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Elements and Characteristics of Management Information Systems in the Application of Information Technology in Education Management

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Abstract

This research focuses on challenges and opportunities related to information systems and technology. Manual and dispersed management of educational data makes it difficult for education unit leaders to obtain fast and accurate information, while the application of information technology (IT) is often understood narrowly as the procurement of computers or applications. This study aims to describe the elements and characteristics of Management Information Systems (SIM) and analyze their relationship with the application of IT in education management. The research uses a qualitative approach with a literature study method on management information system textbooks, education management textbooks, and national education regulations. Data is analyzed descriptively through the stages of reduction, presentation, and drawing conclusions. The results of the study show that SIM consists of six interdependent elements, namely hardware, software, data and databases, procedures, people, and communication networks. A good SIM has nine characteristics, namely integrated, centralized database-based, management-oriented, accurate, timely, relevant and concise, flexible and developable, secure and controlled, and easy to use. In education management, every field of work, from curriculum, students, educators and education personnel, finance, infrastructure, community relations, to leadership decision-making, can be served by an IT-based SIM subsystem that shares a single database. The success of implementation is determined by the balance of all elements, especially data quality and human competence, not by the sophistication of devices. The main challenges include limited infrastructure, uneven digital competencies, unintegrated applications, the risk of personal data leakage, and limited maintenance budgets. Strengthening can be achieved through mapping information needs, establishing a single master data source, periodic training, preparing data management SOPs, and annual evaluations. Thus, the leaders of education units need to view SIM as a complete system, not just the procurement of applications.

Keywords: Management information system, SIM elements, SIM characteristics, information technology, education management.

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INTRODUCTION

Educational institutions manage large amounts of data: student identities, grades, attendance, data on educators and education personnel, budgets, and infrastructure. If this data is managed manually and scattered, it is difficult for school principals or university leaders to obtain fast and accurate information to

make decisions. The development of information technology offers a solution through integrated data management and services that can be accessed at any time.

Law Number 20 of 2003 concerning the National Education System emphasizes that the management of educational units must be based on the principles of school/madrass-based management and university autonomy, which requires accountability and transparency (Republic of Indonesia, 2003). Such accountability can only be fulfilled if the education unit has a reliable information system. Therefore, the Management Information System (SIM) is a necessity, not just an option.

However, the application of information technology (IT) is often understood narrowly as the procurement of computers or applications. In fact, a SIM is a single interdependent element, and the failure of one element, such as data that is not up-to-date or an untrained user, can paralyze the entire system. A complete understanding of the elements and characteristics of the SIM is important as a basis for planning and evaluation.

Data is raw facts that have not been processed, for example a list of students' test scores. Information is data that has been processed so that it is meaningful and useful for the recipient, for example, the average grade per class and its upward trend. A system is a collection of elements that are interconnected and work together to achieve a certain goal. Information systems convert data into information through the process of input, processing, output, and feedback (Jogiyanto, 2005; Sutabri, 2012).

SIM is a human and machine-based system that provides information to support operations, management, and decision-making in an organization. Davis and Olson (1985) describe SIM as an integrated system that uses hardware, software, procedures, models, and databases to generate information for planning, control, and operations functions. Laudon and Laudon emphasize that SIM integrates technology, people, and organizations to solve managerial problems.

Education management is the process of planning, organizing, implementing, and controlling educational resources to achieve educational goals effectively and efficiently. The fields of work include curriculum, students, educators and education personnel, infrastructure, finance, community relations, and special services. Each field produces and needs information, so that SIM becomes a link between these fields.

Information technology includes devices and methods for collecting, storing, processing, and disseminating information, such as computers, databases, networks, the internet, cloud computing, and applications. IT is a means, while SIM is a system that utilizes those means for managerial purposes. This distinction is important so that the procurement of devices is not thought to be the same as building an information system.

Based on this description, the formulation of this research problem is what are the elements of driver's license, what are the characteristics of a good driver's license, and how these elements and characteristics relate to the application of IT in education management. The objectives of this research are (1) to describe the elements of driver's license, (2) to describe the characteristics of driver's license, and (3) to analyze their relationship with the application of IT in education management.

RESEARCH METHODS

This study uses a qualitative approach with a literature study method. The data sources are in the form of textbooks on information systems and education management, as well as national education regulations. Data are analyzed descriptively through three stages: reduction (choosing concepts that are relevant to the elements and characteristics of the driver's license), presentation (grouping concepts into tables and descriptions), and drawing conclusions (relating concepts to IT practices in educational institutions).

RESULTS AND DISCUSSION

Management Information System Elements

SIM consists of six interdependent elements (Table 1). In an input-process-output framework, these elements work as a single chain: data enters through devices and procedures, is processed by software and databases, and then exits as information that managers use (McLeod & Schell; O'Brien & Marakas).

Based on the results of the study, it shows that Indonesia has experienced quite rapid advances in educational technology. Various levels of education have begun to use digital media in learning. Digital applications, computers, the internet, and video learning are contemporary learning media used in many schools.

