

RESEARCH ARTICLE

Digital human resource transformation in remote secondary schools: Implications for educational quality management in resource-constrained contexts

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ABSTRACT

Background: Digital transformation has become a strategic priority in education, yet research on digital human resource transformation in remote secondary schools remains limited. Existing studies have primarily focused on teaching and learning technologies, while less attention has been given to how digital transformation reshapes human resource management practices and supports educational quality management in resource-constrained contexts.

Purpose: This study aimed to examine how digital human resource transformation is implemented in remote secondary schools, how it influences educational quality management, and the factors that facilitate or constrain its implementation.

Method: A qualitative multi-site case study design was employed involving three remote secondary schools in Central Sulawesi, Indonesia. Data were collected through semi-structured interviews, observations, and document analysis. Eighteen participants, including principals, vice principals, teachers, administrative staff, and school committee representatives, were selected using purposive sampling. The data were analyzed using thematic analysis.

Findings: The findings revealed that digital human resource transformation was implemented through three main dimensions: digitalization of administrative and personnel management, digital professional development practices, and leadership-driven digital transformation. The transformation contributed to educational quality management by improving administrative efficiency and accountability, supporting teacher performance and professional learning, and facilitating data-informed decision-making. Leadership commitment and collaborative organizational culture emerged as key enabling factors, whereas infrastructure limitations, digital competency gaps, and the absence of formal policy frameworks constrained implementation.

Conclusions: The study concludes that digital transformation in remote schools remains largely compliance-oriented and that its long-term sustainability requires the alignment of technological infrastructure, human capacity, leadership support, and institutional policy.

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INTRODUCTION

The digital transformation of education has become a central agenda in educational reform worldwide, driven by rapid technological advancement and increasing demands for organizational effectiveness, accountability, and educational quality (Huang et al., 2024; Surjawan et al., 2025; Veseli et al., 2025). Beyond its role in supporting teaching and learning, digital transformation has increasingly reshaped how educational institutions manage their human resources, organizational processes, and quality assurance systems. In contemporary educational settings, digital technologies are being integrated into various human resource management (HRM) functions, including personnel administration, professional development, performance evaluation, communication, and decision-making processes (Al-Alawi et al., 2023; Kisahwan et al., 2025). These developments have positioned digital human resource transformation as a strategic component of educational improvement rather than merely a technological innovation.

The growing significance of digital human resource transformation is closely associated with the pursuit of educational quality. Educational quality management requires schools to continuously improve organizational performance, strengthen staff competencies, and ensure effective coordination among stakeholders (Khurniawan et al., 2021; Serrano et al., 2025). Digital technologies offer opportunities to support these objectives by enhancing administrative efficiency, facilitating data-driven decision-making, expanding access to professional learning opportunities, and improving the monitoring of institutional performance (Busulwa et al., 2024; Mhlongo et al., 2023). Consequently, the successful integration of digital technologies into human resource management practices has been increasingly recognized as a critical factor influencing the effectiveness and sustainability of school improvement initiatives.

In developing countries, however, the implementation of digital transformation in educational organizations remains uneven. Schools frequently encounter challenges related to technological infrastructure, digital competency, organizational readiness, and institutional support (Diao et al., 2025; Zancajo et al., 2022). These challenges are often more pronounced in geographically remote and resource-constrained settings, where educational institutions must simultaneously respond to national digitalization policies while coping with local limitations (Ahmad et al., 2023; Ndibalema, 2025; Wong & Li, 2025). Understanding how schools navigate these complexities has therefore become an important area of inquiry within contemporary educational management research.

Despite the growing body of research on digital transformation in education, important gaps remain in understanding how digital human resource transformation unfolds within school organizations, particularly in geographically remote contexts. Existing studies have predominantly focused on the integration of digital technologies into teaching and learning processes, student outcomes, and institutional digital readiness ([Oliveira & De Souza, 2022](#); [Wani & Ganaie, 2023](#)). While these studies have generated valuable insights into educational digitalization, they have paid comparatively limited attention to how digital technologies reshape the management of educational personnel and contribute to broader school quality improvement efforts.

First, a substantial strand of research has examined digital transformation as a technology-driven process that enhances instructional practices, learning environments, and institutional innovation ([Kim et al., 2023](#); [Özkeskin, H., & Gökçe, 2025](#); [Tan et al., 2025](#)). These studies generally emphasize the adoption of digital platforms, learning management systems, and emerging technologies within educational settings. However, the organizational and human resource dimensions of digital transformation often receive secondary attention, leaving unanswered questions about how schools manage personnel, professional development, and performance through digital systems.

Second, studies focusing on educational human resource management have highlighted the importance of digital competency development, online professional learning, and leadership capacity in supporting school improvement ([Fernández-Batanero et al., 2022](#); [Timotheou et al., 2023](#); [Zimmer & Matthews, 2023](#)). Although this literature acknowledges the strategic role of human resources, it frequently concentrates on individual teacher development rather than examining how digitalization influences school-wide human resource management practices and quality management processes. Consequently, the organizational mechanisms through which digital human resource transformation contributes to educational quality remain insufficiently understood.

