Journal of Higher Education and Academic Advancement
Homepage : https://journal.antispublisher.id/index.php/EJHEAA
Email : admin@antispublisher.com

e-ISSN : 3032-1123
JHEAA, Vol. 3, No. 1, January 2026
Page 82-94

Digital Transformation in High Schools Through Principal Management: A Case Study in A Private High School

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DOI : https://doi.org/10.61796/jheaa.v3i1.1647

Sections Info

Article history:
Submitted: December 08, 2025
Final Revised: December 22, 2025
Accepted: January 07, 2026
Published: January 15, 2026

Keywords:
School leadership
Principal management
Digital service quality
Educational digitalization
Innovation culture

ABSTRACT

Objective: *This study aims to analyze the role of principal management in improving the quality of digital education services at SMA Swasta Muhammadiyah 10 Rantauprapat, Labuhanbatu Regency, North Sumatra.* ***Method:*** *This study used a qualitative case study design. Data were collected through semi-structured interviews, observations, and documentation studies involving the principal, vice principal, teachers, and students as informants.* ***Results:*** *The results show that improvements in the quality of digital services were successfully realized through the implementation of comprehensive principal management functions. This includes visionary planning such as the provision of information technology infrastructure, systematic resource organization, and mobilization through teacher motivation and support, and control through consistent supervision. The principal's responsive, solution-oriented leadership has proven to be a key catalyst in creating an effective digital ecosystem, characterized by integrated teacher competencies, continuous learning and innovation, and administrative efficiency.* ***Novelty:*** *This study concludes that principal management plays a crucial role in the digital transformation of education. This research contributes by offering an empirical understanding of digital management practices in private schools. It provides a basis for developing a more comprehensive digital management model in the secondary education context.*

INTRODUCTION

The digital revolution has drastically changed the world of education, causing rapid changes in teaching strategies and school administration [1], [2]. Despite rapid digitalization, the current situation shows that the use of technology in many private high schools in North Sumatra remains far from ideal. This gap is mainly due to poor digital Leadership among administrators, low digital competency among teachers, unplanned technology integration, uneven oversight, and poorly designed digital policies [3], [4].

Education is concerned with creating intelligent, faithful, and adaptable people [5], [6]. According to contemporary educational philosophy, the primary motivator for improving the quality of educational services is visionary, digitally minded Leadership [7]. The principal is the primary agent of change in this situation, who consciously and comprehensively oversees the school's digitalization process [8], [9].

The philosophy of transformational Leadership and change, where leaders not only direct but also motivate and enable other stakeholders to adopt technology successfully, is a key component of principal management in digitalization [10], [11]. Another critical factor that influences the effectiveness of technology integration in the classroom is teachers' digital literacy [12]. Previous studies have shown that good Leadership in

organizing, planning, implementing, and supervising the digitalization process can increase the effectiveness of educational digitalization [13], [14], [15].

Preliminary data from this study revealed that a private high school in North Sumatra faces several serious challenges in digitalizing education, including low teacher digital competency, inconsistent technology integration, inconsistent supervision, and partial and unstructured digital policies. This phenomenon creates a gap that requires in-depth research on how principal management can optimally improve the quality of digitalization services.

This research will comprehensively examine the managerial aspects of school principals, teachers' digital literacy, and the quality of digitalization services [16]. The novelty of this research lies in its focus on the context of private high schools in North Sumatra, which has so far received less attention in the literature, and in its attempt to propose a contextual and applicable digital management model.

The research objective is to examine how principal management can improve the quality of digitalization services by assessing digital Leadership, teacher competency development, technology integration, and adequate supervision and policy implementation. This research also provides strategic recommendations for improving the governance of digitalization in education at the high school level. Future research recommendations include developing digital Leadership training for principals, improving teachers' digital competencies through ongoing development programs, designing structured digital policies, and implementing a consistent monitoring and evaluation system for educational technology integration.

Principal Management

Principal management requires the ability to integrate pedagogical and administrative Leadership functions harmoniously. Principals not only direct the learning process but also ensure the entire management system is consistent with the institution's goals [17]. This dual role often creates pressure because the principal must maintain focus on the quality of learning while also managing resources, internal regulations, and institutional relationships [18].

