



The Role of AI in Education Management Information Systems in Indonesia

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Abstract

This study examines the role of artificial intelligence (AI) in management information systems (MIS) in the Indonesian education sector, focusing on its opportunities, challenges, and implications for learning quality. The rapid advancement of AI technology has significantly changed the way educational institutions manage information, support decision-making, and improve the teaching and learning process. This research aims to provide a comprehensive understanding of the integration of AI in MIS education and its impact on the quality of education. The study uses a literature review method by analyzing the latest scientific publications related to AI in education and information systems. Relevant articles are systematically selected, reviewed, and synthesized to identify key themes, including the role of AI, its potential benefits, implementation challenges, and its impact on learning outcomes. These findings reveal that AI contributes to improving efficiency in academic management, enabling personalized learning experiences, and supporting data-driven decision-making in educational institutions. Additionally, AI improves student engagement and learning outcomes through a more interactive and adaptive learning environment. However, some challenges remain, including limited digital literacy, inadequate infrastructure, ethical issues, data privacy issues, and uneven access to technology. In conclusion, AI has a strong potential to improve the effectiveness of management information systems in education. Nevertheless, its successful implementation depends on proper management, institutional support, clear policies, and the readiness of users to adopt and utilize technology responsibly.

Keywords: Artificial Intelligence, Education, Management Information Systems, Quality of Learning, Indonesia

1. Introduction

The development of technology in the modern era has shown rapid progress since the beginning of digital transformation, having a significant impact on various aspects of life, including education. Artificial Intelligence (AI) has emerged as one of the most transformative technologies. In the educational domain, AI is applied through intelligent tutoring systems, automated assessments, chatbots, and data-driven decision support tools embedded in Management Information Systems (MIS) [1].



Figure 1. Categories of Artificial Intelligence Applications in Indonesia

Source: <https://www.peutilizanteknologiartificialintelegentsebagaiapananakanakartificialintelegentsebaganyanya padananak>

According to the data in Figure 1, the education sector recorded an AI usage rate of 15%, with the highest projected growth of 25% compared to other sectors. This shows the increasing potential and attention to the use of AI in the education sector in Indonesia.

The integration of AI in education is theoretically supported by Cognitive Load Theory and adaptive learning frameworks. These theories suggest that AI can personalize the learning experience by tailoring content delivery according to students' individual speeds, needs, and abilities, thereby reducing unnecessary cognitive burden and improving academic performance [2]. From a socio-technical perspective, the success of AI implementation depends not only on the technology itself but also on human factors, including the digital literacy of users and institutional support [3].

In practice, AI has demonstrated its ability to improve learning efficiency through instant feedback, increased student engagement, and more informed academic decision-making. AI-powered tools can improve learning outcomes and foster an interactive learning environment when applied with the right pedagogical strategies [4]. In Indonesia, the development of educational information systems, including Learning Management Systems (LMS) and e-learning platforms, has supported more flexible, structured, and accessible academic administration. However, its effectiveness remains highly dependent on infrastructure readiness, institutional support, and user willingness to adopt the technology [5].

Despite these promising developments, the application of AI in Indonesian education still faces various challenges. These include limited digital literacy among educators and students, infrastructure constraints, data privacy issues, ethical issues such as plagiarism, and the risk of over-reliance on technology that can erode critical thinking and self-learning skills [6]. Additionally, many teachers require adequate training and institutional support to effectively integrate AI tools into the teaching and learning process [7].

Therefore, examining the integration of Artificial Intelligence in education management information systems is increasingly important, as the successful implementation of AI requires not only advanced technology but also appropriate institutional strategies, human readiness, and responsible utilization. Understanding the opportunities and challenges of AI adoption can provide valuable insights for educators, administrators, and policymakers in maximizing the potential of AI to improve education management and learning quality.

Although previous research has extensively discussed the general application of AI in education, including the use of tools such as ChatGPT in higher education, there are still significant research gaps. Most of the existing research focuses on the role of AI in general aspects of learning or technology adoption, while few have thoroughly examined the integration of AI into education Management Information Systems (MIS), specifically its implications for managerial decision-making and overall learning quality in the Indonesian context [8].

Given these gaps, this study offers a comprehensive analysis by integrating artificial intelligence into education management information systems in the Indonesian context. This study aims to examine the role of AI in educational MIS by identifying opportunities that can be exploited, implementation challenges, and their implications for improving the quality of learning. The systematic literature review approach is used by examining a variety of relevant scientific sources to gain a thorough understanding of the topic.

