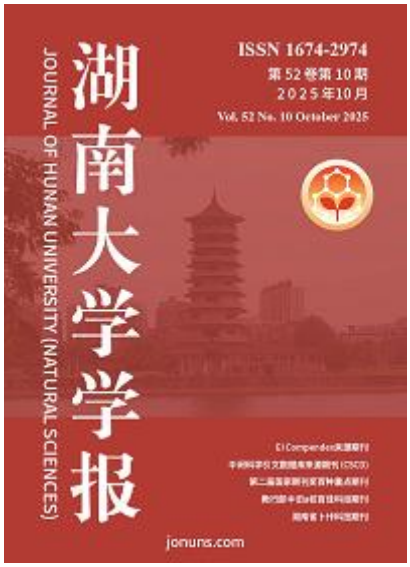

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The Role of Digital Transformation in Educational Management: Innovation, Challenges, and Its Impact on School Quality

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Abstract: Digital transformation in educational management has emerged as a major catalyst for systemic change across educational institutions. This study examines the role of digital transformation in driving managerial innovation, identifying implementation challenges, and assessing its influence on overall school quality. Employing a qualitative approach through an extensive literature review, the article synthesizes insights from ten reputable international journals relevant to the field of digital education transformation.

The findings indicate that digitalization has stimulated a wide range of innovations, including the use of big data for performance evaluation, interactive platform-based learning models, and predictive analytics to support

evidence-based policymaking. Moreover, digital transformation enhances transparency, accountability, and stakeholder engagement throughout the educational process. Despite these benefits, several persistent challenges continue to hinder its effective implementation, such as the digital divide, resistance stemming from organizational culture, limited digital literacy among educators, and concerns regarding data privacy and security.

Nevertheless, schools that strategically integrate digital transformation demonstrate substantial improvements in managerial efficiency and educational quality. Such progress is largely influenced by adaptive digital leadership and an organizational culture that embraces continuous change. Strengthening digital infrastructure, providing ongoing professional development, and fostering cross-sector collaboration are therefore essential components for achieving sustainable digital transformation in education.

This study offers important implications for policymakers, school leaders, and education practitioners seeking to design context-appropriate and long-term strategies for effective digital transformation.

Keywords: Digital Transformation, Education Management, School Innovation, Education Quality, Digital Leadership.

数字化转型在教育管理中的作用：创新、挑战及其对学校质量的影响

摘要：教育管理中的数字化转型正逐渐成为推动各类教育机构系统性变革的重要动力。本研究旨在探讨数字化转型在推动管理创新、识别实施过程中的关键挑战以及提升学校整体质量方面所发挥的作用。通过对十篇与数字教育转型相关的高水平国际期刊进行系统性的文献综述，本研究采用质性研究方法对现有成果进行了综合分析。

研究结果显示，数字化进程已促生多项创新，包括利用大数据进行绩效评估、基于互动平台的学习模式，以及运用预测分析支持循证决策制定。此外，数字化转型还增强了教育过程中的透明度、问责机制以及利益相关者的参与度。然而，数字鸿沟、组织文化阻力、教师数字素养不足以及数据隐私与安全问题仍是阻碍数字化实施的重要挑战。

尽管如此，那些能够战略性地整合数字化转型的学校在管理效率和教育质量方面均表现出显著提升。这一成功在很大程度上取决于适应性强的数字化领导力以及开放变革的组织文化。因此，加强数字基础设施建设、提供持续的专业培训以及促进跨部门协作，是实现教育领域可持续数字化转型的关键要素。

本研究对政策制定者、学校管理者及教育实践者具有重要参考价值，为制定具有情境适应性与长期可持续性的数字化转型战略提供了实证支持与理论启示。

关键词：数字化转型、教育管理、学校创新、教育质量、数字化领导力。

1. Introduction

Digital transformation has become a crucial element in the change of the global education system that demands technology-based management and innovation [1]. In the era of the Industrial Revolution 4.0 and Society 5.0, schools are not only required to adopt digital devices but also to reformulate educational management that is responsive to these changes [2]. This change brings a new paradigm in the school governance system, especially in aspects of strategic planning, curriculum implementation, and technology-based assessment systems [3].

Digital transformation is the process of integrating digital technologies into all aspects of a business and organization, fundamentally changing the way it operates and delivers value to customers. Effective implementation of digital transformation can improve operational efficiency, revenue, and change the culture of an organization to be more adaptive to change. However, this process also presents challenges, such as the complexity of implementation and the risk of failure that can be detrimental to the organization.

