et al. (2024) found that principals' data literacy has characteristics that differ from teachers' data literacy. For principals, data literacy is closely connected to building a data-based culture, using data for school improvement, and using information to improve leadership practices.

School management transformation also requires digital leadership. AlAjmi (2022) found that principals' digital leadership plays a positive role in encouraging technology integration in schools. Leadership with a digital vision can increase the use of technological resources in educational activities.

Riski et al. (2023), in their study in Indonesia, also show that principals' digital leadership capabilities play an important role in creating effective educational processes. However, improvements in competence, support, training, and infrastructure are still required for the implementation of digital leadership in Indonesia.

Lin (2024) identifies several key characteristics of digital leadership, including vision, digital empowerment, innovation, cross-boundary collaboration, and adaptability to change. These competencies show that digital leadership is not limited to the ability to operate applications. Leaders must be able to connect technology with organizational goals.

Asriadi and Andriani (2026) show that research on school digital leadership still tends to place strong emphasis on infrastructure readiness and digital literacy, while organizational capacity and the principal's strategic role still need to be strengthened. The effects of digital leadership are also more consistently visible in organizational aspects and work relationships than in direct learning outcomes.

These findings reveal an important area for further synthesis. Some studies discuss digital transformation, others examine digital leadership, and still others focus on data use. A synthesis is still needed that connects School Management Information Systems,

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data quality, data literacy, digital leadership, and principals' decision-making as one integrated chain of educational management.

Based on these issues, this study aims to examine the utilization of School Management Information Systems in supporting principals' decision-making through a review of recent literature. The review focuses on research developments from 2022 to 2026 in order to provide a perspective that is relevant to current developments in digital transformation in education.

Specifically, the study is directed at answering three questions: what role do Management Information Systems play in school management; what factors determine the effectiveness of their use; and how can information systems support principals' decision-making?

RESEARCH METHOD

This study uses a literature review method with a qualitative descriptive approach. The literature review is used to develop an understanding of conceptual developments, empirical findings, and research trends concerning information technology in educational management.

The study does not collect data through respondents, interviews, field observations, or experiments. The research data come from secondary sources in the form of scientific journal articles and institutional reports directly related to the research topic.

The literature search was directed toward publications from 2022 to 2026. This time restriction was applied to obtain studies that are relevant to recent developments in information technology and educational management.

The search sources included Google Scholar, ScienceDirect, Taylor & Francis, Crossref, national journals, OECD, and UNESCO. Keywords included school management information system, education management information system, digital transformation in education, school digital leadership, principal data literacy, data-informed decision making, data-driven school management, and educational management information technology.

The inclusion criteria were as follows: articles published between 2022 and 2026; studies discussing information technology in education; studies related to school management, leadership, data, or decision-making; publications with clear bibliographic identities; and sources relevant to the objectives of the study.

Sources that discussed technology only as a learning medium without a connection to educational management were not used as core literature. Literature without verifiable publication information was also excluded from the main sources.

The analysis was conducted through four main stages: identification, classification, analysis, and synthesis. Selected literature was read to identify relevant concepts and research findings. The findings were then grouped into specific themes. The next stage

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compared similarities and differences across sources, and the final results were organized as a thematic synthesis.

The review focused on five main themes: digital transformation in educational management, the functions of School Management Information Systems, data quality and integration, principals' leadership and data literacy, and the use of information for decision-making.

RESULTS AND DISCUSSION

1. Mapping of Key Literature

The review of literature published between 2022 and 2026 shows a shift in research from a focus on technology use toward organizational transformation and data-based management.