Third, research conducted in rural and remote educational settings has largely emphasized infrastructural constraints, digital divides, and inequalities in technology access ([Ahiaku et al., 2025](#); [Graves et al., 2021](#); [Olanrewaju et al., 2021](#)). While these studies provide important evidence regarding barriers to digitalization, they often portray remote schools as passive recipients of technological change. Less attention has been devoted to understanding how school leaders, teachers, and administrative staff actively adapt, negotiate, and implement digital transformation initiatives within their unique organizational and socio-cultural contexts. As a result, empirical knowledge regarding the interaction between digital human resource transformation and educational quality management in remote schools remains limited.

Addressing these gaps, the present study investigates how digital human resource transformation is implemented and experienced in remote secondary schools and how such transformation relates to educational quality management. Rather than focusing solely on technological infrastructure or individual digital competencies, this study examines digital transformation as an organizational process involving school leadership, teachers, administrative personnel, institutional practices, and quality management mechanisms. Understanding these dynamics is particularly important in remote educational settings, where schools often operate under significant resource constraints while simultaneously being expected to comply with national digitalization policies and quality assurance standards.

This study adopts a qualitative multi-site case study approach involving three secondary schools located in remote areas of Central Sulawesi, Indonesia. The multi-site design enables a comparative exploration of how schools with different organizational characteristics and institutional contexts respond to similar digital transformation pressures. By examining experiences across multiple sites, the study seeks to identify both shared patterns and context-specific dynamics shaping digital human resource transformation and educational quality management.

The study contributes to the educational management literature by providing empirical evidence from underrepresented remote-school contexts in the Global South. Specifically, it offers a deeper understanding of how school actors interpret, adapt, and enact digital transformation initiatives within their everyday organizational practices and how these processes influence efforts to improve educational quality.

Accordingly, this study addresses the following research questions: (1) How is digital human resource transformation implemented in remote secondary schools? (2) How does digital human resource transformation influence educational quality management practices in remote secondary schools? (3) What organizational, technological, and contextual factors facilitate or constrain the implementation of digital human resource transformation in remote secondary schools?

METHODS

Research Design

This study employed a qualitative multi-site case study design (Yin, 2018) to explore how digital human resource transformation is implemented in remote secondary schools and how it relates to educational quality management. A qualitative approach was appropriate because the study sought to understand participants' experiences, perceptions, and organizational practices within their natural settings rather than to examine causal relationships between variables.

A multi-site case study design was adopted to investigate the phenomenon across different institutional contexts. Three secondary schools in remote areas of Central Sulawesi, Indonesia, were selected as individual cases representing diverse organizational characteristics. Examining multiple sites enabled the identification of both shared patterns and context-specific variations in digital human resource transformation. This design also facilitated a deeper understanding of the organizational and contextual factors influencing digital transformation and educational quality management in remote school settings.

Research Participants

Participants were selected using purposive sampling to ensure that individuals with direct experience and knowledge of digital human resource transformation and educational quality management were included in the study. The selection criteria focused on stakeholders who were actively involved in school leadership, teaching, administrative management, and school governance. These groups were considered capable of providing diverse perspectives on the implementation of digital transformation initiatives and their implications for educational quality.

The study involved 18 participants from three remote secondary schools in Central Sulawesi, Indonesia. The participants ([Table 1](#)) consisted of school principals, vice principals, teachers, administrative staff, and school committee representatives. Including participants from different organizational levels enabled the study to capture a comprehensive understanding of both strategic and operational aspects of digital human resource transformation. To ensure confidentiality, participants were assigned identification codes, and all personal information was anonymized during data analysis and reporting.

Research Instruments

Data were collected using three complementary instruments: semi-structured interview guides, observation protocols, and document analysis checklists. The use of multiple instruments enabled methodological triangulation and enhanced the credibility of the findings.

The primary instrument was a semi-structured interview guide developed based on the study's research questions and relevant literature on digital human resource transformation and educational quality management. The interview protocol consisted of open-ended questions designed to explore participants' experiences, perceptions, and practices related to digital transformation initiatives within their schools. While a common set of guiding questions was used across participant groups, minor adaptations were made to accommodate the specific roles of principals, vice principals, teachers, administrative staff, and school committee members. The interview guide was reviewed by two experts in

educational management and qualitative research to ensure clarity, relevance, and alignment with the research objectives.

An observation protocol was used to document school practices, technological facilities, and organizational activities related to digital human resource management and quality management processes. Field notes were recorded systematically during site visits. In addition, a document analysis checklist was employed to examine relevant institutional documents, including school strategic plans, professional development records, quality assurance reports, digital policy documents, and administrative records. These documents provided contextual information and served as a means of corroborating data obtained from interviews and observations. Together, the three instruments generated rich and comprehensive data for understanding digital human resource transformation in remote school settings.

