

Digital Transformation in Islamic Education: Challenges and Opportunities for Muhammadiyah-Based Learning Institutions

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ABSTRACT

This study examines the challenges and opportunities of digital transformation in Muhammadiyah-based learning institutions within the broader context of Islamic education. The research aims to analyze how Muhammadiyah educational institutions adapt to technological change while maintaining Islamic educational values, organizational identity, and ethical learning practices. The study employed a qualitative approach using a case study design because this method enables in-depth exploration of institutional experiences, educational transformation, and sociocultural adaptation processes. The research was conducted in Muhammadiyah educational institutions located in Yogyakarta and West Java, Indonesia, selected due to their active implementation of digital learning systems and institutional modernization initiatives. The study involved fifteen informants consisting of institutional leaders, teachers, digital technology coordinators, and students, chosen purposively based on their direct involvement in digital educational practices. The findings reveal that digital transformation enhances educational accessibility, institutional efficiency, and collaborative learning opportunities; however, challenges related to digital literacy, technological infrastructure, ethical concerns, and organizational adaptation remain significant. The study recommends strengthening digital literacy programs, integrating Islamic ethical values into digital learning environments, and developing sustainable hybrid educational models to support adaptive and value-oriented Islamic education in the digital era.



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INTRODUCTION

The rapid expansion of digital technology has fundamentally transformed educational systems across the world, including institutions operating within religious and faith-based frameworks (Nadlif, 2023). In the context of Islamic education, digital transformation is no longer understood merely as the adoption of technological devices in classrooms, but rather as a comprehensive restructuring of pedagogical practices, institutional governance, curriculum development, knowledge dissemination, and student engagement (Sugito, 2024). Muhammadiyah-based educational institutions, which represent one of the largest Islamic educational networks in Indonesia, are increasingly confronted with the necessity to integrate digital innovation while maintaining their Islamic identity, ethical orientation, and organizational values (Sya'bani et al., 2024). The acceleration of digitalization after the COVID-19 pandemic has intensified institutional demands for adaptive learning models, online educational platforms, data-based management systems, and digital literacy competencies among educators and students (Damayanti et al., 2025). Consequently, the discourse on digital transformation in Islamic education has become strategically important within both national and global educational debates.

Existing studies concerning digital transformation in Islamic educational institutions generally focus on technological implementation, online learning effectiveness, and digital literacy development (Mubaidilla, 2025). Several scholars emphasize that digitalization can improve educational accessibility, administrative efficiency, and collaborative learning processes (Dimiyati, 2025). Research also demonstrates that technology-based learning environments are capable of enhancing students' critical thinking, creativity, and flexibility in accessing Islamic knowledge. Within Muhammadiyah

educational institutions, digital transformation is increasingly associated with institutional modernization, organizational competitiveness, and educational sustainability in the era of Society 5.0 (Haq & Adiningsih, 2025). Nevertheless, the majority of previous studies tend to examine digital education from technical or managerial perspectives without sufficiently exploring the intersection between technological adaptation, Islamic educational philosophy, and Muhammadiyah's ideological framework. As a result, the broader implications of digital transformation for Islamic identity formation, value internalization, and institutional culture remain underexplored.

The state of the art of this research highlights that contemporary discussions on Islamic educational digitalization are still dominated by general educational perspectives rather than value-oriented Islamic educational paradigms (Pabbajah, 2024). Many studies focus primarily on infrastructure readiness, e-learning implementation, teacher competence, or student satisfaction (Fadhilah et al., 2025). Although these studies provide valuable empirical findings, they often overlook the unique characteristics of Muhammadiyah educational institutions as Islamic reformist organizations that integrate religious teachings, social empowerment, and modern educational principles (Trianita et al., 2024). Furthermore, previous research rarely addresses the tension between technological modernization and the preservation of Islamic ethical values in educational environments (Farissa & Haryanto, 2025). This condition creates an important academic gap because digital transformation in Islamic education cannot be fully understood solely through technological determinism or administrative efficiency. Instead, it requires a holistic approach that considers theological values, institutional identity, pedagogical ethics, and sociocultural adaptation simultaneously.

The main research problem emerges from the increasing complexity faced by Muhammadiyah-based learning institutions in balancing digital innovation with Islamic educational values. On one hand, digital transformation offers significant opportunities for educational advancement, including broader learning accessibility, flexible instructional methods, international collaboration, and improved institutional governance (Sajdah et al., 2025). On the other hand, the rapid penetration of digital culture also introduces challenges related to ethical degradation, information overload, cyber behavior, reduced interpersonal interaction, and the weakening of character-based education (Mu'amalah, 2024). Muhammadiyah educational institutions are therefore required to formulate adaptive educational strategies capable of integrating technological innovation with Islamic moral principles. The inability to manage this transformation effectively may create institutional disorientation, educational inequality, and a decline in the quality of Islamic character formation among students.

The research gap identified in this study lies in the limited scholarly attention devoted to examining digital transformation within Muhammadiyah educational institutions from an integrative Islamic educational perspective. Previous studies frequently separate discussions of technology adoption from discussions of Islamic values and organizational identity (Chumayroh & Cahyadi, 2025). Moreover, there remains insufficient analysis regarding how Muhammadiyah institutions negotiate institutional modernization while preserving their reformist Islamic ideology (Malik, 2025). Existing literature also lacks comprehensive exploration of how digital transformation affects curriculum integration, educator professionalism, student religiosity, and institutional resilience simultaneously. Therefore, this study seeks to bridge the gap by providing a multidimensional analysis that connects digital transformation, Islamic educational philosophy, Muhammadiyah organizational values, and contemporary educational challenges within a unified analytical framework.

The novelty of this research is reflected in its effort to conceptualize digital transformation in Muhammadiyah-based educational institutions not merely as technological adaptation, but as a transformative socio-religious process involving institutional identity reconstruction, value negotiation, and educational innovation (Mudiono, 2025). Unlike previous studies that primarily emphasize technical implementation, this research integrates perspectives from Islamic education, organizational transformation, and digital culture studies. The study also introduces an analytical approach that positions Muhammadiyah educational institutions as active agents in shaping ethical digital education rather than passive recipients of technological modernization. Through this perspective, digital transformation is interpreted as an opportunity to strengthen Islamic educational values, enhance

institutional competitiveness, and develop adaptive educational ecosystems grounded in Muhammadiyah's principles of progressive Islam.