Therefore, the right management strategy is needed to ensure the success of digital transformation in the organization [4].

In Indonesia, the government has set a direction for digital transformation until 2024, with a target of digital economic growth reaching 3.17% to 4.66%. This effort includes utilizing the digital economy to increase efficiency in various sectors, including the processing industry, as well as contributing significant added value to the national economy. In addition, the government is committed to accelerating the development of the digital economy as a strategic pillar in realizing the Vision of Golden Indonesia 2045, which is realized through the launch of the White Paper on the National Strategy for Developing Indonesia's Digital Economy 2030 [5]. Digital transformation also plays an important role in the education sector, where the integration of technology in learning can improve the quality of education and prepare competent human resources in the digital era [6].

Digitalization not only touches the administrative side, but also has a significant impact on learning, collaboration, and transparency of education management [7]. By utilizing management applications such as EDM Kemenag, schools can improve process efficiency, information transparency, and stakeholder participation [8]. However, the adoption of digital technology also requires readiness of human resources, adequate infrastructure, and digital literacy that is evenly distributed among teachers and education personnel [9], [10].

The main challenges in implementing digital transformation in education management include organizational cultural resistance, the digital divide between urban and rural schools, and the lack of policies that support sustainable innovation [11], [12]. In addition, many schools have not been able to maximize the potential of technology to boost the quality of learning and data-based decision making [13], [14]. Therefore, synergy between technological innovation and adaptive institutional transformation is needed.

The quality of schools is largely determined by managerial capabilities that are able to respond to technological developments and utilize them strategically [15]. Principals and education personnel as the main actors in education management need to play an active role in creating a flexible, participatory, and future-oriented digital-based learning environment [16]. In other words, digital transformation is not just about hardware and software, but also includes updating the culture of educational organizations [17], [18].

The urgency of this research lies in the urgent need for an innovative and responsive education management model for digital transformation, considering that there is still a gap between national policies and implementation in educational units [19]. This research is important to answer how digital innovation can be a catalyst for improving school quality, and to what extent existing challenges have affected the effectiveness of education management [20].

Previous studies have highlighted various aspects of digital transformation in education, such as the influence of digital learning applications on learning outcomes [21], or the implementation of technology-based curriculum [22]. However, studies on the integration of digital transformation specifically in school education management, as well as its overall impact on the quality of institutions, are still limited and require further exploration [23].

This study aims to critically analyze the role of digital transformation in school education management, identify emerging innovations, challenges faced in their implementation, and their impact on improving school quality holistically.

2. Method

This study uses a qualitative approach with a descriptive literature study type of research, which aims to systematically describe and analyze various literature and previous research findings related to digital transformation in education management, as well as its impact on innovation and school quality. This approach was chosen because it is relevant to explore the meaning, understanding, and conceptual and practical tendencies that develop in the context of digital education, especially in institutional management [24], [25]. Descriptive literature research allows researchers to critically examine various sources and present a comprehensive mapping of the issues being studied.

The data sources in this study consist of secondary data obtained through a review of reputable international journal articles, scientific proceedings, academic books, and official research reports relevant to the theme of digital transformation in education management. The selection of literature was carried out purposively by considering the relevance of the topic, the credibility of the source, and the recency of the publication [26]. All sources used were published in the period 2015–2025 to ensure that the data analyzed reflects the latest developments in this field.

Data collection techniques are carried out by documentation through systematic searches using scientific databases such as Google Scholar, SpringerLink, ScienceDirect, and Taylor & Francis. This process includes identifying keywords such as digital transformation, educational management, school innovation, and quality improvement in education. After being collected, all documents are evaluated in terms of validity, content substance, and relevance to the research focus.

The data analysis method used is content analysis, which is carried out descriptively-qualitatively. This

analysis includes three main stages: data reduction, data presentation, and drawing conclusions. The data reduction stage is carried out by sorting literature based on research sub-themes, namely management innovation, digital transformation challenges, and impacts on school quality. Furthermore, the data is presented in a structured narrative form that shows patterns and relationships between thematic variables. The final stage is data interpretation and synthesis to obtain a deep and comprehensive understanding [27], [28].