2. Research Methods

This study uses a systematic literature review approach to examine the role of Artificial Intelligence (AI) in Education Management Information Systems in Indonesia. The literature review method was chosen because it allows researchers to analyze, compare, and synthesize findings from previous research to build a comprehensive understanding of current developments and research gaps.

The data source consists of peer-reviewed journal articles indexed in leading international databases, specifically Scopus and other leading academic platforms. To ensure relevance to the latest technological developments, only publications released in the last five years are considered. More than 25 articles that met the selection criteria were used as the main reference in this study.

The article selection process is carried out in several stages. First, the researchers identified relevant studies using keywords such as Artificial Intelligence in Education, Management Information Systems, AI Adoption, Educational Technology, and Learning Quality. Second, the identified articles were screened based on inclusion criteria, including topic relevance, year of publication, journal credibility, and comprehensiveness of findings. Articles that are duplicate, irrelevant, or lack adequate academic quality are excluded from the analysis.

In addition, the selected literature is carefully reviewed to ensure that each study contributes relevant insights regarding the integration of AI in education management information systems. The researchers examined the objectives, methodologies, and key findings of each article to identify common patterns and differences among previous studies. This process helps to generate a more comprehensive understanding of the opportunities, challenges, and implications of current AI adoption in the context of education.

After the screening stage, the selected studies were analyzed using a qualitative descriptive method. The findings of each article are classified into several main themes: (1) the role of AI in management systems in Indonesia, (2) opportunities for AI implementation, (3) challenges and barriers to adoption, and (4) implications for learning quality. The categorised findings are then synthesized to produce a broader interpretation of AI integration in educational institutions.

The synthesis process is carried out by comparing and interpreting the findings of previous research to identify broader trends in the implementation of AI in educational institutions. Through this approach, this study provides a comprehensive overview of how AI supports education management systems, the challenges faced during their implementation, and its potential impact on improving the quality of learning.

3. Results and Discussion

The Role of Artificial Intelligence in Education Management Information Systems in Indonesia

One sector that needs sustainable growth, along with technological advancements, is education. Through the integration of technological advancements, the quality of education will continue to improve. This is of course also driven by other factors, such as managerial skills and a strong work ethic among the academic community in an educational institution [9]. Regarding technology, one of the innovations that has recently been widely discussed is Artificial Intelligence (AI). The presence of AI as a technological innovation is considered to have a positive impact on education, namely in the form of improving quality and services [10]. Regarding the application of Artificial Intelligence in the field of education, Batubara (2020) in Wijiyanti, et al. (2024) stated that Artificial Intelligence in the field of education can be implemented through an education management information system [9].

A system in the field of education that facilitates a number of tasks, including faculty management, curriculum development, student enrollment, performance monitoring, and resource allocation, is known as an education management information system [11]. The field of education will undergo substantial changes as a result of the integration of artificial intelligence with management information systems [12]. Through this integration, educational institutions can operate more effectively and efficiently [9]. The automation of standard administrative tasks such as scheduling, grading, and student enrollment is one illustration of this, which ultimately eases the workload of administrative staff [11]. In addition, it can be used to analyze large amounts of data, implement automated evaluation systems, and track student progress [13]. For this reason, integrating AI into education management information systems is essential to ensure the continued progress of the education sector, especially in the 21st century [11].

In Indonesia, the use of AI is growing to support various aspects of education management, especially in universities. AI is used to analyze student performance, identify at-risk students, and provide timely and accurate intervention recommendations. Additionally, AI helps optimize administrative tasks such as scheduling and resource management [11]. In recent years, Indonesia has also increased investment in education management information systems, particularly in connectivity, data security, and system capacity. As a result, EMIS is now the basis for creating an educational data ecosystem that is more integrated, transparent, and easily monitored than just an administrative tool [14].

Integrating artificial intelligence into the education management information system (MIS) in Indonesia aims to make academic data management more efficient and able to respond to information on the strategic needs of educational institutions. Using an AI-based framework helps universities set up synchronization more flexibly, share learning progress in person, and accelerate research actions with more accessible and organized data. This technology has the ability to analyze large amounts of data, so teachers can discover the learning patterns of each student and provide suggestions for actions for students who are at risk in academic performance. Thus, AI plays a role as a system that supports important decision-making in the higher education environment in Indonesia.

