

The Role of Digital Leadership and Administrative Innovation in Enhancing School Management Effectiveness in the Era of Education 5.0

M. Karim^{1*}, Karlini Oktarina², Syafrul Antoni³

¹ IAIN Kerinci, Indonesia

² IAIN Kerinci, Indonesia

³ IAIN Kerinci, Indonesia

Corresponding email: m.karimiainkerinci12@gmail.com

Abstract

This study aims to analyze the role of digital leadership and administrative innovation in improving school management effectiveness within the framework of Education 5.0. Employing a literature review method, this research synthesizes relevant empirical studies, theoretical frameworks, and recent scholarly discussions from international journals published between 2018 and 2025. The review explores how digital leadership competencies such as data-driven decision-making, digital ethics, and adaptive communication contribute to the development of innovative administrative practices in schools. Findings indicate that digital leadership fosters a culture of continuous improvement, enhances collaboration through digital platforms, and promotes organizational agility in response to technological disruptions. Furthermore, administrative innovation serves as a mediating factor that transforms leadership vision into operational effectiveness by streamlining processes, optimizing resource management, and increasing stakeholder engagement. In the context of Education 5.0, where human-centric and technology-integrated approaches dominate, both digital leadership and administrative innovation are pivotal in ensuring sustainable educational governance. The study concludes that strengthening the digital capacity of school administrators and integrating innovation-driven administrative systems are key strategies for achieving effective and future-ready school management.

Keywords: Digital Leadership, Administrative Innovation, School Management, Education 5.0, Literature Review

Introduction

The transformation of education towards the era of Education 5.0 marks a paradigm shift from a purely technology-based approach towards integration between digital innovation and human values (Alif et al., 2022). This concept emphasizes the importance of building an education system that not only adopts digital technology, but also fosters the character, empathy, and creativity of students in dealing with the complexities of modern life (Hashim & Fadzil, 2023). In this context, educational leadership no longer focuses on conventional administrative control, but rather must develop humanist digital leadership, in which principals and policymakers play the role of facilitators of value- and technology-based transformation (Nouri et al., 2022). This change requires adaptive ability to integrate technology into learning strategies, resource management, and organizational communication in an ongoing manner (Asnur et al., 2024; Oktarina et al., 2018, 2021).

Furthermore, Education 5.0 demands a new paradigm in school governance that emphasizes collaboration, participation, and cross-disciplinary innovation. Schools need to be learning ecosystems that combine artificial intelligence, big data, and the Internet of Things (IoT) with a human-centered pedagogical approach (Benešová & Tupa, 2022). In this context, the role of educational leadership is crucial to ensure that technology is used not to replace humans, but to strengthen the human dimension and creativity in the educational process (Prasetyo et al., 2023). Effective governance in the Education 5.0 era must be able to integrate technology with collaborative culture, administrative innovation, and a reflective approach that fosters a balance between digital efficiency and educational ethical values (Maharani & Info, 2025).

Digital leadership is a strategic competency that places technology as the main catalyst in the transformation of education and school governance. An education leader in the digital age is not

only required to understand conventional management principles, but must also have the ability to integrate digital technology in decision-making processes, organizational communication, and learning innovations (Ng, 2021). In this context, digital leadership includes visionary thinking skills, technology literacy, and the ability to lead data-driven change to improve managerial efficiency and quality of educational services (Fisk & Hattke, 2022). School leaders with a digital orientation are able to utilize management information systems, academic data analysis, and collaborative platforms to strengthen coordination between stakeholders and increase transparency in school management (Dermawan & Sumarni, 2024).

In addition to the technical aspect, digital leadership also demands the ability to build an adaptive and innovative organizational culture in the midst of rapid technological disruption (Dermawan & Sumarni, 2024). School leaders act as agents of change who not only implement technology, but also encourage collaboration and creativity in the use of technology to improve school performance (ElKordy et al., 2023). Thus, digital leadership is not only about the adoption of digital tools, but about changing the mindset of organizations to be open to innovation and continuous learning (Iivari et al., 2020). Effective leaders in the era of Education 5.0 must be able to combine the human and digital dimensions in a balanced manner, so that technology functions as a support to achieve more holistic, efficient, and equitable educational goals (Anwar, 2024).