Based on the background and identified research gap, the formulation of the research questions includes several interconnected issues. First, how do Muhammadiyah-based learning institutions interpret and implement digital transformation within Islamic educational contexts? Second, what are the primary challenges faced by Muhammadiyah educational institutions in integrating digital technology with Islamic values and educational ethics? Third, what opportunities can digital transformation provide for improving educational quality, institutional governance, and student competency development? Fourth, how can Muhammadiyah educational institutions construct sustainable digital educational models that maintain their ideological and moral foundations? These research questions are expected to guide the investigation toward a comprehensive understanding of the dynamics of digital transformation in Islamic educational institutions.

The primary objective of this research is to analyze the challenges and opportunities of digital transformation within Muhammadiyah-based learning institutions from the perspective of Islamic education and organizational adaptation. Specifically, this study aims to examine the relationship between technological innovation and Islamic educational values, identify institutional barriers in implementing digital transformation, and explore strategic approaches for developing adaptive and value-oriented educational systems. In addition, the research seeks to contribute to theoretical discussions concerning the integration of digital technology and Islamic educational philosophy in contemporary educational environments.

The theoretical significance of this research lies in its contribution to the development of interdisciplinary scholarship connecting digital transformation studies, Islamic education, and organizational modernization (Ardani & Mwila, 2025). This study enriches academic discourse by offering a conceptual framework for understanding how Islamic educational institutions negotiate technological change while maintaining religious identity and ethical values. Academically, the research provides empirical insights that can serve as references for future scholars investigating digitalization in faith-based educational contexts. The findings are expected to expand the literature on Islamic educational transformation, particularly within the Indonesian Muhammadiyah educational network. Practically, this study offers strategic recommendations for educational policymakers, institutional leaders, educators, and curriculum developers in designing sustainable digital educational systems aligned with Islamic values and contemporary educational demands.

Despite its contributions, this research also acknowledges several limitations. The study primarily focuses on Muhammadiyah-based educational institutions within specific sociocultural and organizational contexts, which may limit the generalizability of the findings to other Islamic educational organizations. In addition, the rapid evolution of digital technology may influence institutional dynamics and educational practices beyond the temporal scope of this research. Methodologically, the study may also encounter challenges related to variations in institutional readiness, technological infrastructure, and stakeholder perceptions regarding digital transformation.

Therefore, future research is encouraged to conduct comparative studies involving various Islamic educational organizations across different regions and educational levels. Further investigations may also explore the long-term impact of digital transformation on students' religious identity formation, ethical behavior, and social interaction within digital learning environments (Hussain, 2025). Additionally, future scholars are recommended to examine the role of artificial intelligence, virtual learning ecosystems, and digital governance models in shaping the future of Islamic education (Mulyadi, 2025). Such studies would contribute significantly to developing comprehensive and sustainable frameworks for digital transformation in Islamic educational institutions globally.

LITERATURE REVIEW

Digital transformation has emerged as a dominant paradigm in contemporary educational discourse, particularly within institutions attempting to reconcile technological modernization with value-based educational traditions (Fajarwati, 2023). In Islamic education, the transition toward digitally integrated learning environments represents not only a technical adaptation but also a profound

epistemological and organizational transformation (Khoirohnissah, 2023). Muhammadiyah-based learning institutions, as one of the most influential Islamic educational networks in Indonesia, face increasing pressure to integrate digital systems while preserving their ideological orientation rooted in progressive Islamic values (Hasan et al., 2023). Consequently, scholarly discussions regarding digital transformation in Islamic education require theoretical frameworks capable of explaining technological adaptation, institutional change, and value-oriented educational practices simultaneously. This study employs three major theoretical perspectives, namely the Diffusion of Innovations Theory developed by Everett M. Rogers, the Technology Acceptance Model introduced by Fred Davis, and Transformative Learning Theory proposed by Jack Mezirow. These theories collectively provide a multidimensional analytical framework for understanding the challenges and opportunities of digital transformation within Muhammadiyah educational institutions.

The first theoretical foundation employed in this study is the Diffusion of Innovations Theory popularized by Everett Mitchell Rogers in 1962 through his seminal work *Diffusion of Innovations* (Kharismatunisa, 2023). Rogers was a communication scholar affiliated with Michigan State University, United States. His theory explains how innovations are introduced, communicated, adopted, and institutionalized within social systems over time. According to Rogers, innovation diffusion is influenced by several factors, including relative advantage, compatibility, complexity, trialability, and observability (Jihad et al., 2024). In the context of Islamic education, this theory is highly relevant because digital transformation within Muhammadiyah institutions involves not only technological adoption but also social acceptance among educators, students, administrators, and institutional stakeholders. Rogers emphasizes that innovation adoption depends on communication channels and sociocultural contexts, indicating that educational institutions with strong ideological foundations may experience different patterns of digital adaptation compared to secular institutions.

The conceptual framework proposed by Rogers suggests that organizational readiness and social networks significantly influence the success of technological transformation (Utomo et al., 2024). Within Muhammadiyah educational institutions, the diffusion process may be shaped by religious values, institutional culture, leadership orientation, and community perceptions toward technology. Recent developments of Rogers' theory demonstrate its continued relevance in digital educational research, particularly in analyzing online learning adoption, digital literacy, and educational innovation in developing countries (Mintasih et al., 2024). Contemporary scholars argue that diffusion theory has evolved beyond simple technological adoption toward broader socio-digital transformation processes involving institutional resilience and cultural negotiation. This development aligns with the present study because Muhammadiyah institutions are not merely adopting digital tools but are also redefining Islamic educational practices within rapidly changing digital environments.

