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Digitization of Muhammadiyah Education: Opportunities and Challenges in Creating Access to Inclusive Education

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Abstract

The advancement of global digital technology has driven fundamental changes in the education sector, thus demanding the adaptation of all elements of society to remain relevant in the era of disruption. In this context, Muhammadiyah as an Islamic movement that focuses on da'wah, education, and health has a strategic role in bridging the digital divide in Indonesia, especially in the education sector. Although internet penetration in Indonesia continues to increase, digital inequality still occurs, especially in the 3T area, which has an impact on the quality of education in Muhammadiyah schools. This research aims to identify opportunities and challenges in the implementation of digitalization of Muhammadiyah education, with an emphasis on the success of digitalization and inclusive education policies. Based on a qualitative descriptive literature study, it was found that the success of digitalization is greatly influenced by technological readiness, equitable distribution of infrastructure, and human resource competence. Digitalization also has the potential to improve accessibility and quality of learning through the use of digital platforms that are more personalized, collaborative, and interactive. The main challenges faced include infrastructure inequality and limited digital skills of educators, especially in remote areas. Therefore, the strategy to optimize the digitization of Muhammadiyah education needs to include infrastructure improvement, continuous training for teachers, and collaboration with the government and the private sector to build an inclusive and quality digital education ecosystem.

Keywords: Digitalization, Inclusive Education, Muhammadiyah, Opportunities and Challenges

Introduction Section

Massive scientific advances require all parties to have adaptive competencies to remain relevant in the era of disruption (Zhadlenko et al., 2025). In this context, global digitalization is a determining force that demands the active role of every element of society, delays in responding to this flow will have direct implications for lagging behind access and quality of human development. Each phase of the development of the times brings ambivalence a significant impact on the order of human life. On the one hand, the acceleration of science and technology offers simplification and efficiency in meeting the needs of life. However, on the other hand, this disruption triggers a new problematic complexity for humanity. This transformation not only touches on technical aspects, but also penetrates into fundamental areas such as religious patterns, education systems, health, to political and business dynamics (Yuliasih & Rachmatullah, 2025).

As a pillar of the Islamic movement that focuses on da'wah, education, and health, Muhammadiyah consistently represents itself as a strength *Tajdid* (reform) progressively. The reformist character inherent in this organization requires Muhammadiyah to take a central role as an articulator of solutions to various contemporary social problems. The urgency of this transformation can be seen from national data that shows the existence of *The Digital Divide*; As an illustration, although internet penetration in Indonesia will reach more than 79% by 2024, the effectiveness of its use in the formal education sector is still concentrated in urban areas (Blažič & Pavleska, 2025). Internally, the diversity of the geographical conditions of thousands of Muhammadiyah schools spread from Sabang to Merauke creates a real disparity in access, where most schools in disadvantaged areas still struggle with a ratio of digital devices that are not ideal, which is below 1:10 (devices compared to students). With a critical cadre base, Muhammadiyah should not be passive; On the contrary, the organization, which has been established since 1912, must be able to transform its historical experience into concrete action that is a solution. Muhammadiyah is required to become *Troubleshooter* which is able to create strategic opportunities for the people in facing increasingly competitive global competition.

Digitalization in the world of education brings fundamental changes by utilizing digital technology to improve accessibility, quality, and style for learning (Apriyenti, Leni Oktawira, 2024). Thus, the advancement of science and technology can encourage society to continue to adapt and develop in various aspects of life. This phenomenon is able to encourage collaboration between higher education institutions, governments, and private sector organizations to strengthen digital infrastructure. For example, smartphones, tablets, and Chromebooks have become reliable and effective tools in addressing the digital divide In addition, these changes make it easier to access for more personalized, collaborative, and interactive teaching, facilitating students to learn anytime and anywhere. For example, the use of virtual learning spaces,

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digital learning materials, and interactive tools can help increase student participation and facilitate a deeper understanding of concepts (Adyani, Wali Atmamil, 2025).

Education in the digital age not only focuses on teaching theoretical and technical skills, but also plays an important role in giving students the ability to adapt to ever-changing technology. Thus, education managers need to formulate and implement policies that support the development of digital competencies for students efficiently (Westari & Sumarsono 2025). Inclusive education is a crucial approach in the education sector that emphasizes that all individuals, up to those with special needs, have the right to receive a high-quality education in a uniform learning environment (Nurmalasari & Qudus, 2024). Key principles of inclusive education include acceptance of differences, ensuring that everyone has equal access, and encouraging the participation of every student (Nurfadillah et al., 2022). By adjusting the application of technology according to the special characteristics of children with special needs, technology can function optimally as an effective and efficient learning tool (Abdullah, 2023). This can increase the use of technology in improving the quality of education and creating a more accommodating learning process.

