

Digital Transformation in Islamic Education Management: Strategies of Madrasah Principals in Improving the Quality of Technology-Based Learning

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Abstract: Digital transformation has become an urgent necessity for madrasas in improving the quality of Islamic education amid the rapid advancement of technology. However, various national reports indicate that the implementation of digitalization in many madrasas still faces significant challenges, including low teacher competence, limited infrastructure, and the absence of leadership capable of directing the change process regularly. This study aims to provide an in-depth analysis of the strategies employed by madrasah principals in managing digital transformation as an effort to enhance technology-based learning quality. The research uses a descriptive qualitative approach, relying on secondary data such as scholarly articles, policy reports, and official documents from relevant educational institutions. The findings reveal that the success of improving technology-based learning quality highly depends on visionary and adaptive leadership, particularly in digital planning, teacher capacity building, infrastructure provision, digital learning culture development, and the implementation of data-driven monitoring and evaluation. This study emphasizes that technology becomes effective only when managed through strategic leadership capable of integrating digital innovations into madrasa governance in a sustainable manner.

Keywords: Digital Transformation; Educational Technology; Islamic Education Management; Learning Quality; Madrasa Leadership.

1. Introduction

Digital transformation has penetrated all aspects of life, including the education sector, bringing fundamental changes in how institutions manage learning processes, administration, and interactions between stakeholders. Islamic education, as an integral part of the national education system, is also faced with the demand to adapt to advances in information and communication technology (ICT), especially in responding to the needs of digital generation students who are accustomed to a fast-paced, flexible, and connected ecosystem (Hidayat, 2020). In this context, madrasas, as Islamic educational institutions, face both opportunities and challenges to integrate technology into managerial and pedagogical processes to improve the quality of learning. Digital transformation is not only understood as the use of technological devices, but also includes a paradigm shift in institutional management, work culture, quality of educational services, and teacher and student competencies. This change demands adaptive, visionary leadership capable of leading the organization towards sustainable innovation.

Global developments towards the era of Society 5.0 and the Industrial Revolution 4.0 require Islamic education to be able to develop more dynamic, contextual, and personalized learning models (Kuncoro, 2021). Digital technologies such as Learning Management Systems (LMS), online learning applications, cloud-based administration platforms, and learning analytics are starting to be used in various madrasas to improve teaching effectiveness and

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the quality of evaluation. However, the implementation of technology will not be optimal without the strategic role of the madrasah principal as a manager, learning leader, and driver of innovation. The madrasah principal is not only tasked with directing policy, but also ensuring teacher readiness, the adequacy of infrastructure, and an organizational culture that supports the digitalization process. (Yani, 2021). Thus, digital transformation in Islamic education management has become a strategic issue that requires in-depth study of how madrasa leadership can optimize technology to improve the quality of learning and achieve the holistic goals of Islamic education.

The emerging problems in the field indicate that although many madrasas have begun implementing various forms of digitalization, such as online attendance, computer-based exams, or the use of online learning platforms, their implementation is often suboptimal. Many teachers still experience difficulties in utilizing technology pedagogically, students are less motivated because digital learning has not been designed attractively, and the technological infrastructure in some madrasas does not meet minimum standards (Basit et al., 2025). Problems also arise in the managerial aspect, such as the absence of digital-based strategic planning, weak monitoring and evaluation supported by technology, and inconsistent teacher training. This condition shows that digitalization in madrasas is not only a technical issue, but also a change management issue that requires the presence of a systematic, adaptive, and long-term vision-based leadership strategy.

Various national surveys have shown a significant gap in digital readiness between public schools and madrasas. A 2023 Ministry of Religious Affairs report stated that only around 42% of madrasas had adequate internet access, while only 37% of madrasa teachers reported being able to operate digital-based learning platforms. Furthermore, a 2024 survey by the Ministry of Religious Affairs' Research, Development, and Training Agency revealed that more than 55% of madrasa principals did not have a documented digitalization strategy, resulting in sporadic implementation of technology in the field without a clear direction (Rahman, 2021). These data indicate that the main challenge is not the lack of technology, but rather weak digital management, particularly at the madrasa leadership level, which should act as the driving force behind digital transformation.