3. Results and Discussion

The following is a literature matrix table of findings from a literature study that has been systematically filtered based on the relevance of the theme, the reputation of the source, and the latest year of publication. From a total of dozens of articles identified in the initial search stage, a selection process was carried out based on suitability to the research focus, namely: the role of digital transformation in education management, innovation and implementation challenges, and its impact on school quality. The following table presents 10 selected articles that are considered the most representative, relevant, and high-quality, originating from sources such as Elsevier, Springer, Frontiers, Taylor & Francis, and others.

Table 1. Selected Literature Data on Digital Transformation in Educational Management

No	Author	Judul	Temuan
1	Ortega-Sánchez & Sanz de la Cal (2025)	Teaching Controversial Issues in Secondary Education	Digitalization drives pedagogical innovation and critical thinking in schools
2	Zeng et al. (2024)	Leading Smart Education	Education leaders play a crucial role in accelerating digitalization
3	Macale & Abanto (2024)	Digitalization of DepEd Camarines Norte: Challenges and Opportunities	Infrastructure and teacher training are major barriers to transformation
4	Robby & Andari (2024)	Molah Gati Innovation in Improving School Administration	Digital school management improves efficiency and quality of service
5	Turu & Burton (2025)	Initial Teacher Education in England during the Covid-19 Pandemic	Pandemic accelerates digitalization of education and teacher training
6	Suratman et al. (2024)	The Influence of Digital Leadership Toward Digital Transformation	Digital leadership contributes to the effectiveness of school innovation
7	Shaheen & Waqar (2024)	Role of Leadership in Digital Transformation	Ethical challenges and managerial readiness hamper digitalization
8	Ani (2024)	Transformation of Quality Management towards Partnership Programs	External collaboration strengthens the effectiveness of digital transformation
9	Agava (2024)	Feasibility of Data Literacy Services in University Libraries	Digitalization requires strong data structure support
10	Pulungan & Elfrianto (2024)	Role of Organizational Culture in Leadership Effectiveness	Digital transformation must be supported by an adaptive organizational culture

Based on the results of the literature study conducted on ten selected articles, it is clear that digital transformation in educational management has become a strategic theme that has developed significantly in the last decade. Each article analyzed makes an important contribution to a broader understanding of how educational institutions respond to, adopt, and manage technology-based changes in the institutional realm. These articles not only highlight technological aspects, but also examine dimensions of leadership, organizational culture, managerial policies, and implications for educational quality.

Research by Ortega-Sánchez and Sanz de la Cal (2025) in the journal Frontiers in Education shows that digitalization is not just a technical tool, but also a transformational medium that enables critical teaching of controversial issues in secondary schools. This study emphasizes the importance of teacher competence in managing sensitive materials digitally, as well as how digital approaches can facilitate dialogic and participatory learning that ultimately improves the quality of students' critical and social thinking [29]s.

On the other hand, a study conducted by Zeng et al. (2024) in the Springer publication highlights smart leadership as the main driver in the implementation of smart education. This article discusses the importance of digital vision for educational leaders, including skills in data-driven decision-making and technology infrastructure management. In this context, the role of leaders is not only as administrative managers, but also as change agents who are able to drive systemic innovation in educational institutions [30].

The article by Macale and Abanto (2024) focuses on a case study in the Philippines on the digitalization

of the basic education system in the region of Camarines Norte. This study reveals significant challenges in the form of infrastructure inequality, limited teacher training, and problems with organizational culture adaptation. However, this study also notes that digital programs such as the Digital Rise Program have been positive initiatives in gradually improving the quality of education services, although they are not evenly distributed geographically [31].

Robby and Andari (2024) through their descriptive study of the Molah Gati innovation in the city of Mataram showed that digital-based school management has provided high efficiency in administrative aspects, such as financial management, attendance, and academic documentation. They concluded that digital transformation can increase the credibility of educational institutions in the eyes of the public and strengthen institutional accountability [32].

In the context of teacher training, Turu and Burton (2025) present the results of a study during the COVID-19 pandemic which drastically accelerated digital adoption in teacher training institutions in the UK. This study shows that the sudden transition to online platforms drives a reorientation of technology-based curriculum and learning. Educators are required not only to be proficient in digital platforms, but also in designing meaningful and contextual learning experiences [33].

Research by Suratman et al. (2024) underlines the importance of digital leadership in driving educational transformation. Using a quantitative approach, this article finds that leaders with high digital competence tend to be more successful in directing schools towards innovation. Such leaders are able to design data-driven policies and build an organizational culture that supports change [34].