The second theoretical perspective utilized in this research is the Technology Acceptance Model (TAM), introduced by Fred Davis in 1986 during his doctoral research at the Sloan School of Management, Massachusetts Institute of Technology (MIT), United States (Oktahariana et al., 2025). Davis explains that individuals' acceptance of technology is primarily influenced by perceived usefulness and perceived ease of use. According to this framework, users are more likely to adopt technological systems when they believe the technology improves performance and can be utilized without excessive difficulty (Idhan, 2025). In the context of Muhammadiyah-based learning institutions, TAM provides an important analytical lens for examining how teachers, students, and institutional administrators perceive digital educational technologies such as e-learning platforms, virtual classrooms, learning management systems, and digital administrative services.

Fred Davis argues that behavioral intention plays a critical role in determining actual technological use (Ali & Jumat, 2024). Educational institutions with limited technological infrastructure or insufficient digital competence may encounter resistance toward digital transformation despite institutional encouragement. Contemporary developments of TAM have expanded the theory by incorporating external variables such as organizational culture, social influence, trust, digital ethics, and institutional leadership (Prabowo, 2024). Modern scholars increasingly apply TAM within online education, artificial intelligence integration, and blended learning environments. In Islamic educational settings, the acceptance of technology may also be influenced by moral considerations, religious values,

and concerns regarding the ethical consequences of unrestricted digital exposure. Therefore, this study adapts TAM not only as a framework for measuring technological acceptance but also as a conceptual approach for understanding the interaction between digital systems and Islamic educational ethics.

The third theoretical framework adopted in this research is Transformative Learning Theory developed by Jack Mezirow in 1978 at Teachers College, Columbia University, United States (Aditya & Zuhdi, 2023). Mezirow conceptualizes learning as a transformative process through which individuals critically reassess their assumptions, beliefs, and perspectives in response to new experiences. Transformative learning occurs when learners encounter disorienting dilemmas that challenge their existing worldview and encourage reflective thinking (Mutamimah et al., 2025). This theory is particularly relevant to digital transformation in Islamic education because technological disruption compels educators and students to reconstruct their educational experiences, pedagogical approaches, and institutional identities.

Mezirow argues that meaningful learning requires critical reflection and communicative engagement rather than passive information reception (Osman & Yatam, 2024). In Muhammadiyah educational institutions, digital transformation may generate transformative experiences by altering traditional teaching methods, religious learning interactions, and institutional management systems. The recent development of transformative learning theory emphasizes collective transformation, digital pedagogy, and socially mediated learning experiences (Pan et al., 2025). Contemporary researchers extend Mezirow's framework into virtual learning environments, collaborative online learning, and intercultural educational contexts. This evolution demonstrates that transformative learning is increasingly connected with digital educational innovation and institutional adaptation. Within Islamic education, transformative learning may contribute to developing critical digital literacy, ethical awareness, and adaptive religious understanding among students and educators.

Several contemporary scholars further strengthen the theoretical foundations of this study. Manuel Castells from the University of Southern California, United States, through his theory of the Network Society, explains that digital transformation restructures social interaction, knowledge production, and institutional communication patterns (Atencio & Acuña, 2024). Castells argues that educational institutions operating within digital societies must develop network-based learning systems to remain socially relevant. His perspective reinforces Rogers' theory by emphasizing that technological innovation spreads through interconnected communication networks rather than isolated institutional structures.

Another influential scholar is Henry Jenkins from the University of Southern California, United States, who popularized the concept of Participatory Culture in 2006 (Atabik et al., 2025). Jenkins explains that digital technology encourages collaborative knowledge production, interactive communication, and active audience participation. In educational contexts, participatory culture shifts students from passive recipients of information into active knowledge creators. This perspective complements Mezirow's transformative learning framework because digital participation facilitates critical reflection and collaborative educational experiences. Muhammadiyah educational institutions therefore need to create participatory digital learning ecosystems that integrate Islamic ethical values with collaborative technological engagement.

Furthermore, Neil Selwyn from Monash University, Australia, contributes significantly to contemporary digital education discourse through his critical perspective on educational technology (Adlani et al., 2024). Selwyn argues that digital transformation should not be understood solely as technological progress but also as a process shaped by political, cultural, and ideological factors. According to Selwyn, educational digitalization often reproduces social inequalities and institutional power structures. His perspective is particularly relevant to this study because Muhammadiyah educational institutions may experience unequal technological access, digital literacy disparities, and organizational challenges during digital transformation processes. Selwyn's critical approach enriches TAM and diffusion theory by emphasizing the importance of contextual and ethical considerations in educational technology adoption.

The integration of these theories directly addresses the primary research problem concerning the tension between technological modernization and Islamic educational values within Muhammadiyah institutions. Rogers' diffusion theory explains institutional adaptation processes, Davis' TAM clarifies technological acceptance dynamics, and Mezirow's transformative learning theory analyzes educational and cognitive transformation resulting from digital disruption. Collectively, these theories help explain why some Muhammadiyah educational institutions successfully integrate digital systems while others struggle with organizational resistance, ethical concerns, or limited technological readiness.

The theories also correspond closely with the identified research gap. Previous studies frequently analyze technological implementation from isolated technical perspectives without integrating sociocultural, ethical, and educational dimensions simultaneously (Nguyen et al., 2025). By combining innovation diffusion, technology acceptance, and transformative learning theories, this study provides a more comprehensive analytical framework capable of explaining digital transformation within Islamic educational environments holistically. The theoretical integration also supports the novelty of the research by conceptualizing digital transformation as a socio-religious and educational reconstruction process rather than merely technological modernization.

The theoretical framework further aligns with the research questions concerning institutional adaptation, technological challenges, educational opportunities, and sustainable digital learning models in Muhammadiyah educational institutions. Additionally, the theories contribute to achieving the research objectives by offering conceptual tools for analyzing digital transformation from organizational, behavioral, and pedagogical perspectives. The theoretical benefits of the study include expanding interdisciplinary discussions connecting Islamic education, organizational transformation, and digital sociology. Academically, the study contributes empirical and conceptual insights into Islamic educational digitalization. Practically, the findings may assist educational policymakers and Muhammadiyah institutional leaders in designing ethically grounded digital educational strategies.