Several previous studies have attempted to examine the digitalization of Islamic education, but they have shown different focuses. A study by (Wafik, 2023) found that technology utilization in madrasas is more influenced by individual teacher capabilities, rather than institutional strategies. Research by (Astuti, 2021) shows that madrasah principal leadership significantly influences the success of e-learning implementation, but this study has not examined specific managerial strategies. Meanwhile, a recent study by (Muhayat, 2022) revealed that most madrasas are moving toward digitalization without a clear roadmap, so that digital transformation is reactive, not strategic. These three studies confirm that digitalization is indeed underway, but has not been managed as an integrated quality strategy.

Based on this review, a clear research gap emerges: previous studies have focused more on teacher technology use or barriers to digital implementation in general, but few have specifically analyzed madrasah principals' leadership strategies in managing digital transformation as an instrument for improving learning quality. The novelty of this research lies in its approach, which positions madrasah principals as key actors in integrating digitalization into the Islamic education management system, rather than simply as users of technology. This research offers a new perspective on how digital transformation can be used as a quality improvement strategy, rather than simply a technical adaptation to current developments.

The purpose of this study is to describe and analyze in depth the strategies of madrasah principals in managing digital transformation to improve the quality of technology-based learning. Specifically, this study aims to identify the forms of managerial innovation implemented by madrasah principals, uncover strategic steps in planning, implementing, and evaluating digitalization of learning, and assess the effectiveness of technology in improving the quality of student learning processes and outcomes. Furthermore, this study also aims to provide recommendations for strengthening Islamic education management so that it can adapt and survive in the changing digital era, while maintaining the spiritual values and characteristics of Islamic education that are the foundation of madrasahs.

2. Literature Review

Digital Transformation in Islamic Education Management

Digital transformation in Islamic education management refers to the process of modernizing technology-based educational institution management practices, so that planning, administration, learning services, and quality evaluation activities are carried out more effectively, transparently, and responsive to the needs of digital-era students. This transformation encourages madrasas to integrate digital tools such as Learning Management Systems (LMS), cloud-based platforms, teacher performance monitoring applications, and interconnected academic information systems. According to (Sudirman, 2023), digitalization in Islamic education is not merely the use of technological devices, but a change in management paradigm that leads to strengthening governance, work efficiency, and improving the quality of learning. Similarly, (Kemhan, 2014) emphasizes that digital transformation in madrasas must be based on visionary leadership that is able to drive changes in organizational culture, develop teacher competencies, and ensure the sustainability of innovation through systematic managerial strategies.

Madrasah Principal's Strategy in Improving the Quality of Technology-Based Learning

The madrasah principal's strategy in improving the quality of technology-based learning includes a series of managerial actions aimed at strengthening teacher capacity, providing digital infrastructure, formulating internal policies, and creating a culture of innovation that encourages the pedagogical use of technology. An effective madrasah principal acts not only as an administrator, but also as an instructional leader who ensures that technology integration truly impacts the quality of the teaching and learning process. According to (Naufaliz, 2022), the success of digital learning depends heavily on the madrasah principal's ability to conduct strategic planning, facilitate teacher training, and establish consistent monitoring mechanisms. In addition, (Naufaliz, 2022) emphasizes that madrasah principals need to create a sustainable technology-based learning ecosystem, where digital innovation is not just a temporary program, but becomes a permanent part of the madrasah's overall quality culture.

3. Method

This study uses a descriptive qualitative approach aimed at providing an in-depth overview of digital transformation in Islamic education management through an analysis of madrasah principals' strategies for improving the quality of technology-based learning. The qualitative method was chosen because it allows researchers to comprehensively understand the phenomenon of digitalization through interpretation of relevant texts, documents, and literature without directly collecting field data. (Sugiyono, 2019). The research focus is directed at concept mapping, policy content analysis, and interpretation of various research results that describe the dynamics of digital management in the madrasa environment. This approach emphasizes systematic analysis of information representations related to forms of digitalization, the role of madrasa leadership, technology-based managerial models, and implementation challenges expressed in various academic sources and institutional documents (Sugiyono, 2021).