A review by Shaheen and Waqar (2024) in the Apex Journal deepens the understanding of the ethical and psychological dimensions of the digital transformation process. They found that while technology can accelerate many aspects of educational management, there are major challenges in terms of educator trust in technology, protection of students' personal data, and the need for psychosocial support during the digital transition [35].

In the realm of organizational culture, Pulungan and Elfrianto (2024) emphasize that the success of digital transformation is highly dependent on the readiness of the social structure and internal values of the school. This article explains that institutions that have a collaborative culture, are open to change, and are committed to continuous learning tend to be more adaptive in facing digital disruption [36].

Ani's article (2024) provides an important perspective on the importance of external partnerships in supporting the digital transformation of schools. This study shows that partnership programs between schools, the government, and the private sector can be key to creating a more efficient and contextual digital-based education management system. This partnership also allows access to broader resources and training, especially in schools with limited budgets [37].

Finally, a study by Agava (2024) in Africa highlights the importance of data literacy services in higher education as the foundation of effective digital transformation. This article shows that without efficient data management and strong information infrastructure, digitalization in education will be shallow and vulnerable. Therefore, investment in data literacy and information management systems is vital [38]

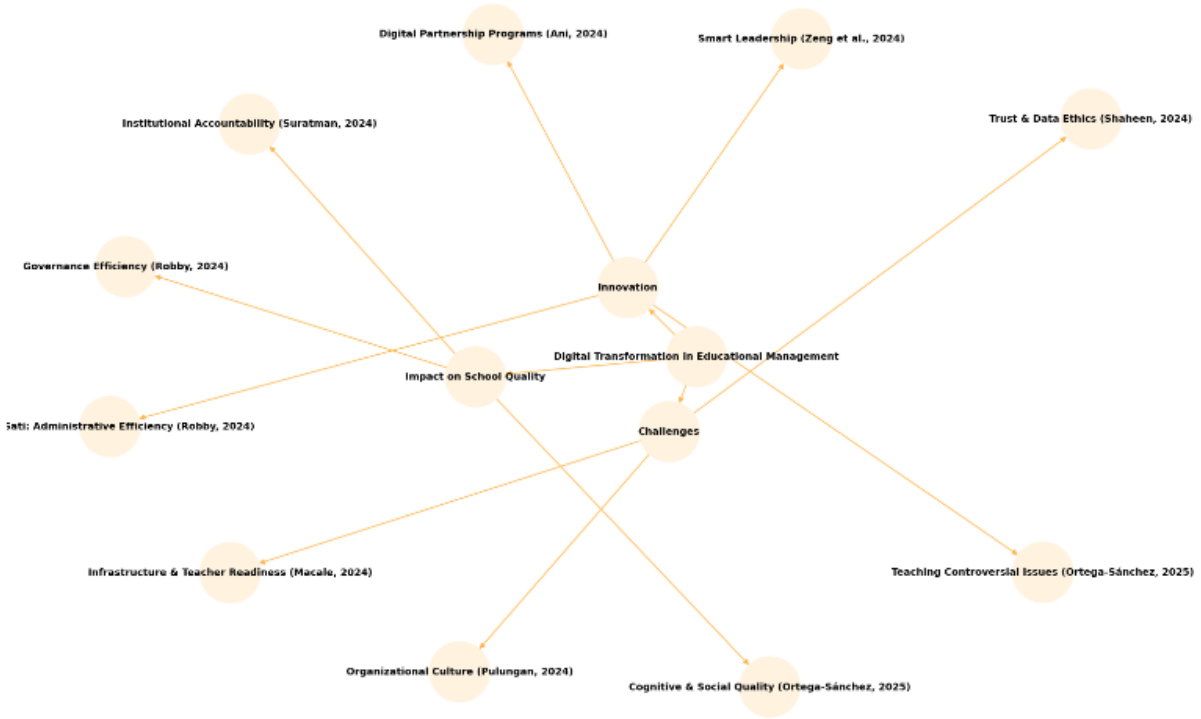

Figure 1. Digital Transformation in Educational Management

Overall, this literature data indicates that digital transformation in education management cannot be viewed as a purely technical phenomenon. It is a complex process that includes structural, cultural, leadership, and ethical aspects. Technological innovation can indeed be an enabler in improving the quality of education, but its effectiveness is greatly influenced by the readiness of the holistic education ecosystem. Therefore, the role of education management is crucial in aligning technology with institutional vision, student needs, and local challenges faced by schools in various parts of the world.

