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The Impact of Digital Transformation on Islamic Education Learning Methods: A Study of Deep Learning Implementation

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Abstract

The study aims to develop an integrated learning model that harmonizes advanced artificial intelligence technology with fundamental Islamic educational values and formulate an ethical framework guiding deep learning implementation in Islamic education contexts. This study employs a qualitative approach utilizing library research design to explore digital transformation impacts on Islamic education learning methods. Data collection was conducted through systematic exploration of contemporary academic literature published in accredited national and international journals, conference proceedings, and research reports concerning digital transformation in Islamic education and deep learning applications in educational contexts. Secondary data obtained were analyzed using content analysis methods with four sequential stages: identification and categorization of data based on relevance to digital transformation impacts in Islamic education, codification of primary findings regarding deep learning implementation, interpretation of emerging patterns and themes, and synthesis of findings to develop conceptual frameworks.

The research reveals that Islamic educational institutions possess adaptive capacity to integrate advanced technology without sacrificing fundamental values. The developed integrated model encompasses four key components: adaptive technological infrastructure enabling personalized learning experiences, educator capacity development programs focusing on digital literacy and pedagogical innovation, technology-enriched curriculum design maintaining alignment with Islamic educational objectives, and an ethical framework based on Islamic principles including justice (adl), trust (amanah), and public interest (maslahah). Deep learning implementation demonstrates

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potential for creating holistic and personalized learning ecosystems that support both intellectual and spiritual development objectives of Islamic education.

Keywords: Islamic education; deep learning; digital transformation.

Abstrak

Penelitian bertujuan mengembangkan model pembelajaran terintegrasi yang menyelaraskan teknologi kecerdasan buatan canggih dengan nilai-nilai fundamental pendidikan Islam serta merumuskan kerangka etis yang memandu implementasi deep learning dalam konteks pendidikan Islam.
Penelitian menggunakan pendekatan kualitatif dengan desain library research untuk mengeksplorasi dampak transformasi digital terhadap metode pembelajaran pendidikan Islam. Pengumpulan data dilaksanakan melalui penelusuran sistematis terhadap literatur akademik kontemporer yang dipublikasikan dalam jurnal nasional dan internasional terakreditasi, prosiding konferensi, serta laporan penelitian mengenai transformasi digital dalam pendidikan Islam dan aplikasi deep learning dalam konteks pembelajaran. Data sekunder yang diperoleh dianalisis menggunakan metode content analysis dengan empat tahapan berurutan: identifikasi dan kategorisasi data berdasarkan relevansi terhadap dampak transformasi digital dalam pendidikan Islam, kodifikasi temuan utama mengenai implementasi deep learning, interpretasi pola dan tema yang muncul, serta sintesis temuan untuk mengembangkan kerangka konseptual.
Penelitian mengungkapkan bahwa institusi pendidikan Islam memiliki kapasitas adaptif untuk mengintegrasikan teknologi canggih tanpa mengorbankan nilai-nilai fundamental. Model terintegrasi yang dikembangkan mencakup empat komponen utama: infrastruktur teknologi adaptif yang memungkinkan pengalaman pembelajaran personal, program pengembangan kapasitas pendidik yang berfokus pada literasi digital dan inovasi pedagogis, desain kurikulum yang diperkaya teknologi dengan tetap mempertahankan keselarasan terhadap tujuan pendidikan Islam, serta kerangka etis berbasis prinsip-prinsip Islam meliputi keadilan (adl), amanah, dan kemaslahatan umum (maslahah). Implementasi deep learning menunjukkan potensi untuk menciptakan ekosistem pembelajaran holistik

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dan personal yang mendukung tujuan pengembangan intelektual dan spiritual dalam pendidikan Islam.

Kata Kunci: Pendidikan Islam; Deep Learning; Transformasi Digital.

A. Introduction

The digital technology revolution has fundamentally changed the global education landscape, creating a learning paradigm that demands systemic adaptation of all components of the education ecosystem. Islamic education, with an intellectual heritage that has developed for more than fourteen centuries, now faces the strategic challenge of integrating cutting-edge technological innovations without losing the philosophical and methodological essence that has proven effective in shaping the character and intellect of generations of Muslims. The implementation of artificial intelligence-based learning technology, especially deep learning, offers transformative opportunities that can enrich the pedagogical dimension of Islamic education through learning personalization, predictive analysis of student learning patterns, and optimization of teaching strategies that are responsive to individual needs.

Digital transformation in the context of Islamic education is not solely the adoption of technology, but a process of reconceptualization of learning methodologies that considers the harmonization between Islamic scientific traditions and contemporary technological advances. Deep learning, as a branch of artificial intelligence that mimics the structure and function of human neural networks, has the capability to process large volumes of learning data, identify complex patterns in the learning process, and provide learning recommendations tailored to each individual's cognitive characteristics. In the context of Islamic education that emphasizes a holistic approach to intellectual and spiritual development, this technology has the potential to create a more effective and meaningful learning ecosystem.