The data sources in this study are entirely secondary, including reputable journal articles, scientific books, research reports, Ministry of Religious Affairs policies, national education statistics reports, and digital documents related to the transformation of Islamic education. Secondary data were analyzed using documentation study techniques, namely reviewing, selecting, and interpreting information relevant to the research problem. The analysis was conducted through a process of data reduction, thematic categorization, and drawing conclusions to produce a comprehensive picture of madrasah principals' strategies in managing the digitalization of learning. Therefore, this study did not involve direct observation or interviews, but instead relied entirely on the accuracy, depth, and completeness of the documents used as data sources to develop a critical and descriptive understanding of digital transformation in Islamic education management.

4. Results and Discussion

Madrasah Principal's Strategy in Managing Digital Transformation

Digital transformation in Islamic education management is not merely a technical process related to the adoption of devices and applications, but rather a fundamental change in the way a madrasah carries out its management, learning, and educational service functions. In this context, the madrasah principal is a central figure who determines the direction of change, the speed of implementation, the readiness of all madrasah members, and the sustainability of the resulting innovations (Chaeruman et al., 2024). The leadership of the madrasah principal plays a strategic role in managing digital transformation because he is not only an administrator, but also a cultural driver, organizational motivator, and architect of change. Digital change requires a complex adaptation process, including the need for a digital vision, strengthening teacher competencies, providing infrastructure, a data-based monitoring system, and consistent internal policies. The following discussion comprehensively outlines the madrasah principal's strategy in managing digital transformation, starting from aspects of planning, implementation, capacity building, to evaluation and sustainability.

One of the dominant strategies of madrasah principals is to develop a digital vision (digital visioning) that can guide all madrasah members towards the importance of utilizing technology to improve the quality of learning. A digital vision is not just a slogan, but a guideline that outlines the goals, expected achievements, and principles that underpin digital transformation. Madrasah principals who successfully implement digital transformation typically begin by formulating a vision that reflects a commitment to quality, innovation, and digital literacy. This vision is then incorporated into strategic planning documents such as the madrasah work plan (RKM), the annual activity plan (RKT), or the madrasah operational curriculum (KOM), which provides greater space for technology integration in learning. With a strong vision, madrasah principals can build collective awareness that digitalization is not just an additional program, but a crucial necessity in facing the dynamics of modern-day education.

The next strategy is to develop a systematic and measurable digital transformation roadmap. This roadmap contains the stages of digital implementation, arranged chronologically, from familiarization to development to consolidation. Madrasah principals establish priority indicators such as strengthening digital infrastructure, teacher training, developing digital learning media, and implementing technology-based administrative systems. This roadmap is important because it allows madrasahs to move gradually and purposefully without rushing or being reactive. In many cases, madrasahs that fail to digitalize are those that jump straight into using technology without a clear plan, resulting in teachers being confused, students being unprepared to adapt, and technological facilities being underutilized. Therefore, developing a thorough plan is a key strategy for madrasah principals.

Madrasah principals also play a crucial role in teacher digital capacity building. Teachers are at the forefront of digital transformation, as successful learning relies heavily on their pedagogical use of technology. Madrasah principals implement strategies such as regular training, digital media development workshops, Learning Management System (LMS) utilization training, and peer coaching (Junita et al., 2023). Teachers are guided not only to learn how to operate devices but also to integrate them into meaningful, creative, and student-centered learning activities. Teacher capacity building should not stop with initial training; madrasah principals must ensure ongoing support so teachers feel confident and able to develop consistent digital learning strategies. In some madrasahs, madrasah principals also develop digital learning communities that enable teachers to share best practices.