Discussion

The Critical Role of Digital Transformation in Education Management

Digital transformation in education management has become a major force that revolutionizes the way schools are managed. Not only does it impact the teaching aspect, this transformation also fundamentally changes how school leaders make decisions, develop strategies, and interact with the entire education ecosystem. Technology now allows school management to be more responsive, efficient, and data-driven. In this context, principals no longer rely solely on intuition or manual reports in managing educational institutions, but use digital systems that allow direct access to real-time data.

One real-world example comes from a study by Maor, McCarthy, and McConney (2023) that examined the implementation of digital transformation in schools in Western Australia [39]. They found that schools that had adopted a data-driven digital approach were able to significantly improve the effectiveness of leadership and decision-making. In one school, for example, the principal used an integrated digital dashboard to monitor student attendance, academic performance, and student engagement in school activities. If a student's academic grades declined for two consecutive weeks, the system automatically sent a notification to the homeroom teacher and principal, so that they could immediately take intervention steps.

This approach makes the management process more proactive and predictive. Not only does it function as an administrative tool, digital technology also strengthens the leadership dimension of the school. Strategic decisions that previously took a long time and were based on assumptions can now be taken quickly based on concrete evidence. Teachers and school staff also feel the benefits, because they are helped in designing learning that is more in line with student needs, and it is easier to submit reports to parents.

Digital transformation also enables education management to be more transparent and accountable. All stakeholders, including students and parents, can access important information directly through online systems, such as academic progress, school agendas, and important announcements. This creates a more open, collaborative, and participatory education ecosystem.

However, the success of this digital transformation is not solely determined by the availability of technology, but also by the readiness of the school's leadership and organizational culture. Education leaders need to have the capacity to manage change, build a clear digital vision, and ensure that all parties receive adequate training. As emphasized by Maor and colleagues, technology-based leadership requires a cultural shift in school management—from an intuitive approach to a data-based and analytical approach.

Thus, digital transformation plays a critical role in improving the quality of education management. When implemented strategically, it not only improves administrative processes but also strengthens the capacity of institutions to provide higher quality, fairer, and more adaptive education services to the challenges of the times.

Emerging Innovations

Innovations that have emerged as a result of digital transformation in education management have brought significant changes to the way schools operate and provide learning services. These innovations are not only technological, but also reflect changes in mindset, organizational culture, and management strategies of educational institutions. The main innovations that are widely adopted in various countries are the use of Big Data, the use of interactive digital platforms, hybrid learning models such as flipped classrooms, and the application of predictive analytics in educational planning.

One prominent form of innovation is the use of Big Data to evaluate school and teacher performance. Through an integrated digital system, schools can collect and analyze data from various sources such as student attendance, assessment results, student feedback, and teacher performance. A concrete example can be seen in the study by Shevchuk and Shpak (2023) in Russia, which shows how a digital-based quality management system is used to evaluate the entire educational process as a whole [40]. Data collected from each school unit allows for evidence-based decision-making and allows school management to intervene immediately if there are declining performance indicators. This makes the management process more predictive and responsive to change.

In addition, another innovation that is widely implemented is the use of interactive digital platforms that enable more collaborative and engaging learning for students. For example, many schools in China and South Korea have adopted platforms such as ClassIn and Edmodo that allow teachers to create interactive quizzes, online discussion forums, and project-based assignments that can be automatically corrected immediately. This innovation increases student engagement and allows for more personalized and

flexible learning. In fact, teachers can see live statistics of student interactions—who is actively asking questions, who is passive, and what their learning rhythm is—all based on data.

The integration of hybrid learning models and flipped classrooms is also an important innovation. In this model, students are given learning materials through videos or digital modules to study at home, while class time is used for discussion, practice, or problem solving. Wang et al. (2023) studied how this approach was implemented in schools in China after the COVID-19 pandemic [41]. The results showed that students became more active in learning and were more prepared when they entered the classroom. Teachers were also able to focus their energy on reinforcing the material, rather than simply delivering information. This model is also considered more effective in building higher-order thinking skills than conventional methods.