In conclusion, the literature review demonstrates that digital transformation in Muhammadiyah-based Islamic educational institutions requires multidimensional theoretical approaches capable of explaining technological adaptation, institutional change, and educational transformation simultaneously. Rogers' Diffusion of Innovations Theory, Davis' Technology Acceptance Model, and Mezirow's Transformative Learning Theory collectively provide comprehensive analytical foundations for examining the challenges and opportunities of digital transformation in Islamic education. The perspectives of Castells, Jenkins, and Selwyn further enrich the discussion by emphasizing network society dynamics, participatory digital culture, and critical technological awareness. These theoretical perspectives are strongly connected with the primary research problem, research gap, novelty, research questions, and research objectives. Ultimately, the integration of these theories contributes to developing a comprehensive understanding of how Muhammadiyah educational institutions can construct adaptive, ethical, and sustainable digital educational ecosystems within contemporary Islamic educational contexts.

RESEARCH METHODS

This study employs a qualitative research approach to investigate the dynamics of digital transformation in Muhammadiyah-based learning institutions within the broader context of Islamic education (Anning-Dorson, 2025). The qualitative method is considered the most appropriate approach because the research seeks to explore social realities, institutional experiences, educational values, and technological adaptation processes that cannot be adequately measured through numerical data alone (Kusumawati & Destari, 2024). Digital transformation in Islamic educational institutions involves complex interactions among organizational culture, religious identity, educational philosophy, technological acceptance, and institutional adaptation. Therefore, qualitative inquiry enables the researcher to obtain in-depth understanding regarding perceptions, experiences, challenges, and opportunities experienced by educational stakeholders in Muhammadiyah institutions. The qualitative approach also facilitates interpretative analysis concerning how digitalization reshapes educational practices, institutional governance, and Islamic value transmission within contemporary educational environments.

The research design utilized in this study is a qualitative case study design (Dahal, 2023). This design is selected because the study focuses on a particular social phenomenon occurring within a specific institutional context, namely Muhammadiyah-based learning institutions experiencing digital transformation processes. A case study design allows the researcher to examine institutional realities comprehensively and holistically through direct engagement with participants, institutional documents, educational practices, and organizational experiences (García-Peñalvo et al., 2024). The design is particularly relevant because digital transformation is context-dependent and influenced by sociocultural, ideological, managerial, and technological factors unique to each educational institution. Through the case study approach, the researcher can analyze the interaction between digital innovation and Islamic educational values in a detailed and contextual manner. In addition, the case study design supports the exploration of institutional adaptation strategies, technological challenges, and educational opportunities emerging within Muhammadiyah educational environments.

The rationale for employing a qualitative case study design is grounded in the need to understand digital transformation not merely as technological implementation but as a socio-educational and cultural process (Holovko et al., 2025). Muhammadiyah educational institutions possess distinctive characteristics shaped by Islamic reformist values, organizational traditions, and educational missions emphasizing religious morality, intellectual development, and social empowerment (Heiber & Farrow, 2024). Consequently, digital transformation within these institutions cannot be separated from ideological considerations and ethical educational principles. Quantitative approaches may identify patterns of technology usage or statistical relationships, but they are insufficient for capturing the nuanced meanings, institutional negotiations, and value-based considerations embedded within digital educational transformation. The qualitative case study therefore enables deeper interpretation regarding how institutional actors perceive, negotiate, and implement digital innovation while maintaining Muhammadiyah's Islamic identity.

The research was conducted in selected Muhammadiyah-based educational institutions located in Yogyakarta and West Java, Indonesia. These regions were intentionally selected because they represent significant centers of Muhammadiyah educational development and possess relatively advanced digital educational infrastructures compared to other regions (Thang, 2024). Yogyakarta has historically been recognized as one of the intellectual and organizational centers of Muhammadiyah educational reform, hosting numerous Muhammadiyah schools, universities, and Islamic boarding institutions actively implementing digital learning systems. Meanwhile, West Java represents a rapidly growing educational region where Muhammadiyah institutions increasingly adopt digital technologies in response to educational modernization and societal transformation. The selection of these locations allows the researcher to compare institutional experiences across different educational and sociocultural contexts while maintaining relevance to Muhammadiyah's national educational framework.

The choice of research locations is further justified by several considerations. First, Muhammadiyah educational institutions in these regions have demonstrated substantial engagement with digital educational transformation, including online learning implementation, digital administration systems, hybrid learning models, and technology-based curriculum development (T. Cao et al., 2024). Second, these institutions provide accessible research environments with diverse stakeholders involved in digital transformation processes, including institutional leaders, educators, students, and technology coordinators. Third, the selected locations represent educational environments where Islamic values and modern educational practices coexist dynamically, making them highly relevant for investigating the intersection between digitalization and Islamic educational philosophy. Finally, the institutions selected possess varying levels of technological readiness and organizational adaptation, enabling richer comparative analysis regarding challenges and opportunities in digital transformation.

This study utilizes purposive sampling techniques to select participants considered capable of providing relevant and comprehensive information regarding digital transformation within Muhammadiyah educational institutions (Lis, 2023). Purposive sampling is appropriate because qualitative research prioritizes depth of understanding rather than statistical generalization. Participants were selected based on their involvement in institutional decision-making, digital educational

implementation, technological management, and Islamic educational practices. The sampling process focused on obtaining participants with diverse experiences and institutional roles to ensure comprehensive exploration of the research problem.

The study involved fifteen key informants consisting of institutional leaders, teachers, digital technology coordinators, curriculum developers, and students from Muhammadiyah-based learning institutions. The institutional leaders included three principals and two vice principals responsible for academic and technological development. To maintain confidentiality and comply with ethical research standards, pseudonyms were used for all participants (Khasanah et al., 2025). The principals were identified as Dr. Ahmad Rizqi, Mr. Fajar Hidayat, and Mrs. Nur Aisyah, while the vice principals were referred to as Mr. Ilham Kurniawan and Mrs. Siti Rahmah. These participants were selected because they possess strategic authority in designing institutional policies related to digital transformation, educational innovation, and curriculum integration. Their perspectives are essential for understanding organizational strategies, institutional challenges, and leadership approaches in implementing digital educational systems.

