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## Transformation of Madrasah Management in the Digital Era: Leadership, Implementation, and Educational Innovation

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### Articles

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### Abstract

The rapid expansion of digital technologies has redefined educational management, yet its implementation in madrasahs remains uneven and context-dependent. While prior studies predominantly frame digital transformation as a technological or individual competency issue, limited attention has been given to its relational and organizational dynamics. Addressing this gap, this study examines how leadership, implementation processes, and educational innovation interact to shape digital transformation in madrasah contexts. Adopting a qualitative multi-site case study design, data were collected from three madrasahs in Palopo City through in-depth interviews, observations, and document analysis, and analyzed using thematic analysis. The findings reveal that digital transformation unfolds as a gradual and socially embedded process, driven by adaptive leadership and sustained through teacher collaboration, yet constrained by infrastructural limitations that produce uneven implementation. While digital innovation enhances administrative efficiency and student engagement, its impact remains contextually variable. This study advances the literature by reconceptualizing digital transformation in education as a relational and context-sensitive process rather than a purely technological transition, highlighting the critical role of leadership–teacher interaction and adaptive implementation strategies in shaping sustainable digitalization. The findings offer important implications for policy and practice, particularly in designing context-responsive digital transformation strategies in resource-constrained educational settings.

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## **Introduction**

The transformation of the educational landscape in the digital era necessitates a redefinition of teacher professionalism, which can no longer be perceived as singular and static, but rather as responsive to evolving social complexities. This phenomenon is significant, as teachers are not merely transmitters of knowledge but also social actors engaging with diverse interests, values, and realities (Biesta, 2021; Istance, 2018; Paniagua & Istance, 2018; Wichaidit, 2025).

Recent studies indicate that digital transformation in education has reshaped pedagogical interactions and expanded the competency demands placed on teachers, particularly in technological adaptation and responsiveness to student needs (Trust, 2017). In this context, teacher professionalism should not be understood solely as an individual attribute, but as a social construct formed through intersubjective relations. This condition highlights the importance of theoretical approaches capable of capturing the plurality of perspectives in contemporary educational practices.

Existing literature has largely focused on individual competencies, such as pedagogical knowledge, digital literacy, and instructional skills, as primary indicators of teacher quality (Tondeur et al., 2020; Zhang et al., 2024). However, such approaches often overlook the relational and contextual dimensions that shape professional practice. Although some studies emphasize collaboration and communities of practice (Vangrieken et al., 2017), they have not explicitly employed polysubjectivity as an analytical lens.

Polysubjectivity offers a perspective that conceptualizes professionalism as the outcome of interactions among multiple subjectivities within educational social spaces. This gap provides an opportunity for theoretical innovation, particularly in explaining how teachers construct adaptive professionalism within dynamic and diverse contexts. Accordingly, this study aims to examine how polysubjectivity can serve as a theoretical lens for understanding and developing responsive and adaptive teacher professionalism in the digital era. The study focuses on: (1) The dynamics of teacher professionalism within digital transformation contexts. (2) The interaction of multiple subjectivities in shaping educational practices. (3) The explanatory power of polysubjectivity in understanding variations in teacher adaptation.

This study contributes both theoretically and practically. Theoretically, it expands the discourse on teacher professionalism by introducing polysubjectivity as a relational analytical framework. Practically, it offers insights for policy and practice, particularly in designing more adaptive and contextualized professional development programs.

## **Literature Review**

### **1. Digital Transformation in Educational Management**

Digital transformation in education has emerged as a new paradigm, shifting management practices from conventional administrative models toward data-driven, technology-based, and collaborative systems. Contemporary literature suggests that digital transformation involves not only technological adoption but also structural, cultural, and leadership changes (Bond et al., 2018; Selwyn, 2023). Educational institutions are therefore required to strategically integrate technology to enhance efficiency and service quality. Studies by Redecker (2017) and Tondeur et al. (2020) emphasize that successful transformation requires organizational readiness, including digital competence, policy

support, and adequate infrastructure. However, most research has focused on general education contexts, with limited attention to Islamic educational institutions such as madrasahs.

At the implementation level, digital transformation exhibits considerable variation influenced by contextual factors such as human resource readiness and infrastructure availability. Studies (Oliveira et al., 2016; Vial, 2019) indicate that technology adoption is uneven and shaped by individual perceptions. Many studies treat digital transformation as a linear, technology-driven process, thereby neglecting its complex social dimensions. This study addresses this limitation by conceptualizing digital transformation as a social practice shaped by interactions among actors, rather than merely technological implementation.

## 2. Leadership and Implementation in Madrasah Transformation

Leadership is widely recognized as a key factor in successful digital transformation. Transformational leadership plays a crucial role in shaping vision, motivating stakeholders, and fostering innovation (Leithwood et al., 2020; Sheninger, 2019). In educational contexts, digital leadership functions not only as policy direction but also as facilitation of adaptive learning environments (Hallinger, 2018; Trust, 2017). However, most studies conceptualize leadership as an individual entity, overlooking its relational and socially constructed nature.