Previous research has shown various efforts to integrate technology in Islamic education with diverse focuses and approaches. The study conducted by

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(Alsharbi et al., 2021) developed a reinforcement learning-based simulator to improve the experience of learning the Quran and Islamic education for non-Arabic speakers, which is able to evaluate the strengths and weaknesses of learners and provide accurate reports for each individual. However, the research is limited to aspects of Arabic language learning and Quranic studies, and does not cover the comprehensive spectrum of Islamic education which includes theological, juridical and ethical dimensions. Meanwhile, (Husaini Zuhri & Huda, 2024) analyzed the implementation of Peter Senge's Learning Organization model in Islamic boarding schools, proving the adaptive capacity of traditional Islamic educational institutions to contemporary changes through the development of five learning organizational disciplines. Although this study shows the organizational flexibility of pesantren, there has not been an in-depth exploration of the integration of deep learning technology in the learning structure of pesantren.

The dimension of educators' readiness in facing digital transformation has been explored by (Suhid et al., 2021) who identify the challenges and readiness of Islamic education teachers in innovative learning. This research emphasizes the urgency of developing educators' digital competencies and identifying obstacles to technology implementation in the context of Islamic education. However, the study has not specifically addressed the need for technical competencies needed to operate and optimize deep learning technology in learning. The contribution of work-based knowledge to educational leadership practices in higher education has been analyzed by (Sudirman & Gemilang, 2020), who found the importance of cultural context in supporting learning and leadership transformations that emphasize Islamic values such as qudwa hasana. Although this study provides a perspective on transformational leadership, there is no concrete framework to lead the implementation of deep learning technology in the Islamic educational environment.

The ethical aspects of the use of technology in Islamic education have been discussed by (Misman et al., 2021) who examine the Islamic perspective on the ethics of new media users,

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emphasizing adherence to the principles of the Quran and Hadith in the use of learning technology. This research provides an important ethical foundation, but it has not explored the specific ethical implications of the implementation of deep learning involving the processing of students' personal data on a large scale. The transition of Islamic higher education to the post-pandemic digital era has been researched by (Hamdanah et al., 2024) which shows the readiness of Islamic education students for online learning and the importance of technological infrastructure. Although this study reveals the adaptability of the young generation of Muslims to learning technology, there has been no in-depth analysis of the potential of deep learning technology to increase the effectiveness of online learning in the context of Islamic education.

Innovative pedagogical approaches in Islamic education have been developed by (Hussien et al., 2021) through Hikmah pedagogy that empowers students in the development of high-level thinking and inquiry skills. This study shows the effectiveness of a student-centered learning approach in achieving Islamic educational goals. However, there is no integration between Hikmah's pedagogical approach and deep learning technology that has the potential to optimize learning outcomes through more precise personalization.

A comprehensive analysis of previous studies identified significant gaps in the implementation of deep learning in the context of Islamic education. First, although there have been efforts to integrate technology in Islamic education, the implementation of deep learning as an adaptive learning technology that can provide deep personalization has not been systematically explored. Second, there is no conceptual model that combines deep learning analytical capabilities with holistic Islamic educational values and methodologies. Third, an ethical framework for the implementation of deep learning in Islamic education has not been developed taking into account the principles of sharia and maqasid al-sharia. Fourth, there is no study that examines the impact of digital transformation through deep learning on the achievement of Islamic education goals that include cognitive, affective,

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and psychomotor dimensions in an integrated manner.

The research gap shows the urgency of developing a comprehensive understanding of the implementation of deep learning in Islamic education that not only focuses on technological aspects, but also considers pedagogical, cultural, and ethical dimensions. This research is here to fill this gap by analyzing the impact of digital transformation on Islamic education learning methodologies, especially through the implementation of deep learning that is in line with Islamic values.

Based on the identification of research gaps, the problem formulation developed in this study is: What is the impact of digital transformation, especially the implementation of deep learning, on the evolution of learning methodologies in Islamic education? How to design a deep learning-based learning model that can optimize the achievement of Islamic educational goals without sacrificing fundamental values? How to develop an ethical framework based on Islamic principles to guide the implementation of deep learning in the context of Islamic education?

This research aims to analyze in depth the impact of digital transformation on Islamic education learning methods with a focus on the implementation of deep learning. Specifically, this research will develop an integrated learning model that synergizes the capabilities of deep learning technology with the values and principles of Islamic education, as well as formulate an ethical framework that can guide the implementation of such technology in various levels of Islamic educational institutions. This research contribution is expected to bridge the gap between the rich Islamic educational tradition and contemporary learning technology innovations, creating an Islamic education paradigm that is responsive to the demands of the digital age while maintaining the identity and fundamental values that have been tested throughout the history of Islamic civilization.