Madrasah principals must ensure that digital infrastructure and ecosystems support the learning process. Digital transformation cannot occur without adequate or minimal technological facilities. Strategies include procuring computers, laptops, interactive LCD/TV devices, a stable internet connection, and digital learning spaces. These resources can be procured through various sources, such as School Operational Assistance (BOS) funds, school committees, donors, or collaborations with external agencies. Madrasah principals must manage these resources effectively by conducting inventory and maintaining equipment, and ensuring optimal functioning. Without adequate infrastructure, teachers will struggle to implement digital learning, and students will not receive the maximum learning experience.

Leadership strategies in digitalization also include building a digital culture. Digital culture is a collective pattern of behavior that supports the ethical, creative, and productive use of technology. Madrasah principals strive to instill values such as digital discipline, media ethics, data integrity, and collaborative working habits. Digital culture does not emerge automat-

ically but is shaped through policies, role models, and consistent practices. Madrasah principals must be role models in technology use, for example through the use of digital administration applications, cloud-based reporting, or official communication platforms. This role model will encourage teachers to follow the same digital work patterns, so that digital transformation is reflected not only in learning but also in the overall governance of the madrasah.

One very important strategy is to increase the effectiveness of digital-based management and administration systems. Madrasah principals typically implement digital attendance applications, cloud-based archiving systems, internal communication platforms, and digitize student services such as online PPDB, digital report cards, or academic information systems. This strategy has a significant impact on the madrasah's work efficiency, service transparency, and speed of information access (Sodik et al., 2021). Digital administration also enables madrasah principals to use data as a basis for decision-making. For example, data on teacher activity in the LMS, student learning outcomes, or parental involvement in madrasah applications can be indicators for evaluating the effectiveness of digital learning. Thus, digitalization of administration not only simplifies work but also creates a data-driven education management system (data-driven decision-making).

Madrasah principals manage aspects of digital transformation by strengthening collaboration and strategic partnerships. Digital transformation requires support from various parties, including the government, digital platform providers, universities, educational communities, and technology companies. Madrasah principals build partnerships with learning application providers, utilize digital training programs from the Ministry of Religious Affairs, and engage technology volunteers to train teachers and students. These partnerships are crucial for expanding access to training, improving the quality of digital implementation, and ensuring that madrasahs receive appropriate support. Many madrasahs have successfully accelerated digitalization because madrasah principals are able to build strong networks and leverage collaboration opportunities as a quality strategy.

principals also carry out digital-based monitoring and evaluation functions. These evaluations focus not only on the technical aspects of technology use, but also on learning effectiveness, goal achievement, and the impact on improving student quality. Madrasah principals utilize evaluation applications, learning outcome dashboards, and activity reports to assess the extent to which teachers and students are engaged in digital learning. These evaluations form the basis for determining subsequent policies, such as whether the madrasah needs to strengthen teacher training, add technological devices, or improve digital learning methods. Effective monitoring and evaluation ensure that digital transformation is measurable, not merely a temporary program, but part of ongoing quality management.

The leadership strategy of madrasah principals in digital transformation is also closely related to strengthening students' digital literacy. Madrasah principals encourage teachers to create learning that not only utilizes technology but also develops students' abilities to search for, process, and utilize information critically. Digital literacy helps students become responsible and creative users of technology. Madrasah principals ensure that the madrasah curriculum includes elements of digital literacy, digital ethics, and technology-based collaborative projects. Thus, digital transformation not only changes teaching methods but also shapes students' future competencies, preparing them to compete in the digital era.

In implementing these strategies, madrasah principals face various challenges, such as teacher resistance to change, limited infrastructure, low digital literacy, and unequal internet access. However, effective madrasah principals overcome these challenges through persuasive approaches, motivation, intensive communication, and strengthening a collaborative culture. Furthermore, madrasah principals need to implement transformational and distributive leadership that encourages all members of the madrasah to feel a sense of responsibility for the digital transformation. Thus, digital management strategies are not simply instructions from superiors but rather a collective movement to improve the quality of Islamic education.