Administrative innovation is an important dimension in strengthening the effectiveness of school management, especially in the digital era which demands efficiency and transparency in education governance. Through the implementation of School Management Information Systems (SMIS), administrative processes such as student data management, finance, inventory, and staffing can be carried out in an integrated and data-based manner (Rahman & Wahab, 2022). Digitizing academic data not only improves the accuracy and accessibility of information, but also allows for faster and evidence-based decision-making (Alharthi & Aziz, 2023). Thus, administrative innovation is an important foundation in creating a school management system that is adaptive, efficient, and responsive to changes in the external environment and increasingly complex demands for quality of education (Agus Supriyadi et al., 2023; Dewanto et al., 2024; Ichsan et al., 2023; Mulya Putra et al., 2023). Furthermore, administrative innovation is not only related to technology adoption, but also includes reform of work processes, organizational culture, and communication patterns between education stakeholders. The use of digital technology in administration allows for decentralization of decision-making, strengthens cross-unit coordination, and increases accountability in the management of school resources (Komba & Ngulube, 2021). On the other hand, the efficiency of technology-based work processes helps reduce the administrative burden on teachers and staff, so that they can focus more on improving the quality of learning and student services (Yuliana et al., 2023). Therefore, administrative innovation serves as the main driver of the transformation of school organizations towards more open, collaborative, and performance-based governance within the framework of Education 5.0 (Winiasri et al., 2023; Zulyusri et al., 2023).

According to Ng (2021), principals with digital competencies are able to integrate technology into strategic decision-making, strengthen internal communication, and encourage collaboration based on online platforms. Similar findings were presented by ElKordy, Khalifa, and Osman (2023), who emphasized that visionary digital leadership impacts organizational performance by increasing the efficiency of managerial processes and fostering learning innovation. Meanwhile, Fisk and Hattke (2022) stated that transforming leadership toward a digital model not only increases administrative productivity but also builds an organizational culture that is more adaptive to technological changes and the demands of educational globalization. These findings reinforce the view that digital leadership is a crucial foundation for optimizing school management in the Education 5.0 era (Mukhtar et al., 2025).

In addition to digital leadership, administrative innovation has also been proven to contribute to increasing the effectiveness of school management through the optimization of technology-based processes and information systems. Rahman and Wahab (2022) found that the implementation of School Management Information Systems (SMIS) significantly improves the transparency, efficiency, and accuracy of education administration. Research by Komba and Ngulube (2021) confirms that innovation in administration is not only related to the digitization of processes, but also to organizational culture changes towards data-driven management and cross-functional

collaboration. Furthermore, Yuliana, Sari, and Nugroho (2023) explain that administrative innovation helps reduce the administrative burden on teachers, allowing for a greater focus on learning and improving the quality of education. Thus, the existing literature shows that the synergy between digital leadership and administrative innovation has a strategic role in strengthening the effectiveness of school management in the midst of the challenges of the Education 5.0 era which demands efficiency, collaboration, and creativity.

Research Methods

This study uses the literature review method to analyze the role of digital leadership and administrative innovation in improving the effectiveness of school management in the Education 5.0 era. This method was chosen because it allows researchers to identify, evaluate, and synthesize a wide range of empirical findings as well as theories relevant to the research topic. This approach focuses on collecting secondary data from credible scientific sources such as reputable international journals, academic books, and educational research reports published between 2018 and 2025 (Snyder, 2019). Through a systematic literature selection process, this study examines the patterns, relationships, and conceptual gaps that have emerged in previous studies related to digital leadership, administrative innovation, and the effectiveness of school management. Thus, this literature review serves not only to map existing knowledge, but also to provide a new conceptual framework that is relevant to the dynamics of education in the digital era.

The study process is carried out through several stages, namely identification, selection, analysis, and literature synthesis. At the identification stage, the researcher used databases such as Scopus, Google Scholar, and ERIC to find publications with the keywords "digital leadership", "administrative innovation", "school management effectiveness", and "Education 5.0". Furthermore, at the selection stage, only articles that meet the inclusion criteria namely topic relevance, originality, and source credibility are further analyzed (Xiao & Watson, 2019). The analysis stage was carried out with a thematic approach to identify conceptual trends and relationships between research variables. The final result is in the form of a synthesis of empirical findings that show how digital leadership and administrative innovation contribute to the effectiveness of school management in the context of digital transformation. With this method, the research not only describes the current situation, but also makes a theoretical contribution to the development of school management models in the Education 5.0 era.

