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Integration of Technology and Resource Management in the Modern Education System

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ABSTRACT

Despite the growing discourse on digital transformation in education, there is a scarcity of empirical research specifically examining the synergy between technology integration and resource management within Indonesian public senior high schools. Addressing this gap, this study aims to explore the integration of technology and resource management at a general public senior high school, focusing on the utilization of Management Information Systems (MIS), Learning Management Systems (LMS), and human resource management strategies. Using a qualitative case study approach, the research involved teachers, administrative staff, and the school principal as informants through semi-structured interviews, participatory observation, and document analysis. The findings indicate that while technology integration has improved administrative efficiency, data transparency, and student engagement, challenges such as uneven digital literacy, limited infrastructure, and the need for ongoing technical support remain. Ultimately, the study demonstrates that technology implementation, underpinned by effective resource management, significantly strengthens teacher professionalism and school operational effectiveness. These insights provide critical implications for school management policy and digital transformation strategies in similar educational contexts.

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INTRODUCTION

In the contemporary digital landscape, the education sector faces complex challenges related to administrative efficiency and the quality of learning. Globally, the adoption of digital technologies is reshaping educational frameworks, demanding a shift from traditional methods to technology-integrated management (Haleem et al., 2022; Bindra et.al, 2026). Many educational institutions continue to rely on traditional management systems that are increasingly unresponsive to the dynamic needs of students and teachers, resulting in the underutilization of human and infrastructural resources. At SMAN 1 Panyipatan, specifically, limitations in teacher allocation, technological tools, and administrative systems have hindered efforts to adopt modern learning practices. These internal challenges are intensified by external demands to enhance educational quality and ensure students' competitiveness in a global environment. Consequently, the integration of technology into school resource management has transformed from an option into a strategic necessity (Caldwell, 1998; Vahdat, 2022).

Human resource management issues within schools constitute a critical concern, particularly regarding insufficient teacher training in technology and low digital literacy among educators (Caroline, 2025; Siyi & Samawi, 2023). Previous studies underscore the pivotal role of school management in integrating technology to enhance character education and learning quality. Luthfiyah et al. (2024), for instance, emphasize that school management is responsible not only for providing infrastructure but also for orchestrating continuous training and establishing policies that support technology utilization. Furthermore,

while the use of Information and Communication Technology (ICT) presents significant opportunities, it also poses challenges such as gaps in access and literacy. As noted by Aslamiah & Sa'adah (2024), technology integration must be implemented systematically and sustainably to address these issues effectively.

Recent literature further validates the importance of this integration. Samsiah et al. (2024) highlight that embedding technology into human resource management is essential for enhancing long-term organizational capacity. Similarly, Ulum et al. (2025) demonstrate that the use of digital HR systems and online training platforms improves transparency, effectiveness, and teacher professionalism. Research by Sholeh & Efendi (2023) and Cinantya et al. (2025) also reveals that technology integration significantly enhances teacher performance in the digital era. However, despite these findings, empirical research specifically focusing on general public senior high schools (Sekolah Menengah Atas Negeri) such as SMAN 1 Panyipatan remains limited. Most existing studies predominantly address Islamic schools (Madrasah), elementary schools, or secondary education broadly, leaving a gap in understanding how general high schools with localized characteristics synergize technology with resource allocation.

To address this gap, this study uses SMAN 1 Panyipatan as a concrete case to analyze the intersection of human resources, technological infrastructure, and administrative systems. Specifically, this research is guided by the following central question: "How does SMAN 1 Panyipatan integrate Management Information Systems (MIS) and Learning Management Systems (LMS) within its human and infrastructural resource management, and what impacts does this integration have on administrative efficiency and learning quality?". By answering this question, the study aims to identify synergies and actual constraints, offering new perspectives and practical recommendations for other schools seeking digital and managerial transformation.