The educator participants consisted of six teachers actively involved in digital learning implementation across various disciplines, including Islamic studies, social sciences, and technology-related subjects. They were identified using pseudonyms such as Mr. Hasan Maulana, Mrs. Fitri Ananda, Mr. Dedi Pratama, Mrs. Salma Khairunnisa, Mr. Yusuf Ramadhan, and Mrs. Lina Oktavia. These teachers were selected because they directly engage with digital learning platforms, online instructional methods, and technology-mediated classroom interactions. Their experiences provide valuable insights into pedagogical adaptation, digital literacy challenges, and the integration of Islamic educational values within digital learning environments. The teachers also represent varying levels of technological competence and teaching experience, enabling broader understanding regarding educator adaptation toward digital transformation.

The research additionally involved two digital technology coordinators referred to as Mr. Rizal Akbar and Mrs. Nadia Putri. These participants were responsible for managing institutional digital infrastructure, educational technology systems, and online learning platforms. They were chosen because of their expertise in technological implementation and institutional digital governance. Their perspectives contribute significantly to understanding infrastructural readiness, technological barriers, cybersecurity concerns, and institutional support systems influencing digital transformation processes in Muhammadiyah educational institutions.

Furthermore, two student participants identified as Aulia Rahman and Nabila Syafira were included in the study to represent student experiences within digitally transformed Islamic educational environments. Students were selected because they are primary recipients of digital educational policies and practices. Their perspectives are important for understanding student engagement, digital learning experiences, technological accessibility, and the influence of digital transformation on religious learning and social interaction. The inclusion of students also strengthens the study's interpretative depth by incorporating learner-centered perspectives into the analysis of digital educational transformation.

Data collection in this research was conducted through in-depth interviews, participant observation, and document analysis (Nariswari & Azani, 2024). In-depth interviews were employed as the primary data collection technique because they enable participants to articulate their experiences, perceptions, and reflections regarding digital transformation comprehensively. Semi-structured interview formats were utilized to maintain flexibility while ensuring alignment with the research objectives (Ignjatović, 2024). Interview questions explored institutional adaptation strategies, technological challenges, educational opportunities, value integration processes, and perceptions regarding digital learning environments in Muhammadiyah institutions.

Participant observation was conducted to examine educational activities, digital learning interactions, institutional practices, and technological implementation processes directly within the research settings (Rughani et al., 2025). Observation enabled the researcher to identify behavioral patterns, classroom dynamics, educator-student interactions, and institutional responses toward digital

educational transformation. Through observation, the researcher obtained contextual understanding concerning how digital systems operate within Islamic educational environments and how institutional actors negotiate technological and religious dimensions simultaneously.

Document analysis complemented interviews and observations by examining institutional policies, curriculum documents, digital learning guidelines, educational reports, online learning materials, and Muhammadiyah educational regulations related to digital transformation (Nurhaliza, 2025). Document analysis provided additional evidence supporting the interpretation of institutional practices and organizational strategies. The triangulation of interviews, observations, and document analysis strengthened the credibility and validity of the research findings by enabling cross-verification among multiple data sources (Nurbaeti et al., 2025).

The data analysis process employed thematic analysis techniques (Lin, 2025). Thematic analysis was selected because it facilitates systematic identification, categorization, and interpretation of recurring themes emerging from qualitative data. The analysis process began with data transcription, coding, categorization, and theme development. Initial coding focused on identifying concepts related to technological adaptation, Islamic educational values, institutional challenges, digital opportunities, and organizational transformation. Subsequently, related codes were grouped into broader thematic categories reflecting the central issues of the study.

The analysis process was conducted iteratively to ensure interpretative accuracy and conceptual consistency (Si, 2024). The researcher continuously compared interview findings, observational data, and documentary evidence to identify convergent and divergent patterns. Data interpretation was guided by the theoretical frameworks employed in the study, including Diffusion of Innovations Theory, Technology Acceptance Model, and Transformative Learning Theory. These theoretical perspectives supported analytical interpretation concerning institutional adaptation, technological acceptance, and educational transformation processes within Muhammadiyah educational institutions.

To ensure trustworthiness and research rigor, the study applied credibility, transferability, dependability, and confirmability criteria (Jusay, 2025). Credibility was enhanced through prolonged engagement, triangulation of data sources, and member checking involving selected participants. Transferability was addressed by providing detailed contextual descriptions regarding institutional settings and participant characteristics. Dependability was strengthened through systematic documentation of research procedures and analytical processes, while confirmability was maintained through reflective interpretation and transparent data analysis practices.

The technique for drawing research conclusions employed inductive reasoning (Yen, 2024). Inductive analysis enables conclusions to emerge progressively from empirical findings rather than imposing predetermined assumptions onto the data. Through inductive interpretation, the researcher identified broader patterns concerning digital transformation challenges, institutional adaptation strategies, and opportunities for educational innovation within Muhammadiyah institutions. The conclusion-drawing process involved synthesizing thematic findings, theoretical interpretations, and contextual analysis into coherent conceptual explanations aligned with the research objectives and questions.

Ultimately, the methodological framework of this study was designed to provide comprehensive understanding regarding the complexities of digital transformation in Muhammadiyah-based learning institutions. The qualitative case study approach enables in-depth exploration of institutional realities, educational values, and technological adaptation processes within Islamic educational contexts. Through purposive participant selection, triangulated data collection techniques, thematic analysis, and inductive interpretation, the study aims to generate credible and meaningful findings contributing to the advancement of digital Islamic educational research within contemporary academic discourse.

RESULTS AND DISCUSSION

The findings of this study demonstrate that digital transformation within Muhammadiyah-based learning institutions represents a multidimensional process involving organizational adaptation,

technological integration, educational reform, and the reconstruction of Islamic learning practices (Wang et al., 2023). The research reveals that digital transformation is not limited to the implementation of online learning platforms or administrative technologies, but also encompasses broader institutional changes related to educational culture, pedagogical orientation, leadership strategies, and the preservation of Islamic values in digital environments (Syahlarriyadi, 2023). Muhammadiyah educational institutions have increasingly adopted digital systems as part of their institutional modernization efforts; however, the implementation process remains accompanied by significant structural, cultural, and ethical challenges. The findings indicate that the interaction between digital innovation and Islamic educational philosophy creates both opportunities for educational advancement and tensions concerning institutional identity, educational ethics, and value-oriented learning practices.