Another innovation is the use of predictive analytics for educational policy planning at the school and district levels. With historical data collected over several years, AI-based systems can predict patterns such as the likelihood of students dropping out of school, the success rate of certain programs, or the need for training for teachers. This is used, for example, in the school management system in Finland, where each school has access to a predictive dashboard to develop scenario-based policies.

These innovations, as a whole, create a more dynamic, inclusive, and scalable education system. Digital transformation is no longer just a tool, but has become a new foundation in school management that places data and technology at the heart of continuous innovation.

Challenges in Implementing Digital Transformation

The implementation of digital transformation in education management, although promising much progress, is not free from various complex and interrelated challenges. These challenges are not merely technical, but also include social, cultural, and human resource capacity dimensions. Many educational institutions experience serious obstacles in realizing their digital vision due to lack of infrastructure readiness, resistance to change, and lack of adequate training for educators.

One of the most fundamental challenges is the digital divide, which is especially evident in developing countries and remote areas. Schools in rural areas often do not have stable internet access, adequate hardware, or digital platforms that support teaching and learning activities. In a study by Gatteschi et al. (2020), the "Riconnessioni" project in Italy revealed the fact that the digital divide is a major obstacle in efforts to equalize digital education [42]. Schools in the north with good infrastructure are able to integrate technology quickly, while schools in the south are still struggling with basic connectivity.

On the other hand, cultural resistance is an equally important obstacle. Gillpatrick (2020) notes that many teachers are experiencing shock from the demands of change due to digitalization [43]. They feel pressured by having to use new, unfamiliar platforms and change teaching methods that have been practiced for years. The study highlights how some educators tend to view technology as an "additional burden" rather than a tool. This is compounded by a lack of understanding of the long-term benefits of digital systems, leading to defensiveness and subtle resistance.

Another problem that is quite striking is the lack of ongoing training. Schools often only provide one-off training at the beginning of the introduction of new technologies, without any ongoing support. Quaicoe et al. (2023) in their study emphasize the importance of building teachers' digital capacity in a gradual and contextual manner [44]. They observed that teachers who received repeated training and the opportunity to explore technology independently showed higher adoption rates than those who only received short training.

Equally important, challenges in terms of data security and ethics are also increasingly emerging. The implementation of digital systems opens up the risk of student information leakage, data misuse, and privacy violations. Many schools do not yet have strong digital security policies or do not fully understand the legal aspects of data processing. This creates loopholes that can be exploited by irresponsible parties. The study by Brunetti et al. (2020) emphasizes that the success of digital transformation is not only determined by the sophistication of the technology, but by the readiness of the managerial structure and security procedures implemented [45].

A concrete example of the complexity of this challenge can be seen in several public schools in Ghana studied by Quaicoe and his team. They found that although the government had provided hardware such as computers and projectors, many schools failed to make optimal use of them due to limited teacher training, unstable electricity access, and the absence of a clear digital policy. In fact, some devices were stored in the principal's office without ever being used because teachers did not know how to operate them.

Thus, the challenge in digital transformation is not just about technology, but also about cultural readiness, human resource capacity, and organizational structure. A holistic and sustainable approach is needed so that this transformation can truly strengthen the quality of education, rather than creating new gaps.

Holistic Impact on School Quality

Digital transformation that is implemented strategically and comprehensively in the school environment has been proven to have a holistic impact on the quality of education. This impact is not only limited to increasing administrative efficiency, but also

includes pedagogical aspects, institutional accountability, stakeholder involvement, and the quality of interaction between teachers and students. This change occurs because digital transformation allows schools to operate more transparently, data-driven, and responsive to the needs of the learning community.

One of the most obvious impacts of digital transformation is improving the quality of education services. Administrative processes such as attendance management, academic reporting, distribution of materials, and document archiving can now be done automatically and efficiently. In a study conducted by Mulyana (2023) in secondary schools in Indonesia, the use of a digital-based school information system has been shown to accelerate the flow of communication between teachers, students, and parents [46]. For example, schools that use the e-Raport or SIM Sekolah platform can produce student academic reports in minutes, allowing teachers to focus more on learning than administrative matters.

In addition, digitalization also strengthens the data-based evaluation system. Schools can now access student performance data in real time, so that decision-making is no longer based on assumptions, but on concrete analysis. Research by Timotheou et al. (2023) in several schools in Europe shows how a school-specific analytical dashboard allows principals and teachers to monitor trends in student decline, absenteeism, and participation [47]. As a result, interventions can be made earlier and based on real needs, rather than simply reacting to a crisis.