In the context of instructional Leadership, the principal plays a central role in formulating educational goals, directing learning strategies, and creating a conducive academic climate [19]. Strong instructional Leadership has been shown to correlate with improved student learning outcomes because principals can mobilize teachers through professional support, academic supervision, and the strengthening of a culture of quality [20].

Professional development is a crucial element in strengthening school principals' capacity. Professionalizing school management requires the ability to conduct institutional reflection, make data-driven decisions, and build cross-stakeholder collaboration [21]. Inter-school collaboration and ongoing professional development programs strengthen the principal's capabilities in strategic management, supervision, and innovation in educational services [22]. This competency is the basis for the principal to ensure that every aspect of management supports school-quality improvement.

In practice, school principals face a variety of challenges, ranging from performance accountability to low teacher motivation and gaps in pedagogical competency. Strategic responses are needed to ensure effective management [23]. Increased teacher collaboration, intensive mentoring, and strengthened learning communities have been shown to impact academic performance positively. Furthermore, digitalization of management through the use of information technology can improve governance efficiency, although this must be balanced with strong interpersonal communication between principals, teachers, and educational staff [24].

Widely adopted Leadership models globally, such as distributed and transformational Leadership, provide a foundation for principals to build a collaborative and participatory culture [25]. Distributed Leadership allows for proportional sharing of responsibilities, strengthening a sense of ownership and improving the school's organizational performance. Meanwhile, transformational Leadership requires the principal to create a shared vision, encourage innovation, and ensure that the entire school community is moving toward the same goals [26]. From an international perspective, various countries are implementing school management reforms through decentralization, external assessment, and the redefinition of the principal's role to strengthen focus on instructional supervision and quality management [27].

Principal management is the key to the success of an educational organization [28]. This success is determined by the principal's ability to align instructional and administrative Leadership, strengthen professional competencies, respond strategically to challenges, use technology wisely, and adopt a Leadership model grounded in collaboration and transformation [29]. This holistic approach enables schools to move sustainably towards better quality educational services [30].

Quality of Digital Education Services

The quality of digital education services refers to the quality of learning experiences provided through technology-based platforms [31]. This quality is evident in the extent to which digital services support an effective, accessible, responsive, and relevant learning process that meets students' needs [32]. This idea developed from the understanding that technology is not just a tool but part of a service system that must be designed in an integrated manner to improve the quality of education [33].

Quality digital services require strong integration between content, systems, and user experience. This integration enables the learning process to be more structured, measurable, and adaptable to student characteristics [34]. The quality of digital services is influenced by platform reliability, clarity of system architecture, ease of navigation, and the technology's ability to provide meaningful interactions between students and educators. When digital systems are designed appropriately, the learning process can be more flexible without compromising the depth of the academic experience [35].

The main challenges in improving the quality of digital services are often related to the irregularity of resources, limited access, and uneven distribution of technology support across educational environments [36]. The disorganization of digital resources makes it difficult for students to find relevant materials, while limited access leads to

unequal learning experiences. Efforts to improve quality require systematic resource management so that all content and services can be optimally utilized by all parties [37].

Their level of inclusivity also determines the quality of digital services. A sound digital system should accommodate learners with diverse needs, including those with visual, hearing, or other disabilities [38]. The integration of assistive technology into digital platforms promotes a more equitable learning environment. Inclusivity is not merely a technical issue, but part of an educational institution's commitment to ensuring that every student has equitable access to education [39].

The development of artificial intelligence offers new opportunities to improve the quality of digital services [40]. This technology enables the system to adapt materials, provide immediate feedback, and more accurately monitor each student's learning progress [41]. Furthermore, using a game-based approach can increase learning motivation and strengthen interactions between students and the learning content. When this technology is used wisely, the learning experience becomes more engaging and meaningful [42].

Virtual and augmented reality technologies are also enabling more immersive learning experiences. These technologies provide students with the opportunity to understand concepts through simulations that mimic real-life situations [43]. The quality of digital services is not only determined by the availability of technology, but also by the ability of that technology to broaden horizons of thought and deepen understanding of concepts [44].