Result and Discussion

The Role of Digital Leadership on School Management Effectiveness

The development of digital technology in the world of education has demanded significant changes in school leadership style. Digital leadership emerged as a new approach that emphasizes the use of technology to improve the effectiveness of management and the quality of educational services. School leaders in the digital age are not only responsible for carrying out conventional managerial functions, but must also have the ability to integrate technology to support decision-making processes, communication, and institutional innovation (Ng, 2021). In this context, the effectiveness of school management depends heavily on the extent to which leaders can adopt technology as a strategic tool to achieve efficiency, collaboration, and improvement of educational quality. Digital leadership requires school leaders to be transformation agents who are adaptive to technological and social change. As explained by Fisk and Hattke (2022), leadership in the digital era includes strategic thinking skills, mastery of technology, and sensitivity to changing organizational needs. In practice, school principals who apply the principles of digital leadership are able to build an online platform-based communication system, optimize academic data in planning, and increase the involvement of teachers and students through a digital collaborative approach. Thus, digital leadership plays an important role in changing the paradigm of education management from a bureaucratic model to a model that is innovative, flexible, and responsive to the dynamics of the digital environment (Shobri & Jaosantia, 2025).

One of the key dimensions of digital leadership is the ability to make data-driven decision-making. Effective school leaders are able to leverage management information systems to access data in real time and use it in strategic planning and performance evaluation (Rahman & Wahab, 2022). Additionally, digital technology strengthens transparency and efficiency in the organization's

internal communications, allowing for faster coordination between principals, teachers, and administrative staff (ElKordy et al., 2023). Thus, digital leadership contributes directly to management effectiveness through strengthening communication and accurate information-based decision-making (Garland et al., n.d.).

Digital leadership also plays an important role in encouraging organizational innovation and improving school performance. According to Nouri, Zhang, and Fors (2022), digital leaders are oriented towards creating a work environment that supports innovation, continuous learning, and cross-disciplinary collaboration. By utilizing technologies such as Learning Management Systems (LMS) and School Management Information Systems (SMIS), school principals can create work systems that are efficient, integrated, and adaptive to modern educational needs. In addition, digital leadership helps foster an organizational culture based on creativity and openness to change, which ultimately strengthens the overall effectiveness of school management. Despite its great potential, the implementation of digital leadership in school management also faces a number of challenges. The main obstacles include limited digital literacy among principals and teachers, resistance to change, and limited technological infrastructure, especially in areas with limited resources (Iivari et al., 2020). In addition, there is a need to build education policies that support the development of digital competencies of school leaders in a systematic manner. Without policy support and ongoing training, digital leadership risks becoming a normative concept that is difficult to implement in daily managerial practice. Therefore, digital capacity building strategies are a crucial aspect in strengthening the effectiveness of school management (Suherman, 2025).

Overall, previous research has shown that digital leadership has a positive and significant correlation to the effectiveness of school management (Prasetyo et al., 2023). School leaders who have digital competence are able to create an educational ecosystem that is efficient, collaborative, and innovation-based. They can integrate technology in every aspect of management, from strategic planning to evaluation of learning outcomes. In the context of Education 5.0, digital leadership serves as a bridge between technology and human values, ensuring that digital transformation in schools remains centered on improving the quality of learning and developing students' character. Thus, digital leadership is not only a supporting factor, but is the main foundation of school management effectiveness in the modern era.

Synergy between Digital Leadership and Administrative Innovation

The synergy between digital leadership and administrative innovation is the key to realizing effective and sustainable school management in the Education 5.0 era. Digital leadership provides strategic direction and technology-based vision, while administrative innovation serves as an operational means to implement this vision into work systems and management processes (Ng, 2021). Digitally-oriented school leaders are not only leveraging technology as an administrative tool, but also as an instrument to change organizational culture and improve performance efficiency. This synergy confirms that digital leadership without administrative innovation tends to be unproductive, while administrative innovation without digital leadership direction has the potential to lose its strategic orientation (ElKordy et al., 2023). Digital leadership acts as a catalyst that encourages technology-based administrative innovation in educational institutions. According to Fisk and Hattke (2022), school principals with digital competence are able to stimulate changes in the administrative system towards a more transparent, efficient, and data-based model. By implementing a school management information system (SMIS), leaders can automate various administrative functions such as finance, attendance, and performance evaluation. In addition, digital leadership allows for integrated information management between organizational units, thereby accelerating decision-making and increasing accountability. Effective digital leaders also create an organizational climate that supports the exploration of new ideas, which is the main foundation for the emergence of administrative innovation (Waldan, 2025).