Researcher	Year	Focus	Method	Key Finding
AlAjmi	2022	Digital leadership	Quantitative	Digital leadership supports technology integration in schools
Mukul & Buyukozkan	2023	Digital transformation in education	Systematic review	Digital transformation requires technological and organizational change
Riski et al.	2023	Digital leadership of Indonesian school principals	SLR	Principals' digital competence and support need to be strengthened
OECD	2023	Digital education ecosystem	Policy review	Data integration and interoperability remain challenges
UNESCO	2023	Technology and educational management	Global review	EMIS supports management efficiency and effectiveness
Lin	2024	Digital leadership	Systematic review	Vision, empowerment, innovation, collaboration, and adaptability

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				are key characteristics
Adhikari et al.	2024	MIS in school administration	Literature review	MIS supports efficiency and managerial decision-making
Rojas-Bravo et al.	2024	Data-driven decision making	Mixed methods	Leadership and organizational conditions shape data use
Lee et al.	2024	Principals' data literacy	Systematic review	Principals' data literacy includes data culture and school improvement
Lee, Camburn, & Sebastian	2025	Data-informed leadership	Quantitative	Data type and school context affect the benefits of data use
Nikmah et al.	2025	MIS and principal performance	R&D/mixed methods	MIS can support the effectiveness of principals' performance
Asriadi & Andriani	2026	School digital leadership	Systematic review	Research still emphasizes technology readiness and needs to shift toward organizational capacity

This mapping shows that the use of information technology in educational management is a multidimensional phenomenon. Technology, data, leadership, human competence, organizational culture, and policy are interrelated.

2. Transformation of Information Technology in Educational Management

Digital transformation has encouraged changes in school administration. Data collection and storage processes that previously relied on physical documents are shifting toward digital systems. However, digital transformation is insufficient if technology is used only as a substitute for paper documents. The strategic value of technology emerges when data are used in planning, monitoring, evaluation, and decision-making.

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Mukul and Buyukozkan (2023) position digital transformation as a systemic change. Transformation requires alignment among technology, human competence, strategy, and organizational processes.

OECD (2023) also shows that most countries already have educational information systems, but their use is still largely directed toward statistical purposes. The real-time use of information to support decisions still needs further development. Therefore, the current challenge in educational management is not merely how to provide technology, but how to transform data into information that can improve the quality of school management.

3. Management Information Systems as School Information Infrastructure

The synthesis indicates that School Management Information Systems have three main functions: administrative, informational, and managerial.

The administrative function relates to data recording. The information function relates to processing data into information. The managerial function concerns the use of information to support planning, monitoring, evaluation, and decision-making. Adhikari et al. (2024) show that MIS can improve efficiency, provide information for decisions, and support resource optimization.

Nikmah, Rasiman, and Violinda (2025) also found that Management Information Systems can support administration, supervision, communication, and principal performance. These findings demonstrate the development of MIS from a simple administrative information system toward management decision support.

Conceptually, the process can be described as follows:

School Data -> Data Collection -> Validation -> Information System -> Managerial Information -> Analysis -> Decision -> Implementation -> Monitoring and Evaluation

This flow confirms that the existence of data alone does not create value unless the data are processed and used.

4. Data Quality, Integration, and Interoperability

Data quality is one of the most decisive factors in information-based management. Inaccurate data will produce inaccurate information. Information used for management decisions should ideally be accurate, relevant, complete, consistent, accessible, and timely.

The literature also shows that interoperability is an important issue in digital ecosystems. OECD (2023) defines interoperability as the ability to combine and use data originating from different digital tools in an easy, consistent, and efficient manner. Systems that are not interoperable increase the need for repeated data entry and slow the provision of information.

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This condition is highly relevant to schools that use several information systems simultaneously. A large number of applications does not necessarily indicate digital progress if those applications create fragmented information.

Integration should be directed toward providing schools with a more comprehensive view of their data. A management dashboard can be one way to integrate academic indicators, student data, human resources, budgets, and facilities and infrastructure.

5. Principals' Data Literacy

Good technology will not produce good decisions if users are unable to understand the information available.

Lee et al. (2024) identified seven dimensions of principals' data literacy and 63 indicators. Their review emphasizes that principals' data literacy has a more strategic scope than technical data-processing skills. Principals need to be able to build a data-based culture and direct the use of data toward organizational improvement.