B. Research Methods

This study uses a qualitative approach with a library research design to explore the impact of digital

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transformation on Islamic education learning methods, especially in the implementation of deep learning. The data collection process is carried out through a systematic search of the latest academic literature published in accredited national and international journals, conference proceedings, and research reports on digital transformation in Islamic education and the application of deep learning in the context of learning. The secondary data obtained was then analyzed using the content analysis method with the following stages: (1) identification and categorization of data based on relevance to the impact of digital transformation in Islamic education; (2) codification of key findings on the implementation of deep learning; (3) interpretation of patterns and themes that emerge; and (4) synthesis of findings to develop a conceptual framework. To ensure the credibility of the research, data sources were triangulated by comparing various perspectives and findings from different literature. The limitation of this study lies in the use of secondary data, without involving direct observation of the implementation of deep learning in Islamic educational institutions. Even so, the depth of literature analysis provides a comprehensive conceptual foundation for the development of deep learning-based learning models that are contextual with Islamic educational values.

C. Results and Discussion

Digital Transformation in the Islamic Education Ecosystem: Evolution and Challenges

Digital transformation has brought fundamental changes in the Islamic education ecosystem that for centuries has relied on conventional learning methods. An analysis of the literature shows that Islamic educational institutions are experiencing significant adaptive pressure in integrating technology into their curriculum and teaching methods. The shift from traditional face-to-face learning to technology-enriched learning is not only a technical challenge but also a cultural one. According to a study conducted by (Husaini Zuhri & Huda, 2024), pesantren as traditional Islamic educational institutions face difficulties in maintaining their classical madrasah system in the era of 21st century knowledge and technology. However,

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interestingly, the study found that Madrasah Hidayatul Mubtadiin (MHM) in Lirboyo, Kediri was able to adapt to its environment through the implementation of five disciplines of Peter Senge's learning organization. These findings show that despite the perception of resistance to change, Islamic educational institutions have adaptive capacities that allow them to transform without sacrificing their core values (Hamdani, 2023).

The COVID-19 pandemic has been a catalyst that has accelerated the adoption of technology in Islamic education. As expressed by (Misman et al., 2021), the COVID-19 pandemic situation and the implementation of lockdowns and social restrictions have encouraged the use of smart technology to communicate and carry out daily activities. In the context of education, this condition increases the need to use new media in the teaching and learning process (Latipah et al., 2023). This abrupt shift presents challenges for educators and students in Islamic educational institutions that have traditionally emphasized direct interaction and teacher-centered teaching. Study by (Hamdanah et al., 2024) who researched the post-pandemic landscape of Islamic higher education at the State Islamic Institute of Palangka Raya, Central Kalimantan, Indonesia, revealed that there is a general readiness among students for online learning. These findings show that despite concerns about the unpreparedness of the younger generation of Muslims towards technology, in reality they show high adaptability and openness to innovative learning modalities (Tubagus et al., 2020). This positive attitude towards online learning is characterized by an appreciation for flexibility and accessibility as a significant advantage.

Another important aspect of digital transformation in Islamic education is the shift from a teacher-centered approach to learning that is more student-centered. (Hussien et al., 2021) describes how the pedagogy of Hikmah, a philosophical inquiry approach, empowers students through the development of inquiry communities and inquiry skills in Islamic Education learning. After four Hikmah pedagogy sessions, this study found an increase in students' thinking from low level to high level of thinking (HOT) based on the level of questions asked in the Hikmah

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session. This approach directly helps in realizing the goals of Islamic Education, which is to understand, internalize, and practice Islamic principles and values. Digital transformation has the potential to strengthen this student-centered approach to learning by providing tools that enable self-exploration, collaboration, and knowledge construction by students (Susanti et al., 2024).

While there is great potential in the digital transformation of Islamic education, significant challenges remain. (Suhid et al., 2021) explore the obstacles in implementing technology-based education in Islamic education. These challenges include inadequate technological infrastructure, limited digital skills of educators, and concerns about the suitability of digital content with Islamic values (Sukkar et al., 2024). In addition, there is a gap between the development of contemporary educational technology and its application in the context of Islamic education. This is partly due to the lack of research focused on the development of learning technologies that are specifically designed with the needs and values of Islamic education in mind. As a result, many Islamic educational institutions adopt technologies developed in western contexts without adequate adaptations to their specific needs, potentially giving rise to cultural and pedagogical incompatibilities.