Table 1.

Demographic Profile of Participants

Code	Position	School Type	Gender	Years of Experience
P1	Principal	Public	M	18
P2	Principal	Public	M	15
P3	Principal	Private Islamic	M	20
VP1	Vice Principal	Public	F	12
VP2	Vice Principal	Public	M	10
VP3	Vice Principal	Private Islamic	F	11
T1	Teacher	Public	F	14
T2	Teacher	Public	M	8
T3	Teacher	Public	F	11
T4	Teacher	Public	M	9
T5	Teacher	Private Islamic	F	13
T6	Teacher	Private Islamic	M	7
A1	Administrative Staff	Public	M	9
A2	Administrative Staff	Public	F	6
A3	Administrative Staff	Private Islamic	M	8
C1	Committee Member	Public	M	10
C2	Committee Member	Public	F	7
C3	Committee Member	Private Islamic	M	12

Research Procedure

During the participant recruitment stage, purposive sampling was used to identify individuals who were directly involved in digital human resource management and educational quality initiatives. Participants were eligible if they (a) had at least one year of professional experience in the participating school, (b) were actively involved in digital administrative systems, teacher professional development, school leadership, or quality

assurance activities, and (c) possessed direct knowledge of the school's digital transformation practices. To ensure comprehensive organizational perspectives, participants were selected from different stakeholder groups, including principals, vice principals, teachers, administrative staff, and school committee representatives. These groups were chosen because they perform complementary roles in planning, implementing, managing, and overseeing digital human resource transformation and educational quality management. Eligible participants were contacted through school administrators and invited to participate voluntarily in the study. Data collection was conducted over a three-month period. Semi-structured interviews were carried out with school principals, vice principals, teachers, administrative staff, and school committee representatives. Each interview lasted approximately 45–60 minutes and was audio-recorded with participants' consent. In addition to interviews, non-participant observations were conducted during school visits, and relevant institutional documents were collected and reviewed to provide contextual information and support data triangulation. The final stage involved data verification. Interview recordings were transcribed verbatim and checked for accuracy. Preliminary findings were shared with selected participants to confirm the accuracy of interpretations. Information obtained from interviews, observations, and documents was continuously compared to ensure consistency and enhance the trustworthiness of the findings.

Data Analysis

Data were analyzed using thematic analysis following the procedures proposed by [Clarke and Braun \(2018\)](#). This approach was selected because it enables researchers to systematically identify, analyze, and interpret patterns of meaning across qualitative data. The analysis began with data familiarization. Interview recordings were transcribed verbatim, and all transcripts, observation notes, and institutional documents were read repeatedly to develop a comprehensive understanding of the data. In the second stage, initial codes were generated inductively from the data rather than being derived from predetermined theoretical categories. Coding focused on participants' descriptions of digital human resource transformation practices, educational quality management, and contextual factors influencing implementation. The coded data were then reviewed and organized into broader categories to identify recurring patterns across participants and research sites. Through an iterative process of constant comparison and refinement, related categories were grouped into potential themes. These themes were subsequently reviewed against the entire dataset to ensure coherence, consistency, and alignment with the research questions.

To enhance analytical credibility, the coding process was conducted collaboratively by the research team. The researchers independently reviewed selected transcripts and compared preliminary codes before discussing similarities and differences. Any

discrepancies in coding or theme interpretation were resolved through iterative discussion until consensus was reached, with reference to the original data to ensure that the final themes accurately reflected participants' accounts. To further enhance the trustworthiness of the analysis, data from interviews, observations, and documents were compared through triangulation. In addition, emerging interpretations were discussed among the research team and verified through member checking with selected participants. The final themes formed the basis for understanding how digital human resource transformation was implemented, experienced, and managed across the participating schools.

RESULT AND DISCUSSION

Results

The findings of this study are organized into three major themes corresponding to the research questions: Implementation of Digital Human Resource Transformation, Influence on Educational Quality Management, and Facilitators and Constraints. Each theme is further divided into several sub-themes. A detailed discussion of these themes and sub-themes is presented in the following sections.

Implementation of Digital HR Transformation

To address the first research question, the findings are organized into three sub-themes: digitalization of administrative and personnel management, digital professional development practices, and leadership-driven digital transformation. Together, these sub-themes illustrate how digital human resource transformation is implemented in remote secondary schools.

Digitalization of Administrative and Personnel Management

The findings indicated that digital human resource transformation was primarily reflected in the digitalization of administrative and personnel management processes. Across the three schools, participants reported increasing use of digital platforms to manage personnel records, attendance, performance documentation, and school reporting activities. These systems had become an essential part of daily administrative operations.

