

Innovation in Information Technology-Based School Management in Renewed Education 5.0

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ABSTRACT

This article discusses innovations in school management based on information technology to support Education 5.0, which integrates digital technology with humanistic values to create an adaptive, inclusive, and responsive education system in line with modern developments. Education 5.0 emphasizes character building, creativity, and critical thinking skills in students, as well as the development of multidimensional competencies to face future challenges. However, the implementation of Education 5.0 faces challenges such as limited infrastructure, educators' digital skills, and inflexible educational policies. In the context of school management, technologies like digital management systems, AI, Big Data, IoT, and blockchain can improve efficiency, transparency, and security, while supporting personalized learning. The use of these technologies not only enhances administrative management but also creates a more adaptive and inclusive learning experience, ultimately improving the overall quality of education.



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INTRODUCTION

In the era of Renewed Education 5.0, digital transformation has become the backbone of developing a more adaptive, integrated, and individualized education system. Education 5.0 not only involves advanced technology to improve learning efficiency but also emphasizes the importance of humanistic values such as collaboration, problem-solving, and creativity. Information technology (IT)-based school management is a crucial component in realizing this vision, providing strong support for the creation of an innovative and responsive educational ecosystem.

IT-based school management encompasses various aspects, from school information systems and administrative automation to more interactive learning technologies. These innovations enable schools to manage academic data, administration, finance, and parent relationships more effectively and transparently. On the other hand, technologies such as artificial intelligence (AI), the Internet of Things (IoT), and big data open new opportunities to understand individual student needs, design more relevant curricula, and strengthen school community engagement.

Amid global challenges such as shifts in learning patterns due to the pandemic and the need for new skills, IT-based school management innovations are becoming increasingly essential. Schools are no longer just learning centers but also environments that support the full development of each student's potential. Therefore, this study aims to explore how IT-based innovations can be applied in school management and how their implementation can support the goals of Renewed Education 5.0 in creating a generation prepared to face future challenges.

Through this discussion, the article aims to provide guidance for educational stakeholders to adopt and develop IT-based school management systems that align with the needs of Renewed Education 5.0.

RESEARCH METHODS

This research employs a descriptive qualitative method conducted through a literature review. The descriptive qualitative method is used to gain an in-depth understanding of the observed

phenomenon without manipulating specific variables. Meanwhile, the literature review is chosen as the primary data source for this study. Through the literature review, information is gathered from various literature sources, such as books, scientific journals, and articles relevant to the research topic. This approach provides a strong theoretical foundation and enables the researcher to explore recent developments in the relevant field of study. Thus, this research aims to provide a comprehensive and in-depth overview of the observed phenomenon in the context aligned with the research objective, which is the innovation of information technology-based school management in the framework of Education 5.0.

RESULTS AND DISCUSSION

Education 5.0 is a new paradigm that integrates digital technology with humanistic values to create an education system more adaptive to future needs. Not only focusing on technology utilization, Education 5.0 also prioritizes character building, creativity, and students' critical thinking abilities (Pan, 2020; Toharudin et al., 2022). Unlike Education 4.0, which emphasizes automation and digitalization, Education 5.0 seeks to balance technological aspects with the social skills required in this increasingly complex era (Zawacki-Richter et al., 2019). This approach responds to the Fifth Industrial Revolution, which emphasizes collaboration between humans and machines and sustainability. Therefore, Education 5.0 encourages people to be more adaptive, innovative, and ethical in their use of technology (Inoue, 2021). In this context, the education system is expected to encourage project-based learning and problem-solving to develop students' multidimensional competencies.

However, the implementation of Education 5.0 faces various challenges, including infrastructure readiness, teachers' digital skills, and adequate policy support. In Indonesia, for example, there is a significant gap in technology access and educational facilities between urban and rural areas, posing a major obstacle in realizing an Education 5.0 system (Purwanto & Ismiyati, 2022). Meanwhile, many educators in various countries struggle to adapt a technology-based curriculum focused on creativity and critical thinking, especially due to limitations in appropriate professional training (Lim et al., 2021).