Data literacy can include the ability to read information, understand indicators, compare results, identify patterns, recognize problems, assess data quality, and communicate analytical findings. These abilities are important because the same information may lead to different decisions when interpreted differently by leaders. Therefore, the development of Management Information Systems must be accompanied by improvements in principal data literacy.

6. Digital Leadership in School Management

Digital leadership is another factor that consistently appears in the literature.

AlAjmi (2022) shows that principals' digital leadership is positively associated with teachers' technology integration. This finding highlights the important role of leaders in creating environments that support technology use.

Riski et al. (2023) found that Indonesian school principals require greater knowledge, support, and digital leadership training.

Lin (2024) shows that digital leaders are characterized by strong vision, the ability to empower users, innovation, collaboration, and adaptability.

Asriadi and Andriani (2026) further show that the impact of digital leadership is more consistently visible at the organizational and work-relationship levels. Future research needs to connect digital leadership more strongly with organizational capacity and educational outcomes.

Based on these findings, principals should not merely be users of technology. They need to become digital leaders who can determine the direction of technology use according to school needs.

7. Information Systems and Decision-Making

Information-based decision-making is the strategic benefit of MIS that is most directly relevant to school leadership.

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Rojas-Bravo et al. (2024) show that successful data-use practices are shaped by an organization's ability to build access, interpretation, collaboration, monitoring, and leadership.

Lee, Camburn, and Sebastian (2025) also found that not all forms of data use are related to the same outcomes. In their study, the use of benchmark assessment data showed a clearer relationship than several other forms of data use. This finding demonstrates the importance of data relevance and quality. Therefore, the term data-informed decision-making is more appropriate than the assumption that decisions are determined entirely by data.

Data provide evidence. Principals remain responsible for interpretation and for integrating data with regulations, professional experience, student needs, organizational capacity, and the school's social context.

The decision-making process can be formulated as follows:

Problem Identification -> Information Access -> Data Analysis -> Development of Alternatives -> Professional Judgement -> Decision -> Implementation -> Evaluation

Management Information Systems primarily support the stages of information access and data analysis.

8. Benefits of Management Information Systems for Principals

Based on the literature synthesis, the use of MIS provides several major benefits.

a. First, it accelerates access to information. Principals do not need to wait for documents to be collected from every unit.
b. Second, it improves administrative efficiency through digital data storage and processing.
c. Third, it supports transparency because data and information can be traced more systematically.
d. Fourth, it improves the capacity to monitor programs.
e. Fifth, it supports performance evaluation by providing indicators that can be compared.
f. Sixth, it helps principals identify problems more objectively.
g. Seventh, it strengthens accountability in decision-making because policies can be linked to available evidence and information.

These findings are consistent with the development of digital ecosystems that position data as a strategic resource in educational organizations.

9. Implementation Challenges

The literature review also identifies several challenges in the use of information technology.

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a. The first factor is infrastructure. Information systems require adequate devices, electricity, networks, and internet access.
b. The second factor is digital competence. Users have different levels of ability, so schools require continuous training.
c. The third factor is data quality. Input errors, duplicate data, and delayed updates can reduce trust in the system.
d. The fourth factor is interoperability. Applications that are not integrated can increase administrative workloads.
e. The fifth factor is security and privacy. Student and staff data require protection mechanisms, access restrictions, and clear governance. OECD positions cybersecurity, privacy, and data protection as important components of educational technology governance.
f. The sixth factor is organizational culture. Digitalization requires changes in working habits. Resistance or low user participation can hinder implementation.

10. Conceptual Synthesis: Data-Informed School Management

Based on the overall literature, this article proposes a conceptual framework of Data-Informed School Management.