The study employs a qualitative case study approach, supported by document analysis, interviews with teachers, staff, and school leaders, and participatory observation. This methodological framework enables an in-depth understanding of how school management plans, organizes, implements, and evaluates technology usage. Furthermore, it explores stakeholders' perceptions regarding the benefits and challenges of this integration. The findings are expected to provide evidence-based recommendations for policymakers, positioning SMAN 1 Panyipatan as a potential model for effective technology integration and resource management in the modern education system.

METHOD

This study adopts a qualitative approach with a single case study design to examine how technology integration and resource management are operationalized at SMAN 1 Panyipatan. The single case design was deemed suitable because it enables an in-depth and contextualized understanding of the school's complex managerial processes, technological adaptation strategies, and the organizational challenges encountered in implementing digital systems across administrative and instructional domains (Yin, 2018). The research was conducted over a three-month period in 2025, at SMAN 1 Panyipatan, Tanah Laut Regency.

Participants were selected through purposive sampling to ensure the inclusion of actors who possess direct experience in decision-making and daily operational engagement with the school's technology infrastructure. Inclusion criteria required participants to hold structural positions relevant to resource governance or to be actively using the Management Information System (MIS) and Learning Management System (LMS) in their professional duties. A total of six informants participated in the study, consisting of the school principal, the vice principal for human resources, two teachers, one administrative staff member, and the school IT technician. Each participant represented a specific functional domain within the institution: the principal oversaw policy formulation and strategic direction; the vice principal for human resources was responsible for teacher training, capacity building, and human resource development; Teacher A contributed insights on technology-supported instructional practices; Teacher B represented administrative and assessment-related technology usage; the administrative staff provided perspectives on MIS implementation; and the school IT technician elaborated on infrastructural management and technical constraints. Their roles collectively offered multi-layered perspectives on how technology permeates governance, pedagogy, and administrative efficiency.

Data were gathered through participatory observation, document analysis, and semi-structured interviews to capture both behavioral and discursive dimensions of technology integration. The interview protocol explored themes related to resource allocation strategies, perceived efficiency and usability of digital tools, and barriers encountered during the adoption and institutionalization of technological innovations. Ethical procedures were rigorously upheld: informed consent was obtained prior to data collection, and all participants were assured full anonymity and confidentiality throughout the study. Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña (2019), consisting of three cyclical stages which are data condensation, data display, and conclusion drawing which is shown in Figure 1..

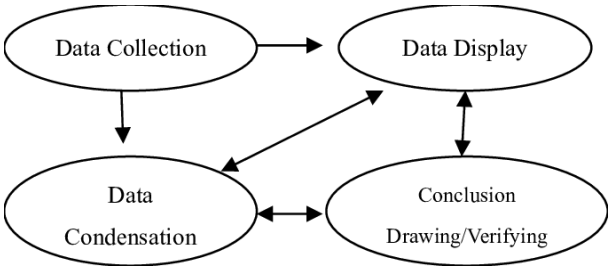

Figure 1. Data analysis model

In the condensation phase, interview transcripts, observational notes, and institutional documents were coded to identify essential patterns and categories relevant to technology management. Data were then organized into narrative matrices and visual displays to portray relationships among actors, processes, and technological systems. Conclusion drawing involved iterative interpretation to generate analytic insights while maintaining alignment with the empirical evidence. To strengthen the trustworthiness of the findings, the study employed source triangulation by cross-checking information from interviews, observations, and official school documents (Sugiyono, 2019). This methodological rigor ensured that the interpretations accurately represented the institutional reality and reduced potential researcher bias.

RESULTS

The following is Table 1. regarding a summary of the results of short interviews with several informants (teachers, administrative staff, and principals) at SMAN1 Panyipatan regarding technology integration and resource management.