The results further reveal that institutional leaders perceive digital transformation as an unavoidable educational necessity in response to globalization, technological acceleration, and post-pandemic educational demands (Y. Cao & Wang, 2024). Nevertheless, educators and administrators also emphasize that digitalization should not weaken Muhammadiyah's Islamic educational mission emphasizing character formation, religious morality, and social responsibility (Umah et al., 2023). Consequently, the institutions examined in this study attempt to develop adaptive digital educational systems integrating technological efficiency with Islamic ethical principles. This condition confirms that digital transformation within Muhammadiyah institutions operates as a process of negotiation between modernization and religious educational identity.

Table

Table 1 Major Findings on Digital Transformation in Muhammadiyah-Based Learning Institutions

Research Dimension	Main Findings	Related Theory	Institutional Implication
Technological Adaptation	Increased adoption of e-learning platforms and digital administration systems	Diffusion of Innovations Theory	Institutional modernization and organizational efficiency
Technology Acceptance	Teachers and students show varying levels of digital readiness	Technology Acceptance Model	Need for digital literacy training and institutional support
Educational Transformation	Hybrid learning reshapes pedagogical interaction and religious instruction	Transformative Learning Theory	Emergence of adaptive Islamic learning environments
Ethical Challenges	Concerns regarding digital ethics and weakening interpersonal values	Transformative Learning Theory	Strengthening Islamic character education in digital contexts
Organizational Leadership	Leadership commitment influences digital implementation success	Diffusion of Innovations Theory	Strategic leadership supports institutional resilience
Student Participation	Students demonstrate increased flexibility and digital engagement	Technology Acceptance Model	Expansion of participatory and collaborative learning

The findings related to the primary research problem demonstrate that Muhammadiyah educational institutions face substantial challenges in balancing technological modernization with Islamic educational values. Institutional actors consistently emphasized that rapid digitalization may increase educational accessibility and efficiency while simultaneously creating risks associated with moral degradation, reduced face-to-face interaction, and declining spiritual engagement among students (Liu, 2023). These findings strongly correspond with Jack Mezirow's Transformative Learning Theory, which explains that educational transformation often emerges through disorienting social changes

requiring reflective adaptation (Ananta & Saputra, 2025). The implementation of digital learning systems forces educators and students to reconstruct traditional educational practices and reinterpret the meaning of Islamic learning within virtual environments.

From the perspective of Everett Rogers' Diffusion of Innovations Theory, the findings indicate that successful digital transformation depends heavily on institutional leadership, communication networks, and organizational culture (Nugraheny et al., 2025). Muhammadiyah institutions with supportive leadership structures and collaborative communication systems demonstrated higher levels of technological adaptation compared to institutions with limited organizational coordination. Institutional leaders who actively promoted digital literacy programs, teacher training, and technological experimentation accelerated innovation adoption among educators and students. This confirms Rogers' argument that innovation diffusion is influenced by compatibility, observability, and communication dynamics within social systems.

Similarly, Fred Davis' Technology Acceptance Model is reflected in the findings concerning technological acceptance among teachers and students (Lytras & Housawi, 2023). Participants acknowledged that digital educational technologies were perceived as useful for improving learning flexibility, educational accessibility, and administrative efficiency. However, technological acceptance was uneven due to differences in digital competence, technological infrastructure, and perceptions regarding the complexity of online learning systems. Older educators, in particular, expressed difficulties adapting to digital platforms due to limited technological familiarity. This finding confirms Davis' proposition that perceived usefulness and perceived ease of use significantly influence technological acceptance behavior within organizational settings.

The implementation of digital transformation in Muhammadiyah educational institutions also revealed significant disparities between institutional aspirations and practical realities. While institutional policies emphasized digital modernization, many schools continued experiencing infrastructural limitations, inconsistent internet access, and inadequate technological resources. This condition reflects the existing research gap concerning the uneven implementation of digital transformation within Islamic educational institutions (Zhu et al., 2024). Previous studies frequently focused on successful technological adoption without sufficiently examining institutional inequalities and sociocultural barriers affecting digital educational practices. The findings of this study therefore contribute new empirical insights demonstrating that digital transformation in Islamic education is shaped by complex interactions among organizational readiness, cultural adaptation, and ethical considerations.

The gap problem identified in this research becomes particularly visible in the relationship between technological innovation and Islamic educational identity. Several educators expressed concerns that excessive dependence on digital technology may weaken traditional Islamic pedagogical values emphasizing direct teacher-student interaction, moral guidance, and communal learning experiences. This finding aligns with Neil Selwyn's critical perspective on educational technology, which argues that digital transformation may reproduce educational inequalities and cultural tensions if implemented without critical reflection (Ngoc, 2024). The study reveals that Muhammadiyah institutions attempt to address this gap by integrating Islamic ethical principles into digital learning systems, including online religious mentoring, digital Qur'anic learning programs, and value-based virtual discussions.

The findings also demonstrate that Muhammadiyah educational institutions are increasingly adopting hybrid learning models combining face-to-face instruction with digital educational platforms (Helferich & Pleil, 2024). This implementation reflects broader institutional efforts to maintain educational continuity while responding to technological and societal transformation. The hybrid learning approach was perceived positively by students because it increased learning flexibility and access to educational resources. However, educators emphasized that digital learning environments require stronger supervision mechanisms to ensure ethical online behavior and meaningful student participation.