In addition, AI also plays a role in operational monitoring tasks that are performed on an ongoing basis, such as automated scoring systems, scheduling settings, and presence monitoring, which massively helps to reduce errors that may occur due to human factors. With the advent of AI, ChatGPT applications are increasingly being applied in various areas of people's lives, especially in the field of education. The use of technology such as ChatGPT and other virtual assistants in the campus environment in Indonesia has helped improve the daily work efficiency of students and staff in completing administrative tasks as well as academic writing work[5]. By reducing the workload of routine work, administrators and teachers can focus more on strategic activities, such as developing learning materials and innovating better teaching methods.

While AI offers many benefits to education, its implementation still faces a variety of challenges, such as limited infrastructure, lack of training for educators, the risk of technology dependency that can undermine students' critical thinking skills, and ethical and data privacy issues. To address these issues, there is a need to improve infrastructure and facilities, provide training for educators, and emphasize that AI only serves as a tool rather than a substitute for human involvement in education [9].

Opportunities for AI Implementation in Education

The implementation of Artificial Intelligence (AI) offers many opportunities to improve the quality of education through fundamental transformations that go beyond just digitizing content towards the creation of an intelligent learning ecosystem. One of its key strengths is its ability to support personalized learning, where AI introduces intelligent adaptation logic that allows systems to co-create learning experiences through tailored feedback and dynamic challenge adjustment[15]. However, the effectiveness of personalized learning is highly dependent on the availability of student data and the readiness of educators to leverage AI-based tools. This shows that technological capabilities alone are not enough without adequate human support. AI systems can analyze students' learning behavior and provide tailored learning materials based on their needs and abilities [16].

As a result, students can better understand the material and achieve better academic results [2]. Additionally, AI creates a more interactive learning experience that encourages students to be more engaged during the learning process. Technologies such as chatbots and intelligent tutoring systems provide real-time feedback, helping students understand learning materials more clearly [4]. This opportunity extends to the use of virtual ecosystems and immersive simulations, especially in environmental education, which allows students to visualize complex systems and understand the long-term impact of their actions in real life. Experiences based on this encourage critical thinking and support transformative learning, where students actively reflect and change their views on real-world issues [17].

Students tend to see AI as a personal task assistant that can simplify routine work and aid in the process of creating ideas, ultimately saving time significantly [18]. AI also supports inclusive education by providing accessibility tools for students with disabilities, allowing them to participate more actively in the learning process. The use of AI-powered assistive technologies, such as screen readers, voice assistants, and natural language processing (NLP) interfaces, substantially improves autonomy and academic engagement for students with visual, physical, and cognitive disabilities. Live transcription tools are especially beneficial for students who have difficulty processing auditory, allowing them to capture lecture information with a high degree of accuracy, while NLP interfaces help with the smooth flow of dense text for students with language impairments [7].

At the institutional level, AI technology can improve the ease and productivity of educational services by automating frequently performed administrative work, such as assessments, scheduling, and controlling attendance. The use of AI-powered tools makes preparing teaching materials, arranging questions, and making

presentation slides easier, so teachers can concentrate more on teaching quality and direct interaction with their students [18].

In addition, AI technologies, including intelligent tutoring systems, conversational agents, and automated assessment tools, can improve the efficiency and effectiveness of educational services. The integration of this technology allows educational institutions to create a more adaptive learning experience and implement innovative teaching approaches that accommodate the diverse learning needs of students. In addition, AI is driving the development of a more flexible and technology-based learning environment, which contributes to the improvement of the overall quality of educational services [8].

Another important opportunity is the ability of AI to support data-driven decision-making in educational institutions. By analyzing large data sets, AI can provide insights that help institutions improve teaching strategies and academic policies. This is in line with the main function of the MIS, which is to provide accurate information for decision-making. The use of AI in education has the potential to increase operational cost efficiency, including in training activities and learning processes, by optimizing the use of human resources. This allows educational institutions to allocate financial resources more effectively, especially to improve the quality of content and develop educational programs [6].

Although it has enormous potential, the success of AI implementation requires competent human assistance, sufficient data, and the readiness of educators. There are challenges to understanding AI and ethical concerns, such as data privacy issues as well as the possibility of diminished critical thinking skills if a person relies too much on AI [18]. Therefore, this preservation must be seen not just as a technological shift, but as a change in the way of thinking that requires the ability of teachers and students to maintain the role of humans in every decision made by algorithms [15].