Table 1. Summary of Interview Findings

Informant	Main Theme	Short Interview Excerpt
Principal	Policy & strategy	"We prepare annual plans so all divisions use information systems for attendance, administration, and learning evaluation to improve efficiency."
Vice Principal (HR)	Teacher training & HR development	"Every semester we conduct workshops on LMS use and teacher data management systems, but many teachers still feel unsure about using technology."
Teacher A	Technology use in learning	"I use online learning platforms for assignments and quizzes; students are more active, but the internet connection is sometimes unstable."
Teacher B	Administration & evaluation	"Previously, grading was done manually on paper; now we input everything into the system, making it faster and easier to access."
Administrative Staff	Management information system	"The school MIS makes it easier to manage student data, facilities, and reports, but it still needs regular maintenance and technical support."
School IT Technician	Infrastructure & technical issues	"We face problems when power goes out or when the network drops; sometimes we also need a server upgrade to keep systems running smoothly."

Based on the thematic analysis following the interactive model by Miles et al., (2019), the raw data underwent open and axial coding. This process identified core themes related to administrative digitization, human resource readiness, and infrastructural support. The synthesis of these findings, summarized in Table 1 above, reveals the dynamic interplay between technology integration and school resource management. First, regarding Administrative Efficiency, SMAN 1 Panyipatan has successfully implemented a Management Information System (MIS) for administration and assessment. The analysis confirms that digitization has accelerated managerial processes. Teacher B specifically noted the shift from manual to digital workflows: "*Previously, grading was done manually on paper; now we input everything into the system, making it faster and easier to access*". This aligns with Digital Human Resource Management (Digital HRM) theory, where automation reduces manual workload and enhances data transparency.

Second, in terms of Human Resource Development, the findings highlight a gap between training availability and adoption. While the school provides regular development programs, the Vice Principal (HR) highlighted persistent psychological barriers: "*Every semester we conduct workshops on LMS use... but many teachers still feel unsure about using technology*". This indicates that despite the availability of training, digital confidence remains a critical challenge that requires more personalized intervention than standard workshops.

Third, regarding Infrastructure and Learning Engagement, the integration of LMS has notably increased student participation. Teacher A reported, "*I use online learning platforms for assignments and quizzes; students are more active, but the internet connection is sometimes unstable*". This finding underscores the "digital divide" within the school context; while pedagogical engagement improves, it is frequently

compromised by physical constraints. The School IT Technician further corroborated this, stating, “We face problems when power goes out or when the network drops”, confirming that infrastructure remains the primary bottleneck for effective integration. Ultimately, the analysis suggests that successful technology integration depends on Strategic School Management. As the Administrative Staff emphasized, “The school MIS makes it easier to manage student data. but it still needs regular maintenance and technical support”. This implies that sustainable transformation requires school policies that go beyond procurement to include consistent maintenance budgeting and technical support systems.

DISCUSSION

The findings from SMAN 1 Panyipatan illustrate that technology integration is not merely a technical upgrade but a complex managerial process. This section interprets these findings in relation to existing literature and discusses their implications. Interpretation and Consistency with Previous Studies The successful adoption of school management information system (MIS) for administration and evaluation. This aligns with recent studies indicating that information system integration is a crucial strategy for improving educational services. Specifically, the findings corroborate Nazifah et al. (2024), who demonstrated that an integrated MIS improves efficiency and transparency in school administration. This confirms that proactive school management in implementing information technology optimizes the utilization of administrative resources, allowing staff to focus on strategic tasks rather than manual data entry.

Regarding human resource development, the teacher training conducted at SMAN 1 Panyipatan on LMS usage is pivotal, yet psychological barriers remain. The finding that some teachers lack confidence despite training reflects a persistent challenge in educational management: the digital literacy gap. This aligns with international findings by Peceño et al. (2022), who argue that without continuous digital competency development, the gap between hardware availability and teacher readiness will widen. This supports Luthfiyah et al. (2024), who emphasize that the role of school management extends beyond providing hardware; it must also build human resource readiness through continuous, personalized training. Furthermore, consistent with Kusumaningrum et al. (2024), organizational resistance can arise if management does not carefully navigate the cultural shift required for technology adoption. In terms of infrastructure, the study identifies technical instability (internet and power) as a major bottleneck at SMAN 1 Panyipatan. This is in line with Erliana (2025), who found that limited infrastructure and data security issues remain serious challenges in ICT management across secondary schools. Similarly, Sugiyantoro et al. (2025) highlight the "access gap" as a primary barrier to effective technology-management integration. Consequently, without strengthening technical infrastructure, the sustainability of digital programs remains at risk.