Table

Table 2. Challenges and Opportunities of Digital Transformation

Challenges	Opportunities	Related Theory	Practical Implication
Limited digital literacy among educators	Expansion of flexible learning systems	Technology Acceptance Model	Continuous teacher training programs
Weak technological infrastructure	Increased institutional competitiveness	Diffusion of Innovations Theory	Investment in digital infrastructure
Ethical concerns regarding online behavior	Development of collaborative learning	Transformative Learning Theory	Integration of Islamic digital ethics
Reduced interpersonal interaction	Broader access to Islamic knowledge	Transformative Learning Theory	Hybrid learning implementation
Resistance to organizational change	Administrative efficiency and transparency	Diffusion of Innovations Theory	Participatory leadership strategies

The findings addressing the research questions reveal that digital transformation in Muhammadiyah institutions is interpreted as both an educational opportunity and a cultural challenge. Regarding the first research question concerning institutional interpretation of digital transformation, participants described digitalization as a strategic necessity for maintaining institutional relevance in contemporary educational environments. Institutional leaders viewed digital transformation as essential for improving educational competitiveness and organizational sustainability (Azari, 2023). This finding supports Rogers' argument that innovation adoption is influenced by perceptions regarding relative advantage and institutional compatibility.

The second research question concerning the primary challenges of digital transformation identified several significant obstacles, including technological inequality, limited digital literacy, resistance to organizational change, and ethical concerns regarding online educational environments. These findings correspond closely with Davis' Technology Acceptance Model because technological acceptance was strongly influenced by institutional support systems and users' confidence in utilizing digital technologies effectively (Mi, 2025). Participants repeatedly emphasized the importance of institutional training programs and collaborative support mechanisms for strengthening technological adaptation among educators and students.

The third research question explored opportunities generated through digital transformation. The findings demonstrate that digital educational systems create opportunities for expanding educational accessibility, strengthening institutional networking, improving administrative efficiency, and enhancing collaborative learning experiences. Students particularly appreciated the flexibility of digital learning systems enabling broader access to Islamic educational resources. These findings reflect Manuel Castells' Network Society perspective emphasizing that digital networks transform educational communication and knowledge production processes (Wibowo et al., 2025).

The fourth research question concerning sustainable digital educational models revealed that Muhammadiyah institutions increasingly attempt to integrate Islamic ethical principles into digital educational systems. This includes incorporating Islamic character education into online learning platforms, strengthening digital religious mentoring, and developing value-oriented virtual educational communities. These findings align strongly with Mezirow's Transformative Learning Theory because institutional transformation requires reflective adaptation capable of integrating technological innovation with ethical and cultural values (Syamsiah & Aisyah, 2025).

The findings also clarify the achievement of the research objectives. The first objective aimed to analyze the challenges and opportunities of digital transformation within Muhammadiyah educational institutions. The study successfully demonstrates that digital transformation creates simultaneous opportunities for educational innovation and challenges concerning ethical adaptation, organizational readiness, and value preservation. The second objective focused on examining the relationship between technological innovation and Islamic educational values. The findings reveal that Muhammadiyah institutions actively attempt to harmonize technological modernization with Islamic ethical principles through value-oriented digital educational practices.

The third research objective sought to identify institutional barriers affecting digital transformation implementation. The findings indicate that infrastructural inequality, technological competence disparities, and organizational resistance remain substantial obstacles limiting effective digital educational transformation. Finally, the fourth objective aimed to explore adaptive educational strategies capable of supporting sustainable digital transformation. The study identifies hybrid learning systems, participatory leadership approaches, digital literacy programs, and Islamic ethical integration as key strategies supporting sustainable institutional adaptation.

The theoretical benefits of this research are closely connected with the integration of the three theoretical frameworks employed in the study. Rogers' Diffusion of Innovations Theory contributes to understanding how Muhammadiyah institutions adopt and institutionalize technological innovation within religious educational environments (Symeonidis & Impedovo, 2025). Davis' Technology Acceptance Model provides analytical insights regarding behavioral adaptation and technological acceptance among educational stakeholders (Sziegat, 2025). Mezirow's Transformative Learning Theory explains how digital transformation reshapes educational experiences, pedagogical interaction, and institutional identity formation (Huda & Jazariyah, 2025). Collectively, these theories contribute to the development of interdisciplinary scholarship connecting Islamic education, organizational transformation, and digital sociology.

Academically, the study contributes empirical evidence enriching scholarly discussions concerning digital transformation within faith-based educational institutions. Previous studies often emphasized technical dimensions of educational digitalization without adequately exploring institutional identity, ethical adaptation, and Islamic educational philosophy. This study therefore fills an important research gap by demonstrating that digital transformation in Muhammadiyah institutions involves broader socio-cultural and ideological negotiations rather than merely technological implementation. The findings also expand contemporary discussions regarding the future of Islamic education in digital societies.

Practically, the study provides strategic implications for policymakers, institutional leaders, and educators within Muhammadiyah educational networks. The findings indicate that successful digital transformation requires comprehensive institutional support involving technological infrastructure development, digital literacy training, participatory leadership, and ethical educational integration. Muhammadiyah institutions are encouraged to strengthen digital competency programs while simultaneously preserving Islamic educational values emphasizing morality, social responsibility, and character formation. Hybrid learning models integrating technological flexibility with interpersonal educational interaction may serve as effective strategies for balancing modernization and religious educational identity.

The discussion of the findings also demonstrates strong connections with previous research. Earlier studies generally identified digital technology as a tool for improving educational efficiency and accessibility (Salogub et al., 2025). However, this study extends previous findings by emphasizing that digital transformation within Islamic educational institutions involves deeper institutional and cultural implications. While previous researchers primarily focused on technological adoption rates or online learning effectiveness, the current study highlights the importance of ethical adaptation, organizational resilience, and value-based educational transformation.

Previous research conducted in Islamic educational contexts frequently identified technological limitations and digital literacy disparities as primary obstacles to educational modernization. The findings of this study confirm these earlier observations while additionally revealing the importance of organizational leadership and Islamic ethical integration in supporting sustainable digital transformation. Furthermore, unlike previous studies emphasizing technological determinism, this research demonstrates that institutional culture and religious educational values significantly influence the implementation and acceptance of digital educational innovation.

The novelty of this study emerges from its multidimensional analysis integrating organizational transformation, technological adaptation, and Islamic educational philosophy simultaneously. The findings reveal that Muhammadiyah educational institutions are not passive recipients of digital modernization but active agents negotiating technological change within ethical and ideological frameworks (Elbolok et al., 2025). This perspective contributes significantly to contemporary Islamic educational scholarship by conceptualizing digital transformation as a socio-religious and pedagogical reconstruction process.