The framework can be illustrated as follows:

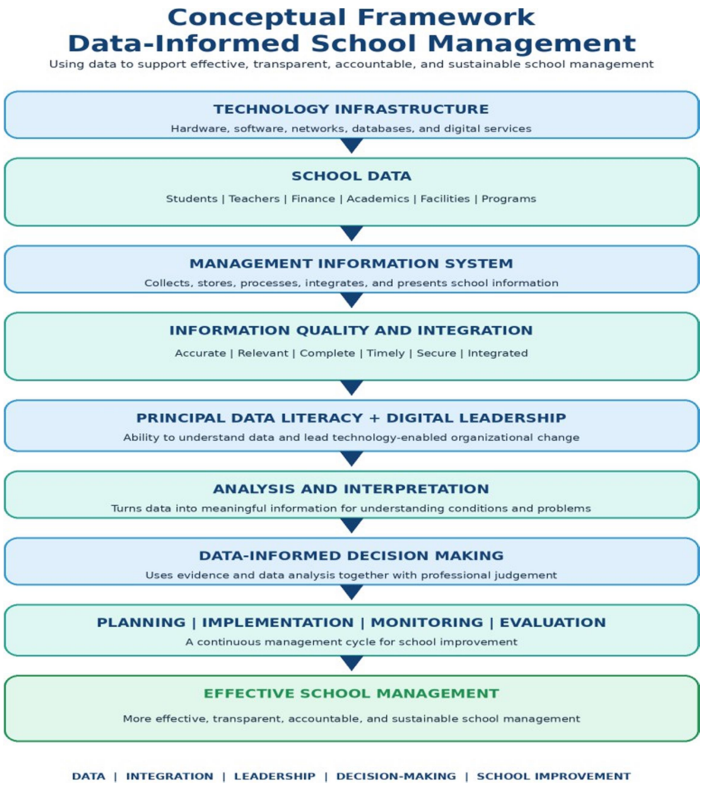


Figure 1. Conceptual Framework of Data-Informed School Management

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The framework represents the main synthesis of this review. The information system is positioned as information infrastructure, not as the decision-maker.

Data literacy and digital leadership occupy a bridging position between information systems and decisions. Without these capabilities, available information does not automatically become managerial action.

The concept of Data-Informed School Management also allows room for professional judgement. Principals use data as an information base, while decisions still take into account context, regulations, values, experience, and school needs.

This model distinguishes information-based management from approaches that assume technology can replace the leader's function.

CONCLUSION

The literature review shows that information technology has transformed School Management Information Systems from administrative instruments into an important component of strategic educational management.

Management Information Systems can improve the speed of information access, administrative efficiency, data integration, monitoring, transparency, accountability, and support for principals' decision-making processes.

However, the presence of technology does not automatically improve management effectiveness. Successful utilization is strongly influenced by data quality, system integration and interoperability, technological infrastructure, information security, digital competence, organizational culture, data literacy, and principals' digital leadership.

The literature also indicates that principals' ability to use data occupies an important position. Principals must not only obtain information, but also be able to analyze, interpret, and connect it with organizational needs.

Management Information Systems do not replace principals as decision-makers. The systems provide information as a basis for consideration. Principals still use professional experience, regulations, organizational values, student needs, and school conditions when making decisions.

Based on this synthesis, information technology-based transformation in educational management should be directed toward Data-Informed School Management. This concept integrates information systems, data quality, data literacy, digital leadership, and professional judgement to produce more appropriate and accountable decisions.

RECOMMENDATIONS

Schools need to develop integrated Management Information Systems that are not oriented solely toward administrative compliance.

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Principals need to strengthen digital competence and data literacy so that they can use information for planning, monitoring, evaluation, and decision-making.

Government and Education Offices need to strengthen technological infrastructure, system interoperability, data security, and programs for improving the digital competence of principals and education personnel.

Schools also need to establish consistent data-validation and updating mechanisms so that information used in decision-making has a high level of accuracy.

Future studies may empirically test the Data-Informed School Management model by linking Management Information Systems, digital leadership, data literacy, data-informed decision making, and school management effectiveness.

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