In addition, digital transformation plays a role in increasing school accountability and community engagement. Information transparency systems such as parent portals, public reporting applications, and school social media make all educational activities directly accessible and evaluated by the community. This creates a more open, collaborative, and accountable educational culture. In many cases, parental involvement in their children's learning activities increases due to the ease of access to digital information, as observed in a study conducted by Quaicoe et al. (2023).

Equally important is the impact on the quality of the relationship between teachers and students. Two-way communication systems based on digital applications such as Google Classroom, WhatsApp Education Group, or Microsoft Teams allow teachers and students to stay connected, even outside of class hours. These platforms create flexible and personal interaction spaces. In a study by Wang et al. (2023), schools that integrate digital communications consistently show increased student satisfaction with the learning experience, as well as increased academic motivation.

A concrete example can be found in schools in Finland that have long implemented the digitally integrated “KivaKoulu” system. This system not only handles academic data, but also monitors students’ emotional well-being. The information collected is used by school teams to address bullying, improve psychosocial support, and create a healthy learning environment. As a result, Finland consistently ranks among the countries with the best education systems in the world, with one of the main indicators being the use of technology to support students’ quality of life at school.

Thus, digital transformation is not just about introducing new technology, but reshaping the way schools carry out their mission: to become inclusive, accountable, and adaptive learning institutions. When implemented with a holistic and inclusive approach, digitalization can address the challenges of education today and the future in a comprehensive manner.

4. Conclusion

Digital transformation in education management is not merely the adoption of new technology, but rather reflects a complex and comprehensive transformative process. This process not only touches on technical aspects, but also demands structural changes, organizational culture renewal, and adjustments in leadership styles in the school environment. The proper implementation of digital transformation can encourage operational efficiency of educational institutions, strengthen accountability to stakeholders, and create a wider collaboration space between teachers, students, parents, and school leaders.

However, the success of this transformation is largely determined by several important prerequisites, including the readiness of technological infrastructure, the level of digital literacy of educators and education personnel, and the existence of an organizational culture that supports renewal and innovation. Therefore, digitalization in education management is not a short-term agenda, but rather a long-term journey that requires synergy between technology, human resources, and supporting institutional policies. This study shows that without complete and integrated support from these various elements, digital transformation is at risk of not being optimal or even experiencing implementation failure.

Based on the findings and analysis that have been carried out, there are a number of practical recommendations that can be considered by schools and policy makers. First, schools need to organize sustainable and contextual digital training programs to improve the competence of educators and education personnel. This training is not only technical, but also touches on strategic aspects such as data management, information security, and analytical decision-making. Second, the government at both the central and regional levels must strengthen educational technology infrastructure, especially in 3T (underdeveloped,

frontier, and outermost) areas. This includes providing stable internet access, hardware, and school information management systems. Third, school principals need to be equipped with digital leadership skills to be able to manage change, facilitate technological transformation, and build an innovative and inclusive institutional vision.

Fourth, close collaboration is needed between schools and various external parties, such as the private sector, training institutions, and higher education institutions, in order to expand resources and strengthen digital capacity in the school environment.

To enrich future studies, it is recommended that further research adopt a comparative quantitative approach to compare academic achievements between schools that have implemented a digital management system and those that still use a conventional system. In addition, a longitudinal study is needed to observe gradual changes in organizational culture due to the implementation of digital transformation in school management. This kind of research can provide a more holistic picture of the long-term impact of digitalization.

On the other hand, exploration of the effectiveness of a digital-based principal training model is also very relevant to be developed. This study will help design training programs that not only improve technical skills but also strengthen the role of principals as agents of change in the era of digital education management.

Limitations of the Study

This study primarily relies on a qualitative literature review, which limits the ability to generalize findings or provide empirical evidence. Including primary data, such as surveys or interviews with educators, would enhance the depth and practical relevance of the findings. Additionally, the review focuses on studies from the past decade, potentially overlooking earlier research or emerging trends in fast-evolving areas like digital tools and AI. The study also emphasizes management and policy aspects, with limited exploration of pedagogical impacts. Future research should include the effects of digital transformation on learning outcomes and teacher-student interactions. Lastly, the study does not address potential biases in the selection of reviewed articles, which may limit the diversity of perspectives.

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