Technology adoption among teachers is influenced by both individual readiness and institutional support (Chao, 2019; Granić & Marangunić, 2019; Gudmundsdottir & Hatlevik, 2018; Scherer et al., 2019). The Technology Acceptance Model (TAM) explains that perceived usefulness and ease of use are key determinants (Scherer et al., 2019). However, this model tends to be reductionist, treating teachers as isolated individuals. This study offers a more integrative perspective by emphasizing the relational dynamics among leadership, teachers, and institutional contexts in shaping implementation practices.

## 3. Educational Innovation and Teacher Professionalism in the Digital Era

Educational innovation in the digital era encompasses not only technological tools but also pedagogical transformation (OECD, 2019). The use of LMS, blended learning, and interactive media represents key indicators of modern innovation. Research (Tondeur et al., 2020; Zhang et al., 2024) highlights that teacher professionalism is characterized by adaptability and effective technology integration. However, professionalism is still often treated as an individual competency.

In reality, educational innovation develops within complex social contexts involving interactions among teachers, students, and institutions. Collaboration and communities of practice play a critical role (Fullan, 2025; Joyce & Calhoun, 1991; Vangrieken et al., 2015), yet these approaches do not fully capture the interplay of multiple subjectivities. This study contributes by linking innovation and professionalism within a broader relational framework grounded in social interaction.

## Method

This study employs a qualitative multi-site case study design to explore digital transformation in madrasahs. It focuses on interactions among leadership, human resources, and technological implementation as integrated units of analysis.

Data were collected from 26 purposively selected informants, including principals, vice principals, teachers, administrative staff, and students from three madrasahs in Palopo City. Methods included:

- a. In-depth semi-structured interviews (30–60 minutes)
- b. Non-participatory observations
- c. Document analysis

All interviews were transcribed verbatim and analyzed iteratively.

Data were analyzed using thematic analysis (Braun, & Clarke, 2022), involving:

- a. Open coding
- b. Theme categorization
- c. Theoretical interpretation

Validity was ensured through triangulation, member checking, and peer debriefing. Ethical principles—including informed consent and confidentiality—were strictly maintained.

## Results

### ***Leadership and Human Resource Readiness in Digital Transformation***

Field observations indicate that digital transformation in madrasahs does not occur instantly, but rather through a gradual process led by the principal and supported by the readiness of human resources. Data show that the principal at MAN Palopo emphasized initial implementation in administrative aspects before expanding to digital learning. The vice principal confirmed this gradual approach as a strategy to accommodate varying teacher capabilities. Teachers reported initial difficulties in using technology, but gradually improved through training and experience. Furthermore, patterns of collaboration emerged among teachers, where more proficient teachers assisted their peers. This finding suggests that digital transformation depends not only on policy but also on social interaction within the work environment.

*Table 1. Empirical Findings on Leadership and Human Resource Readiness in Madrasah Digital Transformation*

Category	Indicator	Data Representation	Informants
Gradual Leadership	Non-instant implementation	Digitalization began with simple administration	KM1
	Adaptive approach	Implementation carried out gradually	WK1
Mindset Change	Focus on human resources	Main challenge lies in teacher readiness	KM3
	Learning process	Teachers experienced initial difficulties	G1,G12
Teacher Adaptation	Competency improvement	Training supports adaptation	G5
	Peer learning	Teachers assist one another	G4,G11

All data presented in Table 1 demonstrate the relationship between leadership and human resource readiness. Gradual leadership is reflected in strategies that begin with simple aspects rather than comprehensive implementation. At the same time, human resource readiness is evident in the gradual adaptation of teachers, from initial difficulties to improved competence. Other categories, such as mindset change and internal collaboration, indicate that transformation success is shaped not only by structural policies but also by individual readiness and social dynamics within the organization.

***Implementation Dynamics and Infrastructure Limitations***

The implementation of digital practices in madrasahs shows significant variation across teachers and institutions. Data indicate that in MTsN Palopo, technology use is uneven, as noted by the principal. Students also confirmed that technology use depends on individual teachers, resulting in varied learning experiences. In certain situations, teachers use WhatsApp as an alternative when LMS access is limited. Network issues were frequently identified as a major obstacle, particularly during digital learning. Observations further revealed that not all classrooms have adequate infrastructure, leading to hybrid implementation combining digital and manual methods.

*Table 2. Digital Implementation Dynamics and Infrastructure Limitations in Madrasahs*

Category	Indicator	Data Representation	Informants
Implementation Variation	Uneven usage	Implementation varies among teachers	KM2
	Individual dependence	Technology use depends on teacher	S4
Adaptation Strategy	Alternative technology	Use of WhatsApp as a solution	G6
	Infrastructure	Network constraints	Learning disrupted by connectivity issues
		Limited access	Not all classrooms have facilities
Hybrid Implementation	Method combination	Digital and manual methods combined	G2, S5

The data in Table 2 illustrate the relationship between implementation variation and infrastructure conditions. Uneven technology use is influenced not only by teacher competence but also by limited access and facilities. Adaptive strategies, such as using WhatsApp, indicate teachers' efforts to respond to existing conditions. Hybrid implementation reflects flexibility in combining digital and conventional methods.