The focus of this research is to identify the elements that affect the successful implementation of digitalization policies, including technology readiness, infrastructure support, and human resource skills, as well as analyze the challenges that arise in the implementation process. This research also seeks to describe the influence of digitalization on the quality of learning, which includes increasing access, efficiency in the teaching and learning process, and adaptation to technological developments (Ermi Sola, Maryam Djasdar, 2025). In the end, the purpose of this research is to formulate the right strategy to optimize the implementation of digitalization policies, how to optimize learning achievements, and create an innovative and of course inclusive learning ecosystem (Dede Kusnadi, Jaenal Abidin, Mulyana, 2022).

Method

This study uses a descriptive qualitative method with a literature study approach. This approach is applied to study and explain various written sources, such as journal articles, books, research reports, and policy documents that are relevant to the theme of digitization of Muhammadiyah education as well as efforts to realize inclusive access to education. The data analyzed is secondary data obtained through a search of credible academic literature, which is purposively selected based on relevance to the research focus, namely the digitization of education and inclusive education in the context of Muhammadiyah educational institutions.

Data analysis is carried out qualitatively through content and inductive analysis, by categorizing the main findings from the literature, comparing the research results, and synthesizing them into general findings regarding technological readiness, human resource competence, as well as challenges and opportunities for the implementation of digitalization in Muhammadiyah education. Based on this analysis, this study aims to formulate a comprehensive picture of the optimization of digital transformation by Muhammadiyah as a strategy to improve the quality and equitable distribution of inclusive access to education.

Results and Discussion

Digitalization Opportunities in Muhammadiyah Education

Digitization of education opens up huge opportunities in improving the quality of learning and expanding access to education, especially for those who have been limited in accessing learning materials to the fullest (Ismail & Ling, 2025). Technology allows for more flexible and efficient learning, where students can access subject matter through a variety of devices such as smartphones, tablets, and computers without being constrained by space and time. For Muhammadiyah schools located in remote areas, digitalization opens up opportunities to catch up in terms of learning resources available in urban areas (Avizenna et al., 2023). By utilizing technology, students across regions can now obtain materials of the same quality as those in big cities (Kamila et al., 2025).

Digitalization allows teaching to be more personalized and collaborative (Nungu et al., 2023). The use of online learning platforms and interactive tools facilitates new teaching methods that increase students' motivation to actively participate in the learning process (Rakha, 2025). Through digitalization, students can choose a time and study method that suits their individual learning style, so that each individual has the opportunity to develop a deeper understanding. In addition, digitalization supports the principles of inclusive education by allowing technology to be used to accommodate the diverse needs of students, including those with special needs (Yin et al., 2025). Learning materials can be adjusted using technology to make it easier to understand according to individual needs.

Digital education has significantly improved educational accessibility, especially for students living in areas with limited facilities. The availability of innovative learning platforms and mobile apps allows students from different regions, including remote areas, to access educational materials equivalent to those available in major cities (Setiawati et al., 2025). These developments reduce the educational gap between urban and rural areas and allow students to receive quality education even without physical access to comprehensive schools or educational facilities. In addition, the integration of digital multimedia learning resources, such as videos, articles, and interactive content, improves accessibility for learners with different levels of competence and learning rhythms, which directly creates a more inclusive learning experience.

The empowerment of the Muhammadiyah educational community through digital platforms offers significant opportunities to expand the reach and impact of Muhammadiyah education. The availability of online learning platforms and digital access allows Muhammadiyah schools throughout Indonesia to connect and share educational resources (Suardi et al., 2023). This connectivity facilitates collaboration between schools in more developed areas and schools in less developed areas, fostering a supportive educational network (Bakir, Ihsan, Titis, Kiatina, 2025). Digital platforms serve as a medium for sharing learning materials, innovative teaching methods, and experiences in the effective implementation of educational technologies. The collaboration can reduce the gap in the quality of education between Muhammadiyah schools in urban and remote areas and accelerate comprehensive educational transformation.