RESEARCH METHOD

This research uses a qualitative case study design to gain a deeper understanding of the principal's management practices for improving the quality of digital services at a high school in North Sumatra Province. This approach was chosen because it allows for a holistic, contextual exploration of the phenomenon across various data sources [45]. The case study in this study focuses on the principal's management in improving the quality of digital services at SMA Swasta Muhammadiyah 10 Rantauprapat, Labuhanbatu Regency, North Sumatra Province, Indonesia, which served as the research location from August to October. The area was selected purposively because the school has implemented various digitalization programs, which are therefore relevant to the research focus.

The research subjects included the principal (MH), the vice principal for curriculum (AR), teachers (UHSM), and students (NS), who were selected for their direct involvement in the management and use of digital education services. In qualitative research, selecting informants focuses on their ability to provide in-depth information about the phenomenon being studied [46]. Data were collected through semi-structured interviews, observations, and documentation. Interviews were conducted to explore the principals' experiences, perceptions, and management strategies. Observations were used to directly observe the use of digital education services, while documentation

included analysis of policy documents, digitalization programs, activity reports, and other relevant archives.

Data analysis begins with organizing the data into a research database, followed by pattern development, explanatory testing, and drawing conclusions based on the relationship between the empirical data and the initial propositions. The steps include summarizing and displaying the data, and drawing and verifying the findings as stated [47], which allows analysis to be systematic, in-depth, and verified. Through this process, key themes for principal management to improve the quality of digital services were robustly and credibly identified. Data validity was maintained through several strategies, including triangulation of sources, techniques, and time; member checking; adequate researcher involvement at the research sites; and detailed recording of the research process [48].

RESULTS AND DISCUSSION

Results

The research results show that the principal's management in improving the quality of digitalization services at Muhammadiyah 10 Rantauprapat Private High School (SMA Swasta Muhammadiyah 10 Rantauprapat) is carried out through well-planned, organized, and controlled practices. Informants' narratives illustrate that digitalization is not merely a formal agenda but has become a continuously evolving work culture within the school environment.

During the planning stage, the principal prioritized digitalization. This effort was evident in the provision of i-Ready, laptops, and Chromebooks, as well as in plans to install i-Ready in all classrooms permanently. One informant stated, "*Then my plan is for all classes to have permanent infocuses installed. If necessary, we'll also add Wi-Fi*" (MH). This interview excerpt illustrates the principal's long-term vision for a technology-based learning ecosystem. Digital planning is also integrated with pedagogical aspects, for example, recommending the use of digital quizzes to ensure productive use of students' devices. A teacher stated, "*So what makes it easier for us to teach, especially students, if they bring cellphones, so their phones are useful, not for playing games*" (AR).

Figure 1. Students Working on Quizzes with Android.

Figure 1 above shows a group of students focused on a quiz using Android devices in a classroom. All students are seen using their devices while sitting across from one another at long tables, reflecting an active, independent learning environment.

In terms of organization, the school has managed digital facilities, despite their limited number. The availability of five Infocus cameras, Chromebooks, and CCTV cameras demonstrates resource management. Furthermore, organizational communication takes place through formal meetings and WhatsApp groups. An informant stated, "*Sir, you're usually notified in the WhatsApp group... formal meetings are usually with the council*" (UHSM). The use of digital applications for administration, such as Dapodik, e-reports, and RKAS, demonstrates that organization involves more than just facilities; it also involves a more efficient digital work system.

In terms of mobilization, the principal provides motivation and support to increase teachers' confidence in using digital devices. Teachers are free to borrow and utilize the facilities. An informant explained, "*If you want to use an Infocus, or a computer... it's up to you, sir*" (UHSM). In addition to motivation, the principal introduced applications such as Quizizz for interactive learning. Students also experienced this digital integration, as they stated, "*Some of the learning materials are shared online or explained using YouTube videos*" (NS).

The control function operates through routine supervision. The principal confirmed, "*Class visits have been scheduled*" (MH). The integration of technology into the lesson plans is also monitored, as teachers reported that the principal encourages the use of digital devices to align with the lesson plan. Digital administration also runs effectively with no delays in reporting.