School leaders acknowledged that digital technologies had improved the organization and accessibility of administrative information. One principal stated:

"Most administrative activities are now conducted through digital platforms. Teacher data, student information, and school reports are submitted electronically. Compared to previous years, the process is more organized and easier to monitor." (P1-Male-18-Public)

Similarly, a vice principal highlighted the benefits of digital record management:

"Previously, many documents were stored manually, making them difficult to retrieve when needed. Now, most records are available in digital format, which makes administrative work more efficient." (VP2-Male-10-Public)

Administrative staff also emphasized the growing importance of digital systems in managing personnel-related information:

"Our work depends heavily on digital platforms. Teacher data, performance reports, and various administrative requirements must be updated regularly through online systems. Digital records help us manage information more accurately." (A1-Male-9-Public)

Despite these improvements, participants consistently described digitalization as largely driven by external reporting requirements rather than strategic human resource planning. As one participant explained:

"Most digital activities are linked to government reporting systems. We use them because they are required, but their potential for broader school management has not been fully utilized." (VP3-Female-11-Private Islamic)

Overall, the findings suggest that digital human resource transformation in remote secondary schools is currently concentrated on administrative digitalization. While these initiatives have improved efficiency, record management, and accountability, their implementation remains largely compliance-oriented rather than strategically integrated into broader human resource management practices.

Digital Professional Development Practices

The findings revealed that digital human resource transformation was also reflected in the growing use of digital platforms for teacher professional development. Across the three schools, teachers increasingly participated in online training programs, webinars, and self-directed learning activities facilitated through government-supported platforms and other digital resources. These opportunities enabled teachers to access professional learning without leaving their schools, which was particularly important given the geographical constraints of remote areas.

Participants reported that digital platforms expanded access to training materials and professional learning communities. One teacher explained:

"Online training allows us to learn new teaching methods and digital tools without having to travel to the district center. This saves both time and cost." (T2-Male-8-Public)

Similarly, another teacher described how digital learning opportunities encouraged continuous professional growth:

"I regularly join webinars and online courses. Through these activities, I have learned how to use interactive applications and digital resources in my classroom." (T5-Female-13-Private Islamic)

School leaders also recognized the value of digital professional development in improving teachers' competencies. As one principal noted:

"Digital platforms have made professional development more accessible. Teachers can participate in training activities more frequently than before." (P2-Male-15-Public)

However, participants highlighted differences in engagement levels among teachers. While some teachers actively utilized digital learning opportunities, others faced difficulties due to limited digital skills, heavy workloads, or unstable internet connectivity.

"Not all teachers participate equally. Some are very active, while others still need guidance and support to use digital platforms effectively." (VP1-Female-12-Public)

Overall, the findings indicate that digital professional development has become an important component of digital human resource transformation in remote secondary schools. Although participation varies across individuals and schools, digital platforms have expanded access to professional learning and supported the continuous development of teachers' knowledge and skills.

Leadership-Driven Digital Transformation

The findings demonstrated that school leadership played a central role in driving digital human resource transformation. Across the three schools, principals were not only responsible for facilitating the adoption of digital technologies but also for creating an organizational environment that encouraged staff to engage with digital initiatives. Participants consistently emphasized that the success of digital transformation depended largely on the commitment and vision of school leaders.

School principals described their efforts to promote digital practices through planning, resource allocation, and continuous encouragement. One principal explained:

"Digital transformation cannot happen by itself. School leaders must provide direction, encourage teachers to learn new technologies, and ensure that resources are available to support implementation." (P1-Male-18-Public)

Teachers similarly viewed leadership support as an important factor influencing their willingness to adopt digital practices.

"Our principal regularly motivates us to participate in online training and try new digital tools in teaching. This encouragement makes teachers more confident to use technology." (T3-Female-11-Public)

In addition to motivation, participants highlighted the role of leaders in coordinating digital initiatives and addressing implementation challenges. A vice principal noted:

"When technical problems occur, school leaders usually coordinate solutions and help ensure that digital activities can continue despite various limitations." (VP2-Male-10-Public)

However, cross-case comparisons revealed variations in leadership approaches. Schools with more proactive leaders tended to demonstrate higher levels of digital adoption, while schools with less structured leadership approaches experienced slower progress.

"The principal's commitment is very important. Where leadership is strong, teachers are generally more willing to participate in digital programs." (A3-Male-8-Private Islamic)

Overall, the findings suggest that leadership serves as a key driver of digital human resource transformation in remote secondary schools. Through strategic direction, motivation, coordination, and resource mobilization, school leaders play a crucial role in shaping the implementation and sustainability of digital transformation initiatives.

Influence on Educational Quality Management

The analysis revealed three key areas through which digital human resource transformation influences educational quality management: administrative efficiency and accountability, teacher performance and professional learning, and data-informed quality management. These interconnected areas reflect the contribution of digital transformation to school improvement processes.