Table 1. Management Information System Elements

Yes	Elements	Functions in a driver's license	Examples in educational institutions
1	Hardware	Receiving, storing, and processing data	Admin computer, school server, teacher laptop, attendance fingerprint scanner
2	Software	Processing data into information according to management needs	Academic applications, Dapodik, financial applications, learning management systems
3	Data and databases	Information raw materials stored in a structured and centralized manner	Student data, grades, attendance, staffing, budget
4	Procedure	Rules and workflows that govern input, processing, and output	SOP for new student admission, grade input flow, data backup schedule
5	Manusia (brainware)	Designers, operators, and users who run and leverage systems	School principals, operators, teachers, administrative staff, parents
6	Communicati on networks	Connect devices and users so data can be shared	Jaringan lokal (LAN) kampus, internet, surel, portal daring

Source: Results of a literature review (2026)

The human element occupies the most decisive position. Advanced hardware and software are useless if the operator is not skilled or the leadership does not use the information generated. The data element is also critical: a system

containing obsolete or duplicate data will generate misleading information, known as the principle of *garbage in, garbage out*. The procedure guarantees that the data is entered by the right people, at the right time, in a uniform manner.

Characteristics of Management Information Systems

Characteristics are the characteristics that distinguish a driver's license from a mere collection of applications or files. The characteristics in Table 2 are summarized from the literature on driver's licenses (Laudon & Laudon; McLeod & Schell) and are associated with their appearance in educational institutions.

Table 2. Characteristics of Management Information Systems

Yes	Features	Meaning	Manifest in education management
1	Integrated	All subsystems are interconnected and share data	The same student data is used by academic, finance, and library departments
2	Centralized database-based	Data is stored once in one place, reducing duplication and inconsistencies	One parent database, not separate files in each section
3	Management-oriented	Information is compiled for planning, control, and decision-making	Learning outcomes and teacher-student ratio report for principals
4	Accurate	Information free from errors and reflects reality	Report card values are the same as the values in the system, with no difference
5	Punctuality	Information available when needed	Recap of the daily attendance ready before the evaluation meeting
6	Relevant and concise	Information according to the needs of the recipient, not excessive	A concise dashboard for leaders, detailed reports for homeroom teachers
7	Flexible and expandable	Able to adapt to changing policies and needs	Adjustment of grade formats when curriculum changes
8	Safe and controlled	Data is protected from unauthorized access and changes	Tiered access rights, data backup, protection of students' personal data
9	Easy to use	Non-technical users can operate it	Simple interface for teachers and parents

Source: Results of a literature review (2026)

Accurate, timely, and relevant characteristics determine the quality of information, while integrated and centralized database-based characteristics determine the quality of the system structure. Secure and controlled characteristics are becoming increasingly important because student data is classified as personal

data, including children's data, whose management must comply with applicable personal data protection provisions.

Application of Information Technology by Management Field

Each field of education management can be served by a single SIM subsystem that uses IT (Table 3). The subsystem still shares a single database so that it meets integrated characteristics.

Table 3. Application of Information Technology by Field of Education Management

Management field	IT Deployment	Dominant SIM elements	Embodied characteristics
Curriculum and learning	Learning management system, scheduling, digital report card	Software, networking	Flexible, easy to use
Students	Online admission of new learners, digital attendance, student database	Data, hardware	Accurate, timely
Educators and education staff	Staffing database, online performance appraisal	Data, procedures	Integrated, secure
Finance	Budget and payment applications, fund reporting	Software, procedures	Accurate, controlled
Facilities and infrastructure	Digital asset inventory, scheduled maintenance	Data, humans	Relevant, on time
Relations with the community	School portal, email, parent communication app	Communication networks	Punctual, easy to use
Leadership decision-making	Simple dashboards and analytics reports	All elements	Management-oriented, relevant

Source: Results of a literature review (2026)

The Role of Elements and Characteristics in Successful Implementation

First, IT deployments that only add hardware without improving procedures and data are likely to fail, because accurate and integrated characteristics are not met. Second, human competence determines whether information is used in decisions or just an archive. Third, uneven communication networks, especially in areas with limited internet access, limit on-time characteristics. Fourth, the more digital data collected, the greater the responsibility of institutions to maintain secure characteristics.

Implementation Challenges

The implementation of IT-based SIM in education units faces five main challenges, namely limited infrastructure and internet connections in some education units; uneven digital competence of educators and education personnel; applications that run independently so that data is duplicate and not integrated; the

risk of leakage of personal data of students and employees; and the limited system maintenance budget after the procurement period.

Strengthening Strategy

Based on these challenges, strengthening the implementation of SIM can be taken through five steps: (1) compiling a map of information needs in each field before choosing an application; (2) establishing one master data source and the same data standard for all subsystems; (3) training operators and users periodically, including the head of education units as information users; (4) preparing SOPs for data management, access rights, and backup; and (5) evaluating the system every year based on the characteristics of the SIM that have been described.

CONCLUSION

First, a driver's license consists of six elements: hardware, software, data and database, procedures, human, and communication network. Second, a good driver's license has the characteristics of being integrated, centralized database-based, management-oriented, accurate, timely, relevant, flexible, secure, and easy to use. Third, in education management, IT is only a means; the success of its implementation is determined by the balance of all elements of the driver's license, especially data quality and human competence.

Education unit leaders need to view SIM as a complete system, not just an application procurement. The government and education providers need to provide training and infrastructure support equally. Subsequent research can test the level of fulfillment of SIM characteristics in a particular school or college through case studies or surveys.

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