The synergy between digital leadership and administrative innovation contributes directly to improving the effectiveness of school management. Digital platform-based collaboration strengthens coordination between principals, teachers, and education personnel, thereby improving communication efficiency and organizational productivity (Rahman & Wahab, 2022). Digital leadership provides a flexible leadership structure, while administrative innovation creates an adaptive work system that is able to adapt to the needs of the organization. The combination of the

two enables the realization of data-driven management, where strategic decisions are based on accurate and real-time information. The result is improved resource efficiency, transparency in governance, and the achievement of more measurable school goals. The synergy between digital leadership and administrative innovation also strengthens the organization's adaptability to changes in the external environment. In the digital era, schools are required to respond to changes in technology and education policies quickly and appropriately. Komba and Ngulube (2021) show that administrative innovation driven by digital leadership can improve schools' ability to dynamically restructure work processes. Digital leaders direct organizations to develop a robust technology-based administration system that is oriented towards continuous improvement. This allows schools to remain competitive and relevant amid accelerating digital disruption.

Although the synergy of digital leadership and administrative innovation focuses on technology, both still place humanistic values at the core of educational transformation. According to Hashim and Fadzil (2023), Education 5.0 demands a balance between digital capabilities and human empathy in educational management. Effective digital leaders utilize administrative innovation to strengthen the engagement of teachers, students, and the school community through a collaborative approach. Thus, technology does not replace the role of humans, but rather expands their capacity to innovate and participate in educational governance. This synergy produces a school management model that is not only technologically efficient but also inclusive, collaborative, and socially just (Edy Nurtamam et al., 2023; Wantu et al., 2024). The results of the literature review indicate that the synergy between digital leadership and administrative innovation results in high school management effectiveness, particularly in aspects of efficiency, transparency, and organizational sustainability (Prasetyo et al., 2023). Digital leadership strengthens the strategic direction and vision of change, while administrative innovation provides managerial instruments that ensure effective implementation. In the context of Education 5.0, this synergy not only improves organizational performance but also creates a school ecosystem oriented towards lifelong learning and continuous innovation. Therefore, the integration of both is the main foundation in building an intelligent, adaptive, and globally competitive education management system.

School Management Effectiveness in the Era of Education 5.0

The effectiveness of school management in the Education 5.0 era is no longer measured only on administrative efficiency and academic achievement, but also on the ability of educational institutions to adapt to technological, social, and humanitarian changes. Education 5.0 emphasizes the synergy between digital technology and the humanistic dimension in the education system (Hashim & Fadzil, 2023). Therefore, effective school management must be able to integrate *artificial intelligence*, *big data*, and the Internet of Things (IoT)* into managerial practices without neglecting aspects of empathy, ethics, and collaboration. The effectiveness of school management in this context reflects the extent to which schools can create an adaptive, innovative, and sustainable learning environment, aligned with the needs of learners and 21st-century society. The effectiveness of school management in the digital era includes several key dimensions: organizational efficiency, stakeholder participation, information transparency, and policy innovation. According to Ng (2021), effective school management focuses not only on procedural compliance, but also on the flexibility of the system in the face of uncertainty. Adaptive leadership, the use of information management technology, and the formation of an innovation-based organizational culture are crucial factors in creating this effectiveness. In addition, Prasetyo et al. (2023) added that management effectiveness in the Education 5.0 era must be measured through the school's ability to develop cross-disciplinary collaboration, manage resources sustainably, and generate positive social impacts for the educational community (Maharani & Info, 2025).