Another challenge is the lack of equal infrastructure and technology access. Many rural schools, for instance, lack high-quality internet access and digital devices, hindering the implementation of technology, which forms the foundation of Education 5.0. This can widen the digital divide and hinder the achievement of inclusive and equitable education (Setiawan & Prasetya, 2019). Additionally, Education 5.0 requires teachers who possess digital competencies and project-based teaching skills. Many educators do not yet have these skills, and there are still limitations in the provision of professional training that can help enhance their digital skills (Abdulwahed & Nagy, 2019; Hidayat & Nurul, 2021).

Inclusive policy support is also an essential factor for the success of Education 5.0. The curriculum must be designed to be flexible and oriented towards the development of skills relevant for the future, such as collaboration and problem-solving. Rigid national education policies can become a barrier to the implementation of multidimensional skill-based education (Yoon & Kim, 2020). Therefore, achieving the goals of Education 5.0 requires joint efforts from the government, educational institutions, and society in providing infrastructure support, teacher skill development, and policies that foster inclusive and adaptive education.

Digital school management systems are an increasingly adopted technological innovation to enhance school management efficiency. Integrated school management platforms allow for digital management of student data, attendance, class schedules, and administration. This system enables schools to manage data more accurately and structurally, minimizes manual errors, and allows for faster and more responsive monitoring of changes (Yaratan et al., 2021). Additionally, this system facilitates quicker communication between teachers, students, and parents, and simplifies access to data and reports needed for further analysis. In this context, operational efficiency and time management can be achieved, providing more time for teaching and learning.

The use of data analytics in decision-making is becoming increasingly important in school management. School leaders can use data collected from management systems to understand student needs, identify areas needing improvement, and plan more effective educational strategies. For instance, by analyzing student attendance and performance data, schools can detect patterns indicating potential

issues, such as delays in reaching learning targets or high absenteeism. Thus, data-driven decision-making helps schools design more targeted interventions and improve overall school performance (Yusuf et al., 2019).

In educational innovation, artificial intelligence (AI) is increasingly used to assist in educational personalization, particularly in evaluating and assessing student performance. With the ability to analyze students' learning patterns, AI can help predict challenges students might face and offer tailored learning materials to meet each individual's needs. This technology allows for more adaptive teaching that aligns with students' learning styles and speeds, providing a more effective and meaningful learning experience. AI also plays a role in identifying areas where students need additional support, enabling teachers to give focused attention to each individual (Liu et al., 2020).

Big Data also contributes to enhancing educational personalization. By gathering large data from various sources, such as students' interactions with learning platforms, test results, and online behavior, schools can gain deeper insights into students' behavior and needs. Big Data analytics enables the design of a more relevant and adaptable curriculum for each student. This leads to the development of more inclusive and responsive learning programs, ensuring every student has the opportunity to grow according to their potential (Hidayati & Arisandy, 2022).

Monitoring school facilities using Internet of Things (IoT) technology is increasingly introduced to enhance the efficiency and security of the school environment. By using sensors and IoT devices, schools can monitor classroom usage, energy consumption, and other aspects of school infrastructure in real-time. For example, IoT sensors can control classroom temperatures, ensuring comfort for students, or monitor energy use to reduce waste (Raharjo & Susanto, 2021). Additionally, IoT devices can ensure school facilities remain safe, such as detecting gas leaks or connecting fire alarm systems directly with security personnel.

Smart Classroom implementation is one form of IoT application in schools that can improve interactivity and the quality of the learning experience. In a smart classroom, devices such as digital whiteboards, interactive projectors, and sensors that detect students' presence enable a more dynamic learning experience. This technology not only facilitates the teaching process but also enhances student engagement in learning, as it allows access to materials in a more interactive and engaging manner (Junaidi & Chandra, 2020). Furthermore, smart classrooms support collaboration among students and teachers by utilizing technology that supports various teaching methods, such as project-based learning and group discussions.