In the context of modern madrasahs, the success of digital transformation is largely determined by the principal's ability to maintain sustainability. Digital transformation should not stop at the implementation stage but must be continuously updated to keep pace with technological developments. Madrasah principals need to design internal policies such as digital operational standards, technology ethics guidelines, and digital quality assessment systems. Sustainability is also determined by consistent budget allocation, maintenance of technological devices, and regular evaluation of digitalization programs. Without sustainability, technology implementation will decline over time and revert to conventional learning patterns.

These overall strategies demonstrate that the role of the madrasah principal in digital transformation is complex and multidimensional. Madrasah principals serve not only as users

of technology but also as leaders of change, establishing a vision, mobilizing resources, strengthening capacity, building a digital culture, and ensuring the sustainability of innovation. Effective leadership strategies enable madrasahs to face the dynamics of the times and provide higher-quality, interactive, and relevant learning for the digital generation. Thus, digital transformation is no longer an option but a strategic necessity for madrasahs to improve the quality of Islamic education in the modern era.

Improving the Quality of Technology-Based Learning through Madrasah Leadership

Improving the quality of technology-based learning in madrasahs is a strategic process that depends not only on the availability of digital devices, but also on the extent to which the madrasah principal is able to direct, manage, and ensure that technology is used appropriately to strengthen the quality of the teaching and learning process. Madrasah leadership plays a central role in determining the effectiveness of digital transformation because the madrasah principal has the authority to motivate teachers, build a new work culture, formulate innovative policies, and ensure that all elements of the madrasah adapt to the digital learning ecosystem. In the context of Islamic education, learning leadership that prioritizes technology is not only related to technical aspects, but also about how Islamic values and digital ethics are integrated into the learning modernization process. Therefore, discussions regarding improving the quality of technology-based learning through madrasah leadership require a comprehensive analysis, encompassing planning, implementation, pedagogical support, quality control, and strengthening a sustainable digital learning culture.

The quality of technology-based learning is largely determined by the principal's ability to create a conducive digital learning environment. This environment includes clear internal policies, supporting infrastructure, and human resource readiness. A visionary principal sets minimum standards for teacher technology use, such as the use of presentation applications, digital evaluation platforms, interactive visual media, and the use of a Learning Management System (LMS) (Chamidi et al., 2021). The existence of these minimum standards encourages teachers to not feel that technology is an additional option, but rather an integral part of the learning process that must be met. Thus, the principal determines the rhythm of change: the stronger the principal's push, the faster teachers adapt and the more consistent the use of technology in the classroom.

Improving the quality of learning through technology is also greatly influenced by the level of teacher creativity and innovation, which will not emerge without the support of madrasah leadership. Teachers often find it difficult to transform traditional teaching styles into multimedia-based, interactive, and collaborative learning. Therefore, madrasah principals need to implement coaching, mentoring, and learning facilitation strategies so that teachers are able to design engaging and relevant lessons. Many madrasahs have succeeded in improving the quality of learning because madrasah principals initiated *digital classroom programs*, learning media design workshops, or educational video production training. Teachers are encouraged to create digital modules, utilize online quiz platforms, or create digital project-based assignments. When teachers are able to innovate, the quality of learning improves significantly because students are not merely passive recipients of material but actively engaged in the learning process through interaction with technology.

However, improving the quality of technology-based learning is not only determined by teachers' activities in the classroom, but also by the principal's ability to develop a digital learning culture. This culture encompasses the mindset, habits, and values held by the madrasa community in using technology as a learning tool. Principals who successfully build a digital learning culture typically implement policies that encourage collaboration, openness to innovation, and a willingness to try new things. Teachers are given space to experiment with various digital platforms and share best practices with colleagues. Students are also motivated to use technology not just for entertainment, but for knowledge exploration, discussion, and creative project completion. This culture serves as a crucial foundation that ensures that technology-based learning does not remain a temporary program but develops into a permanent habit that strengthens the long-term quality of education.