Digital technology plays a key catalyst in improving the effectiveness of school management. The application of *School Management Information Systems (SMIS)* allows the integration of academic, financial, and personnel data in real-time, which supports *evidence-based decision-making* (Rahman & Wahab, 2022). With the digitalization of administration, the planning and reporting process becomes more efficient, transparent, and accountable. In addition, the use of *learning analytics* and *cloud computing* strengthens the evaluative function in school management, assisting leaders in comprehensively monitoring teacher performance and student learning outcomes. Therefore, technology is an important foundation in creating a smart and measurable

school management system in the Education 5.0 era. Leaders who have digital competence are able to translate the school's vision and mission into a results-oriented technology-based strategy (ElKordy et al., 2023). According to Fisk and Hattke (2022), principals with a digital leadership style not only manage human and financial resources, but also develop managerial innovation through virtual collaboration, digital communication, and data analysis. In this context, management effectiveness is no longer understood as organizational stability, but rather the ability of schools to continue to adapt, innovate, and learn in a dynamic digital environment (Waldan, 2025).

Despite the enormous potential of technology, the implementation of effective school management in the Education 5.0 era still faces a number of challenges (Mukhtar et al., 2025). The main barriers include the digital divide between teachers and staff, the limitations of technological infrastructure, and resistance to organizational culture change (Iivari et al., 2020). In addition, there are problems in data management and information security that can affect stakeholder trust in the digital management system (Maharani & Info, 2025). Therefore, the effectiveness of school management cannot be achieved solely through technological innovation, but also through strengthening digital literacy, human resource training, and education policies that support digital transformation holistically. The effectiveness of school management in the Education 5.0 era has wide implications for improving the quality of education and the nation's competitiveness. Schools that are able to make effective use of technology will create a 21st-century personalized, inclusive, and competency-based learning system (Benešová & Tupa, 2022). Effective school management also strengthens the relationship between teachers, students, and the community through productive digital collaboration. Thus, management effectiveness is not only measured by administrative success, but also by its contribution to shaping an intelligent, adaptive, and sustainable educational ecosystem. In the context of Education 5.0, the effectiveness of school management is a reflection of the ability of educational institutions to balance technological sophistication and human values in the process of educational transformation (Alif et al., 2022).

Conclusion

Findings indicate that digital leadership fosters a culture of continuous improvement, enhances collaboration through digital platforms, and promotes organizational agility in response to technological disruptions. Furthermore, administrative innovation serves as a mediating factor that transforms leadership vision into operational effectiveness by streamlining processes, optimizing resource management, and increasing stakeholder engagement. In the context of Education 5.0, where human-centric and technology-integrated approaches dominate, both digital leadership and administrative innovation are pivotal in ensuring sustainable educational governance. The study concludes that strengthening the digital capacity of school administrators and integrating innovation-driven administrative systems are key strategies for achieving effective and future-ready school management.

References

- Agus Supriyadi, Desy Desy, Yayat Suharyat, Tomi Apra Santosa, & Aulia Sofianora. (2023). The Effectiveness of STEM-Integrated Blended Learning on Indonesia Student Scientific Literacy: A Meta-analysis. *International Journal of Education and Literature*, 2(1), 41–48. <https://doi.org/10.55606/ijel.v2i1.53>
- Alif, K. P., Nabila, S., & Ahmad, M. (2022). *Principal Management in Increasing the Quality of Education in the Society 5.0 Era*. 5, 438–447.
- Anwar, S. (2024). *Digital leadership in the digital era of education : enhancing knowledge sharing and emotional intelligence*. July. <https://doi.org/10.1108/IJEM-11-2023-0540>
- Asnur, L., Jalinus, N., Faridah, A., Apra, T., Ambiyar, R. D., & Utami, F. (2024). *Video-blogs (Vlogs) -based Project : A Meta Analysis*. 14(5), 1553–1557.
- Dermawan, H., & Sumarni, S. (2024). *Basic Education in the Era of Society 5.0 : Opportunities and Challenges*. 1(4), 183–192.
- Dewanto, D., Santosa, T. A., Ratih, A., Asrizal, A., & Hardeli, H. (2024). The Influence of the Stem-Based Guided Inquiry Model on Students' Creative Thinking Skills in Science Learning: A Meta-Analysis Study. *Jurnal Penelitian Pendidikan IPA*, 10(3), 88–95. <https://doi.org/10.29303/jppipa.v10i3.6777>