The use of technology can reduce the previously high cost of education due to limited resources. Digitalization encourages the learning process to become more affordable by reducing the need for expensive physical infrastructure, such as large school buildings and printed teaching materials (Shah, 2024). On the other hand, technological advancements support the continuous utilization of learning materials, such as e-books and educational applications, that can be accessed by many students simultaneously at no additional cost (Nurhaliza Nurhaliza & Rayyan Firdaus, 2024). This condition provides significant benefits for Muhammadiyah schools in areas with limited budgets. As technology develops, the digitalization of education has the potential to become a more efficient, sustainable, and cost-effective model of education (M. J. Putra et al., 2025).

In addition to expanding access to learning, digitalization plays an important role in building the readiness of Muhammadiyah students to respond to the challenges of the future world of work (Zaenul Akfal et al., 2025). Digital skills, such as programming, data analysis, and the use of educational software, are now key competencies in various sectors. Through the use of technology, Muhammadiyah students can be equipped with these skills from an early age, thereby increasing competitiveness in the world of work and adaptability to rapid technological changes (Perez et al., 2025). Thus, the digitization of education not only improves the quality of learning, but also equips students with relevant and essential 21st-century skills (Putri Ardelia et al., 2025).

Infrastructure Challenges and Technology Readiness

Digitalization offers significant opportunities; However, challenges related to infrastructure and technological readiness remain major barriers to implementing digital education, especially in areas with limited resources (Rosyidah et al., 2025). While some Muhammadiyah schools in big cities may have adequate infrastructure, schools located in 3T areas (border, outermost, and disadvantaged) continue to experience problems due to inadequate digital devices (Asyikin et al., 2025). In many regions, the device-to-student ratio is still far from ideal, with many schools reporting ratios below 1:10. These limitations hinder students' effective access to technology-based learning.

The problem of unstable and slow internet connections further worsens the situation. Many schools in remote areas still have difficulty accessing quality internet, hampering the use of online learning platforms and other digital resources (Harahap et al., 2025). To ensure the successful implementation of digitalization, improving the quality and equitable distribution of digital infrastructure, both hardware and software, as well as providing reliable internet connections in all Muhammadiyah schools, especially in remote areas, are very important (Pasha & Rahmanto, 2025). When compared to the past, da'wah in this era is certainly in the form. In the past, we experienced the absence of the media to convey da'wah comprehensively, but today, by using the sophistication of technology, in such a short time we are able to reach remote areas (Muchlas, Setiawan, 2022).

The digitalization of education offers significant opportunities to expand access to education, uneven infrastructure remains a major obstacle (Riki Satia Muharam et al., 2025). Muhammadiyah schools located in the 3T area (disadvantaged, outermost, and frontier areas) often face difficulties in obtaining adequate digital devices (Wahyu Pambudi & Hafidz, 2025). This situation is further exacerbated by unstable and slow internet connections, which significantly reduce the effectiveness of technology-based learning. These limitations hinder students from accessing learning materials optimally, thereby reducing the quality of education (Name & TANGGUR, 2022). To ensure the successful implementation of digitalization in all Muhammadiyah schools, concrete efforts are needed to improve the quality and equitable distribution of digital infrastructure, including the provision of qualified hardware and reliable internet connectivity, especially in the most underserved areas (Negara, Daeli, 2021). These measures will not only improve the quality of learning but also accelerate the equitable distribution of education in remote areas.

Technological advances have had a positive impact in accelerating the spread of da'wah and information, which was previously constrained by media limitations (Riyan Muhammad & Milana Abdillah Subarkah, 2024). In the context of Muhammadiyah's da'wah, digital technology allows messages to reach a wider audience, including areas that were previously difficult to access. The use of digital platforms to disseminate Muhammadiyah values not only increases the reach but also enriches the learning process through more innovative and inclusive methods (Mukhlis et al., 2023). Thus, the digitization of Muhammadiyah education not only affects the academic aspect but also contributes to more effective da'wah in the modern era (Haganta et al., 2022).

Many educators in the 3T region are not yet fully prepared to implement technology-based learning (Sari et al., 2025). Although many Muhammadiyah schools have adopted technology, not all teachers master the digital competencies that are appropriate to support effective learning. Coaching and professional development of teachers plays a role in optimizing the

use of technology in the classroom (Mambaul Ulum, Binti Maunah, 2025). Digital education requires not only adequate infrastructure and tools but also competent teachers who can leverage technology to create engaging and effective learning experiences. Thus, it is very important for Muhammadiyah to implement a digital training program for educators to prepare them to face an increasingly digital educational landscape.