On the pedagogical front, the use of technology for online quizzes and assignments via the LMS has been shown to increase student engagement. This supports the findings of Sholeh & Efendi (2023) and Tsani et al. (2024), which conclude that integrating educational management technology significantly improves teacher performance and student participation. This evidence suggests that technology at SMAN 1 Panyipatan functions not merely as an administrative tool, but as a pedagogical asset that strengthens teaching and learning interactions. Human resource management at SMAN 1 Panyipatan shows that in addition to training, the school also needs managerial policy support to make technology integration part of its long-term strategy. Modern human resource management theory emphasizes the importance of adaptive, efficient, and data-driven management, especially in the era of digital education (Suherman et al., 2025). Technology integration in human resource management (e.g., a digital-based HR system) can support transparency, professional development, and staff and teacher performance monitoring (Juchnowicz & Kinowska, 2026; Chen,2026)

From a school administration perspective, the administrative staff of SMAN 1 Panyipatan felt that MIS made their work easier. This is consistent with a study by Azzahra et al. (2024), which found that technology-based educational administration can improve operational efficiency, decision-making, and the quality of school reports. With MIS, the manual administrative burden is reduced, allowing staff to focus on other strategic tasks such as student data analysis and school development planning. Despite progress, the sustainability of technology integration at SMAN 1 Panyipatan remains a challenge due to system maintenance, budgeting, and technical support. Literature research indicates that organizational resistance and cultural barriers can also arise if management does not carefully plan technology integration (Kusumaningrum et al., 2024). Furthermore, Chen and Mokmin (2024) emphasize that digital leadership from school principals is a determining factor in fostering teachers' digital literacy and technology acceptance. Therefore, school management needs to develop a sustainability policy that includes a maintenance budget, an internal technical team, and regular evaluations to ensure that technology integration is not just a one-time project but part of a long-term managerial transformation.

Theoretically, this study enriches the discourse on Digital Human Resource Management (Digital HRM) within the context of public senior high schools. It validates the theory that modern human resource management must be adaptive and data-driven to survive in the digital education era (Suherman et al., 2025). The findings demonstrate that technology integration is not a standalone technical intervention but a managerial process that must be synergized with human resource strategies to enhance organizational capacity and teacher professionalism. Practically, the study offers actionable insights for school principals and policymakers. First, policy sustainability is critical; school management must develop long-term policies that include dedicated budgets for system maintenance and technical support teams, ensuring technology is not just a one-time project. Second, training differentiation is necessary; training programs should be tailored to different levels of digital literacy to effectively address the lack of confidence among senior teachers. Finally, schools must prioritize infrastructure resilience to prevent technical disruptions from undermining the pedagogical benefits of the LMS.

CONCLUSION

The integration of technology and resource management at SMAN 1 Panyipatan has improved administrative efficiency, data transparency, and student engagement in learning, although challenges remain related to teacher digital literacy, infrastructure, and technical support. The school management information system (MIS) and online learning platform (LMS) have been proven to simplify administrative management, assessment, and monitoring of teacher performance, while ongoing training is key to improving human resource readiness. However, sustainable technology integration requires strong management policies, a maintenance budget, and regular technical support to ensure that technology implementation is not merely a temporary project. Overall, the implementation of technology integration and resource management has the potential to strengthen teacher professionalism, learning quality, and school operational efficiency, enabling SMAN 1 Panyipatan to serve as a model for other high schools in building an effective and sustainable modern education system. Nevertheless, this research has limitations regarding its single case study design and the specific timeframe of data collection. Future research is recommended to expand this scope through comparative studies involving multiple schools or by employing mixed-method approaches to obtain more generalizable data. Additionally, longitudinal evaluations would be valuable to assess the long-term impact of MIS and LMS integration on school managerial effectiveness.

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