Improving Administrative Efficiency and Accountability

Participants consistently reported that digital human resource transformation contributed to greater administrative efficiency and accountability within their schools. The use of digital platforms enabled school personnel to manage records, prepare reports, and access information more efficiently than traditional paper-based procedures. As a result, administrative processes became more systematic and transparent.

One principal explained:

"Digital systems have significantly reduced the time needed to prepare administrative reports. Information can be accessed more quickly, and documentation is better organized than before." (P2-Male-15-Public)

Teachers also recognized improvements in administrative procedures, particularly in relation to reporting and documentation requirements.

"Previously, many reports had to be completed manually. Now, most records can be submitted and stored digitally, making the process more efficient and easier to track." (T1-Female-14-Public)

Administrative staff emphasized that digital records enhanced accountability by providing more accurate and accessible information.

"Because the data are stored digitally, it is easier to verify information and monitor updates. This reduces errors and helps us maintain accurate records." (A2-Female-6-Public)

Participants further noted that digital systems improved transparency in school administration. Access to updated information enabled school leaders to monitor activities more effectively and respond to administrative issues in a timely manner.

"School leaders can now monitor administrative activities more easily because the information is available in digital form. This helps improve accountability across different areas of school management." (VP3-Female-11-Private Islamic)

Overall, the findings suggest that digital human resource transformation has enhanced administrative efficiency and accountability in remote secondary schools. Through improved documentation, streamlined reporting processes, and greater accessibility of information, digital systems have supported more effective educational quality management practices.

Supporting Teacher Performance and Professional Learning

The findings indicated that digital human resource transformation supported teacher performance by expanding opportunities for professional learning and encouraging the adoption of innovative teaching practices. Participants reported that access to online training, webinars, professional learning communities, and digital educational resources enabled teachers to continuously update their knowledge and instructional skills.

Teachers acknowledged that digital professional development activities exposed them to new pedagogical approaches and technological tools that could be integrated into classroom practice. One teacher stated:

"Through online training and webinars, I learned various digital applications that make lessons more interactive and engaging for students." (T4-Male-9-Public)

Similarly, another participant emphasized the role of digital learning opportunities in enhancing instructional competence:

"Digital platforms provide access to many learning resources. They help teachers improve their teaching strategies and stay updated with current educational practices." (T5-Female-13-Private Islamic)

School leaders also observed positive changes in teachers' professional practices following their participation in digital learning activities.

"Teachers who actively participate in online professional development tend to be more confident in using technology and more willing to experiment with innovative teaching methods." (P3-Male-20-Private Islamic)

Participants further noted that digital transformation fostered a culture of continuous learning within the school. Teachers increasingly shared digital resources, exchanged experiences, and supported one another in developing new competencies.

"Teachers often share materials and discuss what they learned from online training. This creates opportunities for collective learning within the school." (VP1-Female-12-Public)

Overall, the findings suggest that digital human resource transformation contributes to educational quality management by strengthening teacher performance and promoting continuous professional learning. The availability of digital learning opportunities has enabled teachers to enhance their competencies, adopt innovative instructional practices, and engage more actively in professional development activities.

Facilitating Data-Informed Quality Management

The findings revealed that digital human resource transformation facilitated data-informed quality management practices in remote secondary schools. Participants reported that digital systems provided easier access to information related to teacher performance, professional development activities, attendance records, and school administration. The availability of such data supported monitoring, planning, and decision-making processes aimed at improving educational quality.

School leaders emphasized that digital platforms enabled them to obtain information more efficiently and monitor school performance more systematically. One principal explained:

"Digital systems help us access important information more quickly. This makes it easier to identify areas that need improvement and plan appropriate actions." (P1-Male-18-Public)

Similarly, a vice principal noted that digital data supported school evaluation and quality assurance activities:

"We can review various records and reports more easily because the information is stored digitally. This helps us monitor progress and prepare for school evaluations." (VP2-Male-10-Public)

Teachers also recognized the value of digital data in supporting educational improvement initiatives.

"The availability of digital records allows us to reflect on our activities and identify aspects of teaching and learning that require further attention." (T6-Male-7-Private Islamic)

Administrative staff highlighted that digital documentation improved the accuracy and accessibility of information used for planning and reporting purposes.

"When data are organized digitally, it becomes easier to compile reports, track progress, and provide evidence when needed for quality assurance activities." (A1-Male-9-Public)

Across the three schools, participants viewed digital information systems as important tools for supporting evidence-based management practices. Although the use of data varied among schools, digital technologies were generally perceived as enhancing the availability and utilization of information for organizational improvement.

Overall, the findings suggest that digital human resource transformation contributes to educational quality management by strengthening data-informed decision-making processes. Improved access to reliable information enables school stakeholders to monitor performance, support quality assurance activities, and make more informed decisions for continuous school improvement.

Facilitators and Constraints

The findings suggest that the implementation of digital human resource transformation is influenced by a combination of organizational, technological, and contextual factors. Four interrelated themes emerged from the data: leadership commitment, collaborative organizational culture, infrastructure and resource constraints, and digital competency and policy challenges.