The digitization of Muhammadiyah education also affects changes in the pattern of interaction between students and teachers (Putri et al., 2024). Digital platforms facilitate more intensive collaboration between schools in developed and remote areas (Setiawati et al., 2025). This creates opportunities for students in remote areas to have a richer learning experience by utilizing the educational resources available in urban schools. Through technology, Muhammadiyah schools can build strong educational networks, overcome geographical barriers, and create many opportunities for students to interact and develop wherever they are located (Azhar, Edwita, 2023). Such inter-school collaboration not only improves the quality of education but also gives students exposure to diverse perspectives, broadens their horizons and prepares them for future challenges (AISYAH, 2023).

Challenges in Human Resource Development

One of the aspects that will be immediately resolved is the development of human resource competencies. Despite efforts to incorporate technology in learning, many teachers are not fully skilled in using digital devices and learning platforms effectively (Althubyani, 2024). Most educators still face difficulties in operating the various tools and technologies available (Rahayu & , Seno Andri, 2022). It is clear that this limitation of digital capabilities hinders the ideal teaching process, which should improve the quality of learning (Fadliani et al., 2025).

It is important to remember that the development of digital competence is not only a matter of technical skills in operating devices, but also the ability to adapt technology in the teaching process creatively and effectively (Sholihatin et al., 2021). Thus, training and mentoring for teachers and education managers must be a top priority. This training must include mastery of various digital learning platforms, the use of educational applications, as well as effective pedagogical techniques in teaching using technology (Hanifa Intan Desiga, 2025). In addition, there is also a need for policies that support the development of teachers' professionalism, so that they can continue to keep up with technological developments and integrate them in the teaching and learning process well.

The main obstacle in improving the competence of human resources in the field of digital education is the low awareness of the importance of continuous training (Concern, 2024). Many schools do not yet have structured training programs for teachers in digital skills mastery (Rahayu & , Seno Andri, 2022). Although technology training has begun to be implemented, the motivation and strengthening of the program is still not optimal. Teachers generally only receive basic technical training, but they also need a more in-depth pedagogical approach in order to effectively integrate technology to support student development (Sofwatul et al., 2025). Therefore, initiatives are needed to build a culture of lifelong learning among educators, so that they can continue to improve their competencies in accordance with the rapid development of educational technology.

Policies that encourage collaboration between teachers, education managers, and technologists are essential (HIDAYAH et al., 2024). Through a collaborative approach, educators can share insights and distribute the best strategies in utilizing technology for more effective learning (Hidayat et al., 2022). One of the solutions that can be implemented is the development of *Community of Practice* (CoP), which brings together teachers from different regions to learn together, share solutions, and solve problems related to the use of technology in education (Rahmania & Alya, 2025). This approach is expected to accelerate the improvement of educators' digital skills and open up opportunities to adapt technology more creatively and innovatively in the classroom.

The development of digital competencies for teachers is also closely related to the inequality of access and use of technology in various regions. Some schools in major cities already have adequate access to technology and teacher training, while many schools in remote or underdeveloped areas are still lagging behind (Singh et al., 2025). This condition causes an imbalance that has a big impact on the quality of learning received by students in various regions. Therefore, education policy must ensure equitable distribution of coaching and strengthening professional capacity for teachers, so that all schools can utilize technology for learning (Nechaeva, 2021). A local needs-based approach, which identifies resource gaps and tailors training programs to the local context, can be a solution to address these inequalities.

A more holistic approach is needed in the development of educators' digital competencies, which includes technical training as well as skill development in designing innovative and enjoyable learning experiences for students. This approach should emphasize the use of technology to create teaching methods that are interactive and collaborative, relevant to the demands and characteristics of students in the digital age. Thus, the development of digital skills not only strengthens the technical aspects of teachers, but also enriches the learning process through a technology-based creative approach, which in turn can improve the overall quality of education.

The Influence of Digitalization on Learning Quality

Digitalization is an important determinant in optimizing the standards of the teaching and learning process. The use of technology allows students to learn independently outside of formal lesson hours by accessing a variety of learning materials anytime and anywhere (Supratama & Hilallaludin, 2025). This freedom allows students to tailor the learning process to their needs and pace, thereby improving understanding and skills. Online learning platforms and educational apps also expand students' access to materials that are not available in traditional classrooms. In addition, teachers can take advantage of a variety of multimedia resources, interactive multimedia content to provide a more immersive and dynamic learning experience, and deepen students' understanding (Ramlah et al., 2023).