Challenges in AI Implementation

Despite the benefits, the application of AI in education also faces several challenges. One of the main problems is the lack of digital literacy among educators and students. These limitations not only hinder the effective use of AI but also reduce its potential impact on improving learning outcomes. Therefore, increasing digital literacy is an important prerequisite for the successful implementation of AI. Many users are not yet fully prepared to utilize AI effectively, limiting its potential impact [6].

Ethical issues also pose significant challenges. The use of AI tools such as chatbots raises concerns regarding plagiarism, academic integrity, and data privacy [19]. Students may overrely on AI-generated content without critically evaluating the information, which can affect the quality of learning [5]. Another significant challenge is the reliability of AI systems. In some cases, AI systems can generate false or misleading information, which can affect students' understanding. This can have a negative impact on student understanding and learning outcomes if not managed properly [20].

Additionally, successful AI implementation requires adequate infrastructure and institutional support. Limited access to technology and lack of clear policies can hinder the adoption of AI in educational institutions, especially in developing countries. The use of artificial intelligence (AI) in education faces various challenges, especially in terms of educator readiness and technology support. Many teachers still lack the knowledge, skills, and experience in using AI, exacerbated by limited access to devices, minimal training, and technical issues such as system complexity and data security. This results in the application of AI in the classroom being less than optimal [21].

In inclusive education, while AI has the potential to improve learning accessibility, there are barriers, such as suboptimal algorithm accuracy, the need for adequate infrastructure, and varying levels of educator readiness. In addition, ethical issues such as algorithmic bias and personal data protection are also important concerns in their implementation [7]. Meanwhile, in early childhood education, the main challenges lie in low AI literacy among educators, limited curriculum, and lack of clear learning guidelines. Additionally, students are at risk of misunderstanding AI, which requires a proper approach to introduce this technology from an early age [22].

Beyond challenges related to digital literacy, ethics, reliability, and infrastructure, the implementation of AI in education is also influenced by institutional readiness and structural inequalities. One of the main problems is the

uneven distribution of digital infrastructure across regions and educational institutions. Schools and universities in urban areas generally have better access to internet connectivity, devices, and technology support than those in rural or remote areas. This digital divide limits equitable adoption of AI and can widen existing education gaps [23].

Another significant challenge is the limited readiness of human resources. Many educators still lack adequate knowledge and skills to integrate AI into the teaching and learning process effectively. Limited access to training and professional development is further hampering AI adoption. Rahmawati et al. (2025) emphasized that strengthening AI literacy and digital pedagogy among educators is essential to maximize the benefits of AI in education [23]. Similarly, Turnando et al. (2025) argue that technological infrastructure alone is not enough without competent human resources [24].

Financial constraints also remain a major concern. The adoption of AI requires significant investments in hardware, software, system maintenance, cybersecurity, and capacity building programs. These costs are often a barrier, especially for educational institutions with limited resources. As a result, many institutions are adopting AI gradually, starting with simple applications such as administrative automation before expanding its use in learning activities [24].

Additionally, the lack of comprehensive regulations regarding AI governance creates uncertainty regarding data privacy, algorithm transparency, and accountability. Rahmawati et al. (2025) note that only a number of educational institutions have established clear policies on AI ethics and data protection. Additionally, algorithmic bias remains a concern because AI systems can produce unfair or inaccurate results when trained on unrepresentative datasets [23].

Overall, these challenges show that the successful application of AI in education requires more than just technology adoption. It demands adequate infrastructure, sustainable capacity building, sustainable funding, and a clear regulatory framework to ensure that AI can be applied responsibly, ethically, and inclusively.

Implications for Learning Quality

The use of Artificial Intelligence (AI) in education Management Information Systems (MIS) increasingly affects how the learning process is structured and delivered. When AI is embedded in these systems, its functions go beyond administrative efficiency to support instructional activities. The ability of MIS to process student learning data in real time allows feedback to be delivered faster, allowing students to identify and address their misunderstandings without significant delays [2].

In practice, AI's contribution becomes more apparent when operating as part of an integrated information system rather than as a stand-alone tool. Through MIS, AI facilitates organized access to learning materials, automated evaluation, and continuous monitoring of student progress. These features contribute to a more structured learning environment, especially when combined with proper pedagogical guidance. Evidence suggests that students who engage with AI-powered learning under teacher supervision tend to achieve more stable and consistent outcomes compared to those who rely on it independently [25].