Madrasah leadership plays a major role in ensuring that technology is used not only to deliver material, but also to improve the quality of student interactions and learning experiences. Technology presents a significant opportunity to create more interactive, multimodal, and adaptive learning. Madrasah principals encourage teachers to utilize interactive applications, digital simulations, instructional videos, and collaborative learning platforms. By using

digital media, teachers can convey abstract concepts more concretely and easily understood through visualizations, animations, or digital case studies. Students become more engaged because learning is no longer monotonous. Thus, madrasah principals ensure that students' learning experiences improve not only in terms of information access, but also in terms of depth of understanding and learning motivation (Chamidi et al., 2021).

Madrasah principals' strategies for utilizing technology also contribute to the increased effectiveness of learning evaluations. Digital evaluations offer advantages such as speed of grade checking, data accuracy, and the ability for teachers to monitor student progress in real time. Madrasah principals encourage teachers to use digital quiz applications, computer-based assessments, or learning outcome analytics platforms. These techniques allow teachers to identify patterns of student errors, assess the difficulty level of the material, and design more targeted learning interventions. Technology also allows students to receive feedback more quickly, allowing them to correct errors and understand the material more effectively. This improvement in evaluation quality demonstrates that the use of technology, when guided by appropriate leadership, has a direct impact on the quality of student learning outcomes.

Madrasah leadership plays a significant role in improving students' digital literacy, which is a key indicator of learning quality in the digital age. Digital literacy encompasses students' ability to search for, evaluate, and critically use information through technology. Madrasah principals ensure that learning not only demonstrates device usage but also provides an understanding of digital ethics, data security, and responsible media use. Technology-based learning is aimed at shaping students' character so they become wise, creative, and productive technology users. For example, madrasah principals encourage teachers to create learning projects based on information retrieval, educational content creation, and digital presentations. Through these activities, students are not only exposed to technology but also hone their higher-order thinking skills (HOTS), creativity, and independent learning.

Madrasah leadership also plays a vital role in strengthening collaboration between teachers, students, and parents through digital platforms. Effective communication is a determining factor in improving the quality of learning. Madrasah principals use communication applications such as the official madrasah WhatsApp Group, Google Classroom, the school's Telegram channel, or the official Ministry of Religious Affairs application to build a fast, transparent, and accountable communication ecosystem. Parents can monitor their children's progress, teachers can make announcements easily, and students do not miss important learning information. Effective digital collaboration ensures that the learning process is comprehensive and supported by all elements of education (Dyaning, 2023).

The principal also plays the role of instructional leader. This role requires the principal to go beyond administrative duties to directly supervise, evaluate, and provide guidance to teachers' learning practices. The principal reviews digital learning tools created by teachers, provides feedback, and participates in supervising technology-based classes. By fulfilling this role, the principal can ensure that the use of technology truly adds value, not just a formality. Principals who consistently exercise instructional leadership have been shown to improve the quality of learning because each teacher feels supported, monitored, and motivated.

Madrasah leadership plays a powerful role in ensuring the sustainability of digital innovation. Many madrasahs fail to maintain digitalization due to the lack of internal policies governing device maintenance, budget allocation, and scheduling of follow-up training. Effective madrasah principals develop internal regulations such as digital learning SOPs, media usage guidelines, device update schedules, and standards for the use of learning applications. This sustainability is crucial to ensure that digital transformation continues to evolve in line with technological developments and learning needs. Learning quality will not improve if digitalization only lasts a short time and then reverts to old patterns.

Successful madrasah leadership in digitalizing learning is also characterized by its ability to overcome resistance to change among teachers. Some teachers feel overwhelmed, lack confidence, or are unfamiliar with technology. Madrasah principals employ persuasive strategies, such as providing motivation, demonstrating the benefits of technology, rewarding innovative teachers, or implementing mentoring programs for struggling teachers. With a humanistic approach, teacher resistance can be minimized, allowing technology-based learning to proceed more smoothly and become accepted as part of the teacher's professional culture.