Digitalization provides significant benefits for inclusive education. Technology allows for the adaptation of learning materials to meet the diverse needs of learners comprehensively, including those who need special educational support (Dheta Ananda, Sri Wulandari, 2025). For example, technology can be used to present material visually for visually impaired students or in a simple and structured manner for students with learning difficulties. Thus, digitalization has the potential to create a more inclusive learning environment, so that every student can access and understand learning materials according to their abilities (Isneini, 2024).

Educational technology offers significant opportunities to create deeper engagement for learners in the learning process (Salman et al., 2025). Digital learning platforms and interactive educational apps facilitate active participation through online discussions, interactive quizzes, and project-based assignments (Ramadhan et al., 2025). Real-time feedback provides information on student progress and areas for improvement, making the learning process more targeted and personalized. These features not only increase motivation, but also encourage students' independence as well as responsibility for their learning progress.

The application of technology in education makes it easier for students to access learning materials flexibly and independently. Through various applications and learning platforms, students can learn anytime and anywhere according to their needs and speed (Renaud et al., 2021). In addition to providing freedom in setting a learning schedule, technology also allows students to repeat ununderstood material to strengthen comprehension. Ease of access to educational resources improves the efficiency of study time and allows students to explore material relevant to their interests and academic goals.

The use of technology in education contributes to the creation of a more inclusive and adaptive learning environment. Various platforms and applications to facilitate the dissemination of teaching materials in text, image, video, or audio formats, which can be tailored to the needs of students based on learning styles and abilities. Technology also facilitates easier access for students with special needs, such as the visually impaired or students with learning difficulties (Čakš et al., 2022). Thus, the classroom becomes more friendly and open to all students, thus, it not only simplifies the instructional mechanism, but also enriches the overall learning experience.

Digitalization Optimization Strategy for Inclusive Education

A number of strategic steps are needed to ensure that the digitization of Muhammadiyah education is carried out effectively and inclusively. First, the improvement of digital infrastructure in all Muhammadiyah educational institutions must be prioritized. This includes providing adequate devices, improving access to a more stable and faster internet, and utilizing digital platforms that meet students' needs. Second, training and mentoring programs for teachers are needed to develop their digital skills, both in using digital devices and in applying technology effectively in teaching (Pradnyana & Wisarja, 2025). Strengthening teachers' digital competencies will enable the technology-based learning process to function more optimally (Hanifa Intan Desiga, 2025). Muhammadiyah must formulate policies that support the integration of technology in the education system, with special attention to the needs of schools in disadvantaged areas. This policy must ensure fair access to technology in all Muhammadiyah schools.

Forging partnerships with governments, technology companies, and non-governmental institutions is essential to strengthen the digital ecosystem in the education sector. Forms of partnership can include the provision of affordable digital devices, technical support for digital infrastructure management, and professional training and development for educators (Ahmad & Alam, 2025). The engagement of various stakeholders will accelerate digital transformation and ensure the effective use of technology to support inclusive and quality education, especially in the areas most in need (Ochieng, 2024).

The use of technology in Muhammadiyah education can increase the involvement of parents and the community in the learning process. Digital platforms make it easier for parents to monitor their children's academic progress through reports that can be accessed online (Depite, 2024). In addition, technology opens up opportunities for community participation in educational activities, such as providing online guidance or training to students in need. Thus, digitalization not only facilitates learning in schools, but also strengthens the role of parents and communities in supporting children's education (Suhartono & Cahyono, 2024).

Conclusion

Advances in science and global digitalization require all stakeholders to develop adaptive capabilities to remain relevant in the era of disruption. These changes have improved the efficiency, accessibility, and quality of learning, but they have

also introduced new challenges in education, health, religious outreach, politics, and business. Muhammadiyah, as a national reform movement, must play an active role in finding solutions, especially considering the continuing digital divide and the quality gap between Muhammadiyah schools across regions. This qualitative descriptive literature study shows that the success of digitalization depends on technological readiness, equitable distribution of infrastructure, and human resource competence. Digitalization also supports inclusive education by providing materials that can be tailored to the diverse needs of students, including the needs of children with special needs. Therefore, key strategies involve strengthening devices and connectivity, offering ongoing teacher training, promoting collaboration between schools, and forging partnerships with various stakeholders to ensure that digital transformation truly expands and equalizes access to education.

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