Another aspect that emerges from this integration has to do with student engagement. AI-enabled systems tend to create more interactive learning conditions, where students are encouraged to actively participate through continuous interaction with the platform. This shows that AI not only improves interaction but also plays a role in increasing cognitive engagement, which is a key factor in improving learning outcomes. However, over-reliance on such systems can reduce students' ability to think independently if not properly guided by educators. This form of engagement is not only behavioral but also cognitive, as students become more involved in processing and applying information. Previous findings suggest that engagement serves as a key mechanism linking the use of AI-based tools to improve learning outcomes [2].

Additionally, incorporating AI into MIS supports the development of more personalized learning experiences. By analyzing student performance patterns, the system can adapt content, adjust difficulty levels, and provide tailored feedback that aligns with individual needs. This flexibility allows learners to progress at their own pace, reducing

the pressure to adjust to a uniform instructional pace. Such an approach contributes to a more inclusive learning environment that accommodates diverse learning abilities and preferences [26].

The data generated through this system also introduces a more evidence-based approach to managing the learning process. Instead of relying solely on periodic assessments, educators can leverage continuous data insights to better understand student progress and learning challenges. This supports more informed instructional decisions and allows for timely intervention when needed. In this sense, AI-powered MIS is not only a data repository but also an active component in shaping learning strategies [27].

Another implication of AI integration in Education Management Information Systems (MIS) is the enhancement of learning analytics capabilities. By continuously collecting and analyzing student data, AI-powered systems can identify learning patterns, detect potential academic difficulties, and provide early warnings for students who require additional support. This allows educators to make more informed decisions and implement timely interventions to improve student performance and reduce learning gaps. Such data-driven approaches contribute to a more effective and responsive learning environment [28].

Furthermore, AI-supported MIS can improve learning effectiveness through adaptive learning mechanisms. By adjusting learning content, difficulty levels, and instructional pathways according to students' progress and individual needs, the system creates a more personalized learning experience. This flexibility allows students to learn at their own pace and receive learning support that matches their abilities. As a result, students tend to become more engaged in the learning process and achieve better academic outcomes because the learning experience is tailored to their specific needs [29].

Despite these advantages, the role of educators remains important in this technology-enabled environment. Teachers are needed to guide students in interpreting AI-generated outputs and to ensure that the information is used appropriately. Without such guidance, it is possible that students may be overly reliant on automated responses, which can limit the development of critical thinking skills [30]. For this reason, the integration of AI in MIS is better understood as a complement to pedagogical practice than a substitute [26].

4. Conclusion

This study examines the role of Artificial Intelligence (AI) in Management Information Systems (MIS) in education in Indonesia, focusing on opportunities, challenges, and implications for the quality of learning. Based on the literature review, it can be concluded that AI plays an important role in improving the efficiency and effectiveness of education management. AI supports data processing, decision-making, and academic services, strengthening the function of MIS in educational institutions. These findings also show that AI offers significant opportunities in education, particularly in supporting personalized learning, increasing student engagement, and improving learning outcomes. In addition, AI enables educational institutions to implement data-driven strategies that improve teaching and administrative processes. However, the implementation of AI also faces several challenges, including limited digital literacy, lack of infrastructure, and ethical issues such as data privacy and academic integrity. These challenges show that successful use of AI requires proper planning, institutional support, and user readiness. Additionally, the impact of AI on the quality of learning depends on how it is used. While AI helps improve learning outcomes, over-reliance on technology can reduce students' critical thinking skills. Therefore, a balanced approach between technology and human interaction is essential. Overall, AI can play an important role in supporting information systems in education if used correctly. However, its effectiveness depends on responsible implementation, the right policies, and the continuous development of digital competencies. Therefore, educational institutions are expected to develop appropriate strategies to optimize the integration of AI into education management systems, including improving digital infrastructure, improving AI literacy among educators and students, and establishing clear guidelines for the responsible use of AI. For future research, empirical studies such as surveys, interviews, and case studies are recommended to provide more practical and context-specific insights regarding the application of AI-based Management Information Systems in educational institutions. Further studies can also examine the long-term impact of AI adoption on student learning outcomes, critical thinking skills, academic integrity, and appropriate policy development to ensure responsible and sustainable implementation of AI in education.

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