Innovation and change are evident in plans to develop permanent facilities, the use of website-based student registration and Google Forms, and the expanded use of digital learning applications. A teacher stated, "*Registration uses an online website... we also use the Quizizz application*" (AR). Student narratives about the use of Canva and tablets demonstrate that innovation is occurring not only within the managerial structure but also in daily learning activities.

In terms of human resource development, teachers have been accustomed to using Infocus, and some have participated in digital training, including webinars and in-person sessions. An informant stated, "*I myself have participated in training twice, either in-person or through webinars*" (UHSM). Administrative staff are required to master digital applications, and students also receive training based on creative applications such as Canva.

Figure 2. Digitalization Training for Teachers and Education Personnel.

Figure 2 above shows the digitalization training session attended by teachers and education staff in a school meeting room. Participants were actively interacting, some working on laptops, while others engaged in a live discussion with the presenter at the front of the room.

The principal's Leadership also demonstrated responsiveness and solution-oriented skills. A concrete example occurred when the school experienced power outages during a computer-based exam, which were immediately resolved by directly coordinating with the state electricity company (PLN). As stated, "*I went straight to the PLN office*" (MH). Meanwhile, the presence of a computer laboratory and a science laboratory demonstrates the principal's ability to provide facilities to support digital learning.

Regarding the quality of digitalization services, accessibility demonstrates that the school provides devices, even though they are limited. Teachers and students experience easy access to facilities without complicated procedures. System reliability is reflected in active CCTV and consistent administration. Data security is maintained through CCTV recordings, which provide transparency and control over classroom activities. User satisfaction is evident in the flexibility of device access and the usefulness of learning applications. Administrative efficiency is increased through timely digital reports and scheduled supervision. Technological innovation continues to advance through plans to build digital laboratories and ongoing training.

Overall, the study findings indicate that the principal has built a strong foundation for digitalization through visionary planning, systematic organization, motivating Leadership, consistent control, continuous innovation, comprehensive human resource development, and Leadership responsive to the school's needs.

Discussion

This research discussion confirms that the principal's management plays a significant role in building an effective digital ecosystem at SMA Swasta Muhammadiyah 10 Rantauprapat. The findings indicate that the principal not only develops systematic planning but also motivates teachers through support, facilities, and ongoing supervision. These Leadership practices indicate a managerial transformation in line with the demands of digital education. In this context, digitalization is not merely the

provision of tools but the process of building a new work culture that integrates digital competency, organizational support, and learning innovation [49], [50].

A deeper interpretation reveals that the success of digitalization in schools is strongly influenced by the principal's ability to combine visionary policies with consistent implementation strategies. Precise digital planning, such as installing permanent infrastructure and strengthening internet networks, demonstrates long-term strategic thinking. Motivating teachers through motivation and easy access to facilities fosters a conducive work environment. Scheduled supervision ensures that technology use complies with quality standards. All of these practices reflect a responsive, collaborative, and continuous improvement-oriented school Leadership model [51], [52].

The research findings also align with various previous studies. The principal Leadership model in this study emphasizes that educational leaders in the modern era must drive change by providing inspiration and moral support and by establishing work structures that enable innovation [53]. Furthermore, research by Le et al. (2025) shows that digital transformation in schools requires Leadership that fosters collaboration and provides opportunities for teachers to develop their competencies [54]. These findings align with human resource development practices implemented by school principals through digital training and teacher empowerment. Likewise, the integration of digital applications like Quizizz and the provision of online materials reinforce the research findings of Balalle (2024) and Panakaje et al. (2024), which show that technology increases student engagement when supported by appropriate teaching strategies [55], [56]. The above explanation reveals the principal's role in transforming the digital ecosystem within the school environment, as illustrated in the following figure:

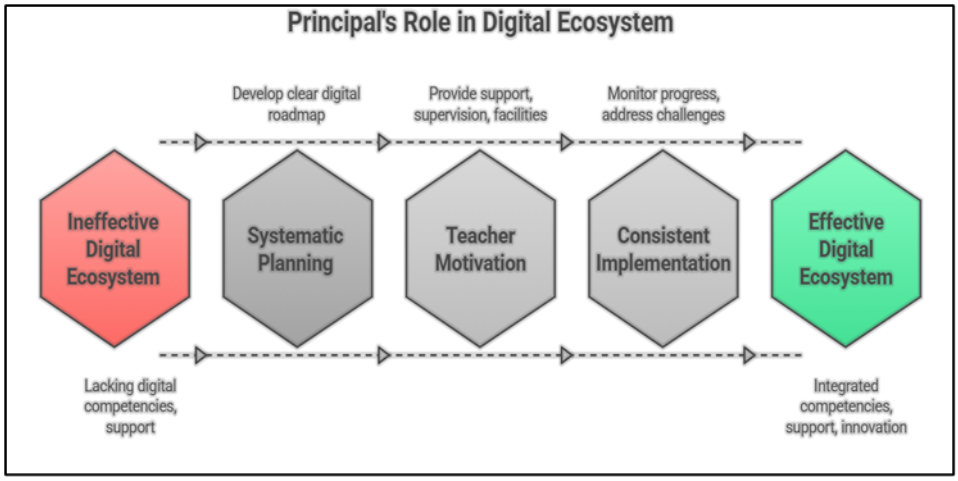

Figure 3. The Role of the Principal in Transforming the School's Digital Ecosystem.

Figure 3 above illustrates the principal's role in transforming the school's digital ecosystem from ineffective to effective. This change process begins with an initial condition characterized by low digital competency and minimal support. The principal then implements systematic planning by developing a clear digital roadmap, increasing teacher motivation through support, supervision, and provision of facilities, and

ensuring consistent implementation through monitoring and addressing obstacles. This series of actions results in an effective digital ecosystem with integrated competencies, adequate support, and continuous innovation.

Theoretically, the findings of this study have important implications for the development of an educational management framework. The results indicate that the digitalization of education cannot be explained simply by the four classic management functions but requires the addition of dimensions of digital Leadership, responsiveness to change, and technological innovation.

Practically, this research has significant implications for schools developing digital services. Experience at SMA Muhammadiyah 10 Rantauprapat demonstrates that digitalization is most effective when it begins with realistic yet visionary planning, coupled with moral support and flexible access to technological facilities. Scheduled digital supervision has been shown to maintain consistent technology use in learning. Training for teachers and staff must be conducted on an ongoing basis so that technology truly becomes part of work practices, not just a formal policy. Easily accessible facilities also positively impact user satisfaction and school administrative efficiency.

This study certainly has limitations, as it was conducted in only one school, thus limiting the generalizability of the findings. The research perspective also failed to accommodate the views of parents and external stakeholders who actually influence the success of school digitalization. Given these limitations, future research is recommended to expand the research location to obtain a comparative picture of the variations in digitalization practices across different types of schools.

CONCLUSION

Fundamental Finding : Based on the results and discussion, it can be concluded that the principal's management plays a crucial role in improving the quality of educational digitalization services at SMA Swasta Muhammadiyah 10 Rantauprapat, where the success of digital transformation is determined by the principal's ability to implement visionary planning, systematic organization, motivating drive, and consistent control, thus creating an effective digital ecosystem supported by adequate facilities, integrated teacher competencies, and continuous innovation. **Implication :** The findings of this study highlight the importance of principal management in driving digital transformation within educational institutions. The successful implementation of digital services relies heavily on the principal’s leadership in vision, resource organization, and consistent supervision. This suggests that principals should focus on strategic planning, motivating staff, and ensuring the availability of necessary resources to support ongoing innovation and the development of a cohesive digital ecosystem. **Limitation :** The study is limited to one school, SMA Swasta Muhammadiyah 10 Rantauprapat, which may not fully represent the broader context of digital education in other schools or regions. As the study was focused on a single case, it may not capture the diverse challenges and practices found in different educational settings. Therefore, the findings may have limited generalizability. **Future Research :** For further research, it is recommended to

expand the scope of the study by involving more schools and a variety of contexts to test the generalizability of the findings, explore the perspectives of external stakeholders such as parents and communities, and develop a more comprehensive digital management model by incorporating variables such as budget support, organizational culture, and the long-term impact of digitalization on student learning outcomes.

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