Through the implementation of these technologies, school management can be conducted more efficiently and adaptively to modern needs. Technology not only functions as an administrative aid but also as a means to create a smarter and integrated learning environment that can enhance the overall quality of education.

The security of academic data has become a crucial issue in education, especially with the rise of digital technologies that simplify data management. Blockchain, with its decentralized and immutable technology, offers a solution to ensure the security and integrity of academic data. This technology can prevent data forgery, such as grades or certificates, which often occur in educational settings. Every transaction or data update recorded in a blockchain system is encrypted and verified by the network, reducing the potential for data manipulation and guaranteeing the authenticity of recorded information. Thus, blockchain provides assurance that student academic data cannot be altered or forged, increasing public trust in the education system (Huang & Zhang, 2020).

Digital certificates issued using blockchain technology are also becoming popular, as they provide higher security compared to conventional certificates. Encrypted and recorded in blockchain, digital certificates are difficult to manipulate, as any changes affect the entire system. This increases confidence among graduates and employers regarding the validity of academic documents received. Therefore, using blockchain for issuing digital certificates ensures graduates have legitimate, unalterable proof of their academic achievements (Lin et al., 2021).

Educational technology (EdTech) platforms and online learning systems have rapidly developed, especially after the COVID-19 pandemic that forced many schools to transition to online learning. EdTech enables schools to adopt flexible learning methods, allowing students to access materials and instructions online from anywhere. These platforms not only store educational content but also provide tools for teachers and students to interact directly through discussion forums, quizzes,

and online exams. Thus, EdTech plays a significant role in ensuring the continuity of education despite physical limitations, as seen during the pandemic (Zhang et al., 2020).

Hybrid Learning, a more adaptive solution in the Education 5.0 era, combines online and face-to-face learning, giving students greater flexibility in choosing the method that suits their learning style. In this context, students who cannot physically attend school can still access materials and participate in classes online, ensuring no one is left behind in the learning process. By combining these methods, schools can reach more students and meet individual learning needs while optimizing technology use to improve education quality (Abdullah et al., 2021).

Communication between schools and parents is essential to support student development. Technology-based applications enhance this communication by providing a platform where parents can monitor their child's progress, such as test results, attendance, and other school activities. With these applications, parents receive real-time updates, giving them quicker information to support their children at home. It also enables better collaboration between teachers and parents in addressing educational challenges that may arise (Ismail & Hasan, 2020).

Community involvement can also be enhanced through the use of technology. Innovations involving digital platforms allow schools to collaborate more closely with the surrounding community, such as by providing community-based educational programs involving parents, volunteers, and local organizations. This involvement not only supports learning activities but also enriches students' experiences with knowledge and perspectives from the outside world (Satria et al., 2021).

Education 5.0 requires a shift in the teacher's role from merely an instructor to a facilitator in project-based and problem-solving learning processes. Therefore, technology training for teachers is essential to enable them to utilize the latest technology in teaching and classroom management. This training includes the use of various educational technology tools, such as digital learning platforms, AI-based assessment tools, and interactive teaching techniques that leverage technology (Darmawan & Sari, 2021).

In the Education 5.0 era, teachers are expected to act more as facilitators, guiding students to think critically and creatively in solving problems. This role emphasizes the development of higher-order thinking skills, such as analysis, evaluation, and creation, which are crucial for facing future challenges.

In the era of Education 5.0, teachers are expected to play a greater role as facilitators who can guide students to think critically and creatively in problem-solving. This role emphasizes the development of higher-order thinking skills, such as analysis, evaluation, and creation, which are essential for facing future challenges. Therefore, continuous competency development for teachers in this regard needs to be carried out through appropriate training and professional development (Aziz & Widiastuti, 2022).

By integrating various technological innovations, education can become more responsive to the changing times and challenges, as well as more adaptive in meeting the needs and expectations of students and society in general.