Leadership Commitment as an Enabling Factor

The findings revealed that leadership commitment was one of the most influential factors facilitating digital human resource transformation in remote secondary schools. Across the three sites, participants consistently emphasized that the commitment of school leaders shaped the direction, pace, and sustainability of digital transformation initiatives. Principals played a central role in promoting technology adoption, encouraging staff participation, and mobilizing available resources to support digital practices.

One principal highlighted the importance of leadership in sustaining digital initiatives: *"Technology alone is not enough. School leaders must continuously encourage teachers and staff to engage with digital systems and demonstrate that these changes are important for school improvement."* (P1-Male-18-Public)

Teachers similarly viewed leadership support as a critical factor influencing their willingness to participate in digital activities.

"Our principal always motivates teachers to attend online training and try new technologies. This encouragement makes us more confident in using digital tools." (T3-Female-11-Public)

Participants also noted that committed leaders actively sought solutions to challenges associated with limited resources and infrastructure. A vice principal explained:

"Even when facilities are limited, school leaders try to find alternatives and ensure that digital programs continue to operate." (VP1-Female-12-Public)

Administrative staff further emphasized the importance of leadership in coordinating digital transformation efforts across different units within the school.

"Strong leadership helps everyone work toward the same goals. Without clear direction, digital initiatives would be difficult to maintain." (A3-Male-8-Private Islamic)

Overall, the findings suggest that leadership commitment serves as a key enabling factor in digital human resource transformation. Through strategic direction, motivation, and resource mobilization, school leaders create conditions that support the successful implementation of digital initiatives and their integration into educational quality management practices.

Collaborative Organizational Culture

The findings indicated that a collaborative organizational culture significantly facilitated the implementation of digital human resource transformation across the participating schools. Participants frequently described collaboration among teachers, administrative staff, and school leaders as an important mechanism for overcoming technological challenges and supporting the adoption of digital practices. In contexts where formal technical support was limited, peer assistance emerged as a critical source of learning and problem-solving.

Teachers reported that informal collaboration often helped them develop digital skills and confidence in using technology. One teacher explained:

"When we encounter difficulties using digital platforms, we usually ask colleagues who are more experienced. Most teachers are willing to help and share their knowledge." (T2-Male-8-Public)

Similarly, another participant highlighted the importance of knowledge sharing among staff members:

"We frequently exchange information about online training, digital tools, and teaching resources. This helps everyone learn together and improve gradually." (T5-Female-13-Private Islamic)

School leaders also recognized collaboration as a key factor supporting digital transformation. A principal stated:

"Digital transformation is not solely the responsibility of the principal or the operator. It requires cooperation from all members of the school community." (P2-Male-15-Public)

Administrative staff emphasized that teamwork was particularly important when dealing with reporting requirements and technical issues.

"Many digital tasks involve coordination among teachers, administrators, and school leaders. Collaboration makes the work more manageable and reduces mistakes." (A2-Female-6-Public)

Across the three schools, collaborative practices were evident through peer mentoring, informal discussions, resource sharing, and collective problem-solving. These interactions created supportive learning environments that encouraged staff to engage with digital technologies despite various constraints.

Overall, the findings suggest that a collaborative organizational culture functions as an important enabling factor in digital human resource transformation. Through mutual support, knowledge sharing, and collective learning, school communities strengthen their capacity to adopt and sustain digital initiatives in remote educational settings.

Infrastructure and Resource Constraints

The findings revealed that infrastructure and resource limitations constituted major barriers to digital human resource transformation in remote secondary schools. Participants consistently identified unstable internet connectivity, limited technological devices, and financial constraints as challenges that hindered the effective implementation of digital initiatives. Although digital systems were increasingly integrated into school operations, the availability of supporting infrastructure remained uneven across the participating schools.

Internet connectivity emerged as the most frequently cited challenge. Participants explained that unstable network access often disrupted administrative tasks, online training, and communication activities. One teacher commented:

"There are times when internet access is very slow or unavailable. This makes it difficult to access digital platforms and complete online tasks on time." (T6-Male-7-Private Islamic)

Similarly, a school administrator highlighted the impact of connectivity issues on administrative work:

"Many reporting activities depend on internet access. When the connection is unstable, the submission of reports is often delayed." (A1-Male-9-Public)

Participants also reported shortages of technological devices and supporting facilities. A vice principal explained:

"Not all teachers have equal access to school-owned devices. In some cases, they rely on personal laptops and internet data to complete their work." (VP3-Female-11-Private Islamic)

Financial limitations further constrained schools' ability to upgrade infrastructure and expand digital initiatives.

"We want to improve our digital facilities, but budget limitations mean that improvements must be made gradually." (P3-Male-20-Private Islamic)

Across the three schools, these challenges reduced the consistency and effectiveness of digital transformation efforts. While participants demonstrated strong commitment to adopting digital practices, infrastructural and financial constraints frequently limited the extent to which digital technologies could be fully utilized.