***Educational Innovation and the Impact of Digitalization***

Educational innovation in madrasahs is reflected in the use of digital media in learning and administrative processes. Teachers have begun using instructional videos to increase student interest, which students perceive as more engaging and easier to understand. The use of LMS enables structured and accessible learning materials. Administrative staff reported increased efficiency in data management and reporting. However, some students noted an increased workload during online learning, indicating that digital innovation introduces both benefits and challenges.

*Table 3. Educational Innovation and the Impact of Digitalization on Learning and Management*

Category	Indicator	Data Representation	Informants
Media Innovation	Video usage	Visual media increases engagement	G8, S6
	LMS	Materials are more structured	S2
Learning Model	Hybrid learning	Combination of digital and conventional learning	G2
Positive Impact	Efficiency	Administrative processes are faster	TU1
	Student engagement	Learning is more interactive	S3
Negative Impact	Workload	Increased online assignments	S1
	Inconsistency	Not all teachers use technology	S4

Table 3 shows that educational innovation is manifested through digital media use and hybrid learning models. The impacts are both positive—such as efficiency and engagement—and negative, including increased workload and inconsistent implementation. This indicates that digital innovation is context-dependent and influenced by implementation practices.

## Discussion

The findings of this study reveal that digital transformation in madrasah management is not a linear or purely technology-driven process, but rather a socially embedded and context-dependent phenomenon shaped by the interaction of leadership, human resources, and institutional conditions. This confirms previous studies that emphasize the complexity of digital transformation beyond mere technological adoption (Bond et al., 2018; Vial, 2019), while at the same time extending these perspectives by demonstrating how such processes unfold within resource-constrained Islamic educational settings.

First, the role of leadership emerges as a central driver of transformation. The findings indicate that adaptive and gradual leadership strategies enable institutions to navigate structural limitations and varying levels of teacher readiness. This supports the argument of Kenneth Leithwood et al. (2020) that effective educational leadership is characterized by the ability to align vision with contextual realities. However, this study goes further by showing that leadership in digital transformation is not merely directive, but relational—constructed through continuous interaction with teachers and institutional actors. In this sense, leadership functions not only as a source of policy direction but also as a facilitator of collective adaptation.

Second, the findings highlight that teacher adaptation and implementation processes are shaped by both individual competence and social interaction. While previous models such as the Technology Acceptance Model (TAM) emphasize perceived usefulness and ease of use (Scherer et al., 2019), this study demonstrates that such models are insufficient to explain the complexity of implementation in real contexts. Teachers do not operate as isolated individuals; rather, their adaptation is mediated through peer collaboration, shared learning, and institutional culture. This finding aligns with research on teacher collaboration (Vangrieken et al., 2017), yet extends it by showing how collaborative dynamics function as an informal mechanism for sustaining digital transformation in environments with limited formal support.

Third, infrastructural limitations play a decisive role in shaping uneven implementation. The persistence of hybrid practices—combining digital and manual methods—reflects what can be understood as adaptive digitalization. This finding resonates with the concept of the digital divide, which highlights inequalities in access and resources (Selwyn, 2023). However, rather than viewing these limitations solely as barriers, this study shows that they also stimulate context-specific innovation, such as the use of accessible technologies like WhatsApp. This suggests that digital transformation should not be evaluated based on uniform standards of technological sophistication, but rather on its adaptability to local conditions.

Finally, the study demonstrates that educational innovation in madrasahs is both productive and ambivalent. On one hand, digitalization enhances administrative efficiency and student engagement, supporting findings from previous studies on technology integration (Tondeur et al., 2020). On the other hand, it also introduces new challenges, including increased workload and inconsistent implementation across teachers. This duality indicates that innovation is not inherently progressive, but contingent upon how it is implemented and experienced by educational actors.

Taken together, these findings contribute to the literature by reconceptualizing digital transformation as a relational and context-sensitive process. Rather than being driven solely by technology, transformation emerges through the interaction of leadership practices, teacher collaboration, and institutional constraints. This perspective challenges reductionist views that frame digital transformation as either a technical upgrade or an individual competency issue, and instead positions it as a socially constructed process shaped by ongoing negotiation among actors within specific contexts.

## **Conclusion**

This study demonstrates that digital transformation in madrasah management cannot be understood as a purely technological process, but rather as a socially embedded and context-sensitive phenomenon shaped by the interaction of leadership, human resources, and institutional conditions. The findings reveal that adaptive leadership plays a crucial role in initiating and sustaining transformation, while teacher collaboration supports gradual adaptation. At the same time, infrastructural limitations produce uneven implementation, resulting in hybrid and context-driven digital practices.

Theoretically, this study contributes by advancing a relational perspective of digital transformation, moving beyond technology-centered and individualistic approaches. It highlights how transformation is constructed through dynamic interactions among organizational actors, thereby enriching discussions on educational leadership and innovation.

Practically, the findings suggest that successful digital transformation requires not only technological investment but also adaptive leadership, collaborative professional culture, and context-responsive implementation strategies.

This study is limited by its localized scope and qualitative design. Future research is recommended to adopt broader and mixed-method approaches to deepen understanding across diverse contexts.

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