A data-driven evaluation system enables real-time and personalized monitoring of student performance. This technology integrates various tools to collect and analyze student data, such as exam scores, class participation, and other activities. With this system, teachers and school leaders can quickly identify students' weaknesses and strengths, adjusting teaching strategies to individual needs. For example, digital platforms like Learning Management Systems (LMS) allow teachers to monitor attendance, learning progress, and student interactions in real-time. This technology also provides students with timely and accurate feedback, supporting a more effective learning process (Mustafa et al., 2020).

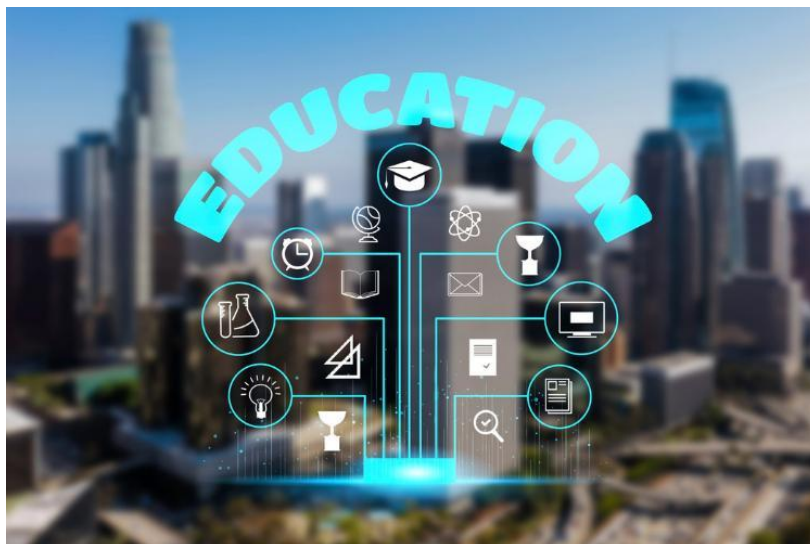
Additionally, data analytics is not only beneficial for evaluating student performance but also for assessing teacher and overall school performance. Data analytics can reveal patterns in teaching practices, the effectiveness of teaching methods, and areas needing improvement. By collecting data on test results, student participation, and feedback from parents, schools can conduct in-depth analyses to evaluate and enhance teacher performance and teaching strategies. This supports continuous improvement in the quality of education provided (Hamid & Zainuddin, 2021).

Innovation in school financial management is increasingly driven by advancements in digital technology. Digital payment systems, such as e-wallets and online payments, have transformed how

schools manage financial transactions, including tuition fees and other expenses. This technology improves transparency and minimizes human error in financial transactions. Additionally, technology-based budgeting systems allow for more efficient fund management by utilizing software that can assist in planning, tracking, and reporting budgets more accurately and transparently. This also enables stakeholders to monitor and control fund usage in real-time (Wijaya & Widyastuti, 2020).

Moreover, technology enables schools to secure additional funding through crowdfunding platforms. Crowdfunding for educational projects has become an effective alternative to support initiatives requiring additional funds, such as building new facilities or innovative learning programs. Through crowdfunding platforms, schools can gain support from the broader community, including alumni, parents, or even the general public interested in investing in education. Thus, technology opens new opportunities for more inclusive and community-based financial management (Andriani et al., 2021).

By integrating technology into various aspects of financial management and evaluation, schools can accelerate the transformation toward a system that is more efficient, transparent, and responsive to the needs of students, teachers, and the community.



Gambar 1 Information Technology Innovation of Education

CONCLUSION

Information technology-based school management innovation is essential to support Education 5.0, which integrates technology with humanistic values to create a more adaptive and inclusive education system. Education 5.0 emphasizes character building, creativity, and social skills alongside technological advancements. However, significant challenges, such as limited infrastructure, disparities in technology access, and the need for teacher training in technology use, remain obstacles to implementing this system. Therefore, realizing Education 5.0 requires collaboration among the government, educational institutions, and society to enhance technology access, develop educator skills, and establish flexible and inclusive policies. Technologies such as digital school management systems, AI, big data, IoT, and blockchain can increase efficiency, personalization, and security in education, ensuring that the learning process is more responsive to student needs and the changing times.

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