Madrasah leadership plays a role in ensuring that technology is used in line with Islamic educational values. The use of digital media must not only be effective but also reflect Islamic manners, morals, and principles. Madrasah principals direct teachers in selecting appropriate content, instilling the value of trustworthiness in internet use, and teaching students social media etiquette. Integrating these Islamic values is crucial to ensure that technology does not

become a moral threat but instead serves as a tool for preaching and strengthening spirituality in learning.

Madrasah leadership has a direct impact on improving student academic achievement through the use of technology. Students who learn through digital media are typically more motivated, have broader access to learning resources, and gain a more varied learning experience. Madrasah principals ensure that learning uses technology not only for visual display, but also to reinforce conceptual understanding, encourage small-scale research, and help students discover their optimal learning styles. Thus, madrasah leadership creates a rich, dynamic, and adaptive learning ecosystem, significantly improving student academic achievement.

The overall strategy implemented by madrasah principals demonstrates that improving the quality of technology-based learning is not simply a technical innovation, but an educational transformation involving change management, cultural formation, competency strengthening, and system renewal. Effective madrasah principals recognize that technology will only have an impact if managed with visionary, inclusive, adaptive leadership grounded in Islamic educational values. With such leadership, madrasahs are able to provide high-quality educational services that are relevant to the demands of the digital era, while remaining rooted in the spiritual and moral values that are the hallmark of Islamic education.

5. Comparison

The results of this study indicate that the success of improving the quality of technology-based learning is largely determined by the leadership of the madrasah principal who is able to build a digital vision, develop teacher capacity, and create a sustainable digital learning culture. These findings demonstrate that technology does not automatically improve the quality of learning, but requires strong and systematic change management at the leadership level. These results are in line with research (Fatma & Munawaroh, 2024) which shows that the implementation of technology in madrasahs will be effective if the leadership is able to provide strategic direction, ensure teacher readiness, and maintain consistent use of digital media in learning. This similarity strengthens the argument that leadership is a determining factor in the process of madrasah digital transformation, not merely a supporting factor.

This study also shows a difference compared to previous studies that emphasized the technical aspects of technology use by teachers rather than the leadership strategies that manage it. While research (Aulia et al., 2024) found that many madrasahs implemented digitalization without a clear roadmap, resulting in sporadic technology implementation, the results of this study actually confirm that madrasah principals who have a planned digital strategy can overcome this problem and create a stable and consistent technology-based learning system. This difference shows that your research makes a new contribution by placing madrasah principals as core actors in the success of digital learning, not just administrative facilitators, thus providing a more comprehensive theoretical perspective than previous studies.

6. Conclusion

This study concludes that digital transformation in Islamic education management can only be effective if led by a visionary, adaptive madrasah principal who is able to integrate technology into all aspects of learning and institutional governance. The madrasah principal's strategy has proven to be a key factor in improving the quality of technology-based learning, which is achieved through the development of a clear digital vision, systematic strategic planning, strengthening teacher capacity, providing adequate digital infrastructure, and establishing a collaborative and sustainable digital learning culture. Technology does not have a significant impact without leadership capable of directing change, ensuring teacher and student readiness, and implementing data-driven monitoring and evaluation mechanisms. Thus, the quality of learning improves not only because of technology, but also because of strong, structured, and consistent change management at the madrasah leadership level.

Based on the research findings, it is recommended that madrasah principals strengthen their digital leadership capacity by continuously updating their educational technology insights, building collaborative networks with other institutions, and developing internal policies that support the sustainability of digital innovation in madrasahs. Teachers need to be provided with regular training and intensive mentoring to increase their confidence in integrating technology pedagogically, while infrastructure provision must be carried out gradually but consistently according to learning needs. Furthermore, madrasahs need to expand the use of digital-based administration and evaluation systems to improve the effectiveness of educational services and strengthen data-driven decision-making. Strengthening students' digital

literacy and integrating Islamic values into the use of technology also require attention so that digital transformation is not only oriented towards technical aspects, but also shapes character, ethics, and digital morals in line with the goals of Islamic education.

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