Overall, the findings suggest that infrastructure and resource constraints remain significant obstacles to digital human resource transformation. Addressing these challenges is essential for ensuring equitable and sustainable digital development in remote educational settings.

Digital Competency and Policy Challenges

The findings indicated that variations in digital competency and the absence of institutional policy frameworks posed significant challenges to digital human resource transformation. Although participants generally expressed positive attitudes toward digitalization, differences in technological skills and limited policy guidance affected the consistency of implementation across schools.

Participants reported that teachers possessed varying levels of digital competency, influencing their ability to engage effectively with digital systems and professional development opportunities. While some teachers adapted quickly to new technologies, others required additional support and training. One teacher explained:

"Some teachers are comfortable using digital platforms, but others still struggle with basic technological tasks. As a result, the adoption of digital practices is not always consistent." (T1-Female-14-Public)

Similarly, a vice principal noted that generational differences often influenced digital readiness:

"Younger teachers tend to adapt more quickly, whereas some senior teachers need more time and guidance to become familiar with new technologies." (VP1-Female-12-Public)

In addition to competency-related challenges, participants highlighted the absence of formal policies and strategic guidelines for digital transformation. A principal commented:

"We implement various digital initiatives, but there is no comprehensive policy that clearly outlines long-term goals, responsibilities, and implementation procedures." (P2-Male-15-Public)

Administrative staff also emphasized the need for clearer institutional direction:

"Many activities depend on individual initiative. Formal guidelines would help ensure consistency and continuity across different programs." (A3-Male-8-Private Islamic)

Across the three schools, the combination of uneven digital competencies and limited policy support created challenges for sustaining digital transformation efforts. Participants suggested that structured training programs, continuous mentoring, and clear institutional policies would strengthen implementation and reduce disparities in digital readiness. Overall, the findings suggest that digital competency gaps and the absence of formal policy frameworks remain important barriers to digital human resource transformation. Addressing these challenges is essential for ensuring the long-term sustainability and effectiveness of digital initiatives in remote secondary schools.

Discussion

The present study aimed to examine how digital human resource transformation is implemented in remote secondary schools, how it influences educational quality management, and the factors that facilitate or constrain its implementation. The findings indicate that digital human resource transformation in remote secondary schools remains largely compliance-oriented rather than strategically integrated into broader human resource management practices. Although schools have adopted various digital platforms for personnel administration, reporting, attendance monitoring, and performance documentation, these technologies are primarily utilized to fulfill external accountability requirements. This suggests that digitalization has been implemented mainly at the operational level, with limited evidence of its use as a strategic mechanism for workforce planning, talent development, or organizational improvement.

This finding aligns with previous studies indicating that educational institutions in developing contexts often adopt digital technologies in response to policy mandates and reporting obligations rather than as part of a comprehensive transformation strategy (Graham et al., 2023; Mohamed Hashim et al., 2022; Pasi & Dhamak, 2026). While digital platforms improve administrative efficiency and information accessibility, their transformative potential may remain underutilized when implementation focuses predominantly on compliance (Mammadli et al., 2026; Zhang et al., 2025). In such circumstances, technology functions as a reporting tool rather than as an instrument for strategic decision-making and organizational learning.

The findings further reveal that the benefits of digitalization were most visible in administrative efficiency, accountability, and data availability. However, these improvements did not automatically translate into systematic human resource development practices. This distinction is important because digitalization and digital transformation are not synonymous. Digitalization refers to the conversion of manual processes into digital formats,

whereas digital transformation involves fundamental changes in organizational practices, decision-making processes, and institutional culture (Alenezi, 2021; Gkrimpizi et al., 2023; Reis & Melão, 2023). Therefore, the present study suggests that remote schools are currently positioned in an intermediate stage of digital maturity, where digital technologies have become embedded in administrative routines but have not yet been fully leveraged to support strategic human resource management and long-term educational quality improvement.

Beyond the role of digital systems themselves, the findings demonstrate that organizational factors significantly influence the success of digital transformation initiatives. Leadership commitment and collaborative organizational culture emerged as critical enablers of digital human resource transformation across the participating schools. While infrastructural limitations were evident across all research sites, schools characterized by proactive leadership and strong collegial relationships demonstrated greater progress in implementing digital initiatives. This finding supports previous research emphasizing the importance of transformational leadership in educational change (Ghorbani et al., 2023; Kılınç, et al., 2024; Sliwka et al., 2024). School leaders acted not only as administrators but also as change agents who articulated a vision for digitalization, encouraged participation in professional development activities, and mobilized available resources despite existing constraints.