- Edy Nurtamam, M., Apra Santosa, T., Aprilisia, S., Rahman, A., & Suharyat, Y. (2023). Meta-analysis: The Effectiveness of Iot-Based Flipped Learning to Improve Students' Problem Solving Abilities. *Jurnal Edumaspul*, 7(1), 2023–1492.
- Garland, V. E., Tadeja, C., Garland, V. E., Tadeja, C., Garland, E., & Tadeja, C. (n.d.). *Educational Leadership and Technology: Preparing School Administrators for a Digital Age Administrators for a Digital Age*.
- Ichsan, I., Suharyat, Y., Santosa, T. A., & Satria, E. (2023). Effectiveness of STEM-Based Learning in Teaching 21 st Century Skills in Generation Z Student in Science Learning: A Meta-Analysis. *Jurnal Penelitian Pendidikan IPA*, 9(1), 150–166. <https://doi.org/10.29303/jppipa.v9i1.2517>
- Maharani, A., & Info, A. (2025). *Innovation in Information Technology-Based School Management in*. 3(2), 53–58.
- Mukhtar, S., Razak, A. Z. A., Setiyowati, N., & Adni, M. A. (2025). *Educational leadership innovation: a recent comprehensive structured review*. 19(4), 2342–2350. <https://doi.org/10.11591/edulearn.v19i4.23239>
- Mulya Putra, Abdul Rahman, Ilwandri Ilwandri, Yayat Suhayat, Tomi Apra Santosa, Ringgo Putra, & Sanju Aprilisia. (2023). The Effect of STEM-Based REACT Model on Students' Critical Thinking Skills: A Meta-Analysis Study. *LITERACY: International Scientific Journals of Social, Education, Humanities*, 2(1), 207–217. <https://doi.org/10.56910/literacy.v2i1.560>
- Oktarina, K., Lufri, L., & Chatri, M. (2018). Validity of Learning Module Natural Sciences Oriented Constructivism with the Contain of Character Education for Students of Class VIII at Yuniior Hight School. *IOP Conference Series: Materials Science and Engineering*, 335(1), 0–10. <https://doi.org/10.1088/1757-899X/335/1/012091>
- Oktarina, K., Suhaimi, Santosa, T. A., Razak, A., Irdawati, Ahda, Y., Lufri, & Putri, D. H. (2021). Meta-Analysis: The Effectiveness of Using Blended Learning on Multiple Intelligences and Student Character Education During the Covid-19 Period. *International Journal of Education and Curriculum Application*, 4(3), 184–192. <http://journal.ummat.ac.id/index.php/IJECA/article/view/5505>
- Shobri, M., & Jaosantia, J. (2025). *Digital Transformation in Islamic Education Management and Leadership: Strategies, Challenges, and Opportunities in the Society 5.0 Era*. 1(1), 1–13.
- Suherman, D. (2025). *Innovation in Educational Administration for Effective Learning Environments*. 1(2), 54–63.
- Waldan, R. (2025). *Strategic Role of Principals in Islamic Digital-Based Human Resource Management*. 459–472.
- Wantu, H. M., Muis, A., Zain, A., Hiola, S. F., Agustina, I., Santosa, T. A., Yastanti, U., & Nugraha, A. R. (2024). Effectiveness of Think-Pair-Share and STEM Models on Critical Thinking in Early Childhood Education. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 8(5), 1320–1330. <https://doi.org/10.31004/obsesi.v8i5.6202>
- Winiasri, L., Santosa, T. A., Yohandri, Y., Razak, A., Festiyed, F., & Zulyusri, Z. (2023). Ethno-Biology Learning Model Based on Design Thinking to Improve Students' Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, 9(9), 7767–7774. <https://doi.org/10.29303/jppipa.v9i9.4213>
- Zulyusri, Z., Santosa, T. A., Festiyed, F., Yerimadesi, Y., Yohandri, Y., Razak, A., & Sofianora, A. (2023). Effectiveness of STEM Learning Based on Design Thinking in Improving Critical Thinking Skills in Science Learning: A Meta-Analysis. *Jurnal Penelitian Pendidikan IPA*, 9(6), 112–119. <https://doi.org/10.29303/jppipa.v9i6.3709>