Ultimately, the findings and discussion demonstrate that digital transformation in Muhammadiyah-based learning institutions represents both a challenge and an opportunity for contemporary Islamic education. The successful implementation of digital educational systems depends not only on technological infrastructure but also on institutional leadership, educational ethics, organizational culture, and adaptive pedagogical strategies. The integration of Diffusion of Innovations Theory, Technology Acceptance Model, and Transformative Learning Theory provides comprehensive analytical foundations for understanding how Muhammadiyah institutions negotiate modernization while preserving Islamic educational identity. Through reflective adaptation and value-oriented digital educational practices, Muhammadiyah educational institutions possess significant potential to construct sustainable and ethically grounded digital learning ecosystems capable of responding effectively to contemporary educational transformation.

CONCLUSION

This study concludes that digital transformation within Muhammadiyah-based learning institutions represents a comprehensive educational transition involving technological adaptation, organizational restructuring, pedagogical innovation, and the recontextualization of Islamic educational values in contemporary digital environments. The findings demonstrate that digital transformation is not merely a technical process characterized by the introduction of online learning platforms or digital administrative systems, but rather a multidimensional institutional transformation influencing educational culture, leadership patterns, student engagement, and religious learning practices. Muhammadiyah educational institutions increasingly recognize digitalization as a strategic necessity for maintaining institutional relevance, educational competitiveness, and sustainability in the era of rapid technological advancement and global educational change.

The results and discussion reveal that Muhammadiyah institutions have actively implemented various forms of digital educational innovation, including hybrid learning systems, online learning management platforms, digital administration services, and technology-assisted instructional models. These transformations have created significant opportunities for improving educational accessibility, institutional efficiency, collaborative learning, and broader dissemination of Islamic knowledge. Students and educators generally perceive digital educational systems as beneficial for enhancing flexibility, learning accessibility, and communication effectiveness. The findings therefore confirm that digital transformation possesses substantial potential to strengthen the modernization of Islamic educational institutions while expanding opportunities for adaptive and inclusive educational practices.

Nevertheless, the study also concludes that digital transformation generates complex challenges affecting institutional adaptation, educational ethics, and Islamic value preservation. The findings indicate that Muhammadiyah educational institutions continue facing obstacles related to limited technological infrastructure, unequal digital literacy levels, organizational resistance, and concerns regarding the ethical consequences of excessive digital dependence. Several educators expressed apprehension that digital learning environments may weaken interpersonal educational relationships,

reduce direct moral guidance, and diminish the spiritual dimensions traditionally embedded within Islamic educational practices. These challenges demonstrate that technological modernization in Islamic education requires balanced and reflective implementation capable of preserving religious identity and educational ethics alongside institutional innovation.

The findings further confirm the relevance of the three theoretical frameworks employed in this study. Everett Rogers' Diffusion of Innovations Theory successfully explains that institutional leadership, organizational culture, and communication networks significantly influence the adoption and implementation of digital educational systems within Muhammadiyah institutions. Educational institutions characterized by collaborative leadership and supportive innovation cultures demonstrated stronger technological adaptation and institutional resilience. Fred Davis' Technology Acceptance Model also proves highly relevant in explaining how perceptions of usefulness and ease of use shape educators' and students' acceptance of digital technologies. Participants who perceived digital platforms as accessible and educationally beneficial were more likely to engage actively in digital learning environments. Furthermore, Jack Mezirow's Transformative Learning Theory provides an important analytical perspective for understanding how digital transformation reshapes educational experiences, pedagogical interaction, and institutional identity within Islamic educational contexts. The transformation process encourages educational stakeholders to reinterpret traditional learning practices while adapting to emerging digital realities.

The conclusion of this study also highlights that Muhammadiyah educational institutions are not passive recipients of technological modernization but active agents negotiating digital change within Islamic ethical and ideological frameworks. The institutions examined in this research attempt to integrate Islamic values into digital learning systems through ethical online learning guidelines, digital religious mentoring, value-oriented educational content, and character-based virtual interactions. This demonstrates that digital transformation within Islamic education can function not only as technological adaptation but also as an opportunity to strengthen Islamic educational values through innovative pedagogical approaches.

In relation to the primary research problem, the study concludes that the central challenge of digital transformation in Muhammadiyah institutions lies in balancing technological advancement with Islamic educational identity. While digital systems provide educational flexibility and institutional efficiency, they also create tensions concerning moral supervision, cultural continuity, and religious educational authenticity. The findings therefore emphasize the necessity of developing sustainable digital educational models grounded in ethical awareness, organizational collaboration, and adaptive leadership strategies.

The research additionally concludes that the existing gap in previous studies regarding the limited integration of technological, organizational, and Islamic educational perspectives has been addressed through the multidimensional framework employed in this study. By integrating innovation diffusion theory, technology acceptance theory, and transformative learning theory, this research provides a more comprehensive understanding of digital transformation within faith-based educational institutions. The study contributes new academic insights demonstrating that digital transformation in Islamic education should be interpreted as a socio-cultural and pedagogical reconstruction process rather than merely technological implementation.

From a theoretical perspective, this study contributes to the advancement of interdisciplinary scholarship connecting Islamic education, organizational transformation, and digital educational studies. Academically, the findings enrich contemporary discussions regarding the future of Islamic education in digitally interconnected societies. Practically, the study provides strategic recommendations for Muhammadiyah educational leaders, policymakers, and educators concerning the importance of strengthening digital literacy, expanding technological infrastructure, promoting participatory leadership, and integrating Islamic ethical principles into digital educational practices.

Ultimately, the study concludes that Muhammadiyah-based learning institutions possess substantial capacity to construct adaptive, ethical, and sustainable digital educational ecosystems capable of responding effectively to contemporary educational transformation. Successful digital

transformation depends not solely on technological resources but also on institutional commitment, educational values, organizational collaboration, and reflective adaptation. Through balanced integration between digital innovation and Islamic educational philosophy, Muhammadiyah institutions may continue serving as progressive Islamic educational organizations capable of addressing the challenges and opportunities of the digital era while maintaining their religious and moral foundations.

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