The role of collaborative culture was equally important. Teachers, administrative staff, and school leaders frequently relied on peer support, knowledge sharing, and collective problem-solving to overcome technological challenges. Such collaborative practices reduced barriers to technology adoption and created opportunities for continuous organizational learning. These findings are consistent with organizational learning perspectives, which emphasize social interaction and knowledge exchange as essential mechanisms for facilitating innovation and change (Alshwayat et al., 2021; Argote et al., 2022; Liu et al., 2021). From a contingency perspective, the findings further suggest that the effectiveness of digital transformation depends on how schools respond to their contextual realities (Quaicoe et al., 2023; Timotheou et al., 2023). Even under similar environmental constraints, schools with stronger leadership and more collaborative cultures demonstrated higher levels of engagement with digital practices. Consequently, successful digital transformation appears to be shaped not only by technological availability but also by the capacity of school communities to collectively navigate and adapt to change.

While leadership and collaboration facilitate digital transformation, the findings also indicate that long-term sustainability depends on the alignment of technological infrastructure, human capacity, and institutional policy. Participants recognized the value of digital professional development and reported positive impacts on teacher performance

and educational quality management. However, implementation was frequently constrained by unstable internet connectivity, limited access to technological resources, varying levels of digital competency, and the absence of formal policy frameworks. These findings suggest that digital transformation cannot be sustained through technology provision alone. This observation is consistent with studies on digital readiness, which argue that successful digital transformation requires the simultaneous development of technical, human, and organizational capacities (Bonnet & Westerman, 2021; Cranney et al., 2025; Dąbrowska, et al., 2022). Although investments in digital platforms and online professional development created new opportunities for learning and organizational improvement, disparities in digital competency and limited institutional guidance often reduced the effectiveness and consistency of implementation.

Moreover, many digital initiatives depended heavily on individual commitment rather than formalized procedures or long-term strategic planning. Such conditions may limit sustainability, particularly when leadership changes or organizational priorities shift (Kanon, 2024; Smith & Beretta, 2021). Therefore, digital transformation should be understood as an ecosystem rather than a technology deployment initiative. Sustainable implementation requires not only adequate infrastructure but also continuous professional development, supportive policies, and organizational structures that promote long-term adoption and innovation (Oyetade et al., 2024; Rasheed et al., 2025). Taken together, the findings suggest that strengthening digital transformation in remote schools requires a holistic approach that integrates technological resources, human capability development, and institutional commitment into a coherent framework for educational quality improvement.

CONCLUSION

This study explored the implementation of digital human resource transformation in remote secondary schools and its implications for educational quality management. The findings reveal that digital human resource transformation has become an important component of school management, particularly through the digitalization of administrative processes, the expansion of digital professional development opportunities, and leadership-driven initiatives that encourage technology adoption. These developments have contributed to improved administrative efficiency, greater accountability, enhanced teacher professional learning, and more data-informed quality management practices. However, the findings also indicate that digital transformation remains predominantly compliance-oriented, with digital technologies primarily used to meet administrative and reporting requirements rather than to support strategic human resource management. The study further demonstrates that leadership commitment and collaborative organizational culture play critical roles in facilitating digital transformation, often compensating for limitations in

technological resources. At the same time, infrastructure constraints, uneven digital competencies, and the absence of formal policy frameworks continue to hinder the sustainability of digital initiatives. The study contributes to the growing literature on digital transformation in education by providing evidence from remote school contexts that are often underrepresented in educational management research. The findings suggest that successful digital transformation extends beyond technology adoption and requires the alignment of organizational leadership, human capacity development, institutional policy, and technological infrastructure. Consequently, efforts to strengthen digital transformation in remote schools should adopt a holistic and long-term approach that integrates these interconnected dimensions to support sustainable educational quality improvement.

Several limitations should be acknowledged. The study was conducted in three remote secondary schools within a single geographical region, which may limit the transferability of the findings to other educational contexts. In addition, the study relied primarily on participants' perceptions and experiences and adopted a cross-sectional design, limiting the ability to examine how digital human resource transformation evolves over time. Future research should therefore employ longitudinal and comparative designs across different educational contexts to explore the long-term development of digital transformation initiatives. Mixed-methods studies integrating qualitative insights with quantitative indicators of digital readiness, organizational performance, and educational quality would also provide a more comprehensive understanding of how digital human resource transformation contributes to sustainable school improvement.

DECLARATIONS

Author Contribution

Saugadi., Conceptualization, Writing - Original Draft, Editing and Visualization; **Marzuki**, Writing - Review & Editing, Formal analysis, and Methodology; **Freitaz.Z.A.**, Validation and Supervision.

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Conflict of Interest

The authors declare no conflict of interest.

Declaration of AI Use

During the preparation of this manuscript, ChatGPT (OpenAI) was used to improve language clarity, grammar, readability, and editorial quality under the supervision of the authors. The authors reviewed, revised, and approved all generated content and take full responsibility for the accuracy, integrity, and originality of the final manuscript. No AI tools

were used for data collection, data analysis, interpretation of results, or generation of scientific conclusions.

Additional Information

The data is available upon reasonable request.

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