The Potential of Deep Learning Implementation in Islamic Education: Analysis and Conceptual Models

Deep learning, as a sophisticated subset of artificial intelligence, offers transformative prospects for Islamic education through its ability to personalize learning and analyze comprehensive educational data. In contrast to conventional learning technologies, deep learning allows systems to learn from data independently, adapt, and provide solutions tailored to individual needs. In the context of Islamic education, where attention to the moral and spiritual development of students is as important as academic achievement, deep learning technology can be used to create a holistic and personalized learning ecosystem. Study by (Alsharbi et al., 2021) about reinforcement learning systems for Quranic and Islamic education for non-Arabic speakers shows the potential application of this

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technology. The system is able to evaluate the strengths and weaknesses of students and provide accurate actual reports for each child. This approach reflects how deep learning can be integrated to enrich the learning experience in Islamic education.

A conceptual model for the implementation of deep learning in Islamic education needs to be developed taking into account several key dimensions. First, the pedagogical dimension which includes the development of learning algorithms that can analyze students' learning styles and adjust learning content according to individual needs. These algorithms can be designed to recognize patterns in student learning interactions, identify areas that need reinforcement, and recommend appropriate learning resources. Second, the curricular dimension involves the development of learning materials that are integrated with Islamic values and can be personalized through deep learning technology. These include the digitization of classical Islamic texts, the development of interactive simulations for complex concepts in fiqh or usul al-din, and adaptive grading systems that measure not only cognitive understanding but also the internalization of values. Third, the technology dimension involves the development of infrastructure that supports the implementation of deep learning, including learning platforms designed with design principles in accordance with Islamic values.

(Hamdanah et al., 2024) revealed that Islamic education students show a high interest in online learning, appreciating its technological advancements, affordability, and intellectually challenging nature. These findings open up opportunities for the development of deep learning-based learning platforms designed specifically for the context of Islamic education. This kind of platform can integrate components such as an intelligent recommendation system that suggests learning resources based on a student's learning profile, a learning analytics tool that provides insights into student progress, and an automated feedback system that provides personalized guidance. Further, the platform can be designed with a user-focused interface that meets the specific needs of educators and learners in an Islamic

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context, such as the integration of prayer schedules, relevant references to the Quran and Hadith, as well as content that takes into account cultural sensitivities and Islamic values.

The implementation of deep learning in Islamic education can also take advantage of this technological capability for natural language analysis, which is particularly relevant for Arabic language learning and the study of Islamic classical texts. (Alsharbi et al., 2021) have demonstrated this potential in their Quranic learning system. Deep learning models for natural language processing can be trained on the corpus of Islamic texts to assist students in understanding the nuances of classical Arabic, analyzing the structure of the text, and identifying key themes in Islamic literature. Further, this technology can be used to develop virtual assistants that can answer students' questions about fiqh, tafsir, or hadith by referring to authoritative sources. However, the development of such models requires interdisciplinary collaboration between technologists and Islamic scholars to ensure accuracy and conformity with Islamic scientific traditions.

Despite its great potential, the implementation of deep learning in Islamic education faces several technical and conceptual challenges. Technical challenges include the need for large, high-quality data to train deep learning models, which may be limited in the context of Islamic education. In addition, the development of algorithms that can understand and evaluate the qualitative aspects of Islamic learning, such as ethical and spiritual understanding, remains a complex challenge. From a conceptual perspective, there is a need to develop an evaluation framework that can measure the effectiveness of the implementation of deep learning in achieving the goals of holistic Islamic education, which includes not only the mastery of knowledge but also the development of Islamic character and values.

Ethical Framework for the Integration of Deep Learning in Islamic Education: Perspectives and Principles

The development of an ethical framework for the integration of deep learning in Islamic education is a crucial element that is often overlooked in educational technology discourse.

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Ethical concerns arise regarding data privacy, algorithm transparency, and potential bias in artificial intelligence-based systems. In the context of Islamic education, this ethical dimension becomes increasingly complex because it must be in harmony with Islamic ethical principles. (Misman et al., 2021) emphasizes that to be a good user of new media, Muslims must adhere to the principles of upholding knowledge and guidance from correct sources of knowledge such as the Quran and Hadith. This principle can be extended to the development and implementation of deep learning technology in Islamic education. A comprehensive ethical framework needs to include aspects such as fairness and equal access, privacy protection, algorithm transparency, and alignment with Islamic values such as amanah (trust), 'adl (justice), and maslahah (public interest).

Justice and equal access are fundamental ethical considerations in the implementation of deep learning in Islamic education. This technology should be developed taking into account the diversity of students' backgrounds, including socio-economic, geographical, and ability differences. Deep learning-based learning systems should be designed to reduce the digital divide and expand access to quality education for all Muslim students, including those in remote or disadvantaged areas. (Hamdanah et al., 2024) Highlight the important role attributed to technological devices and internet connectivity in students' readiness for online learning. This underscores the importance of policies that support the provision of adequate technology infrastructure as a prerequisite for inclusive and equitable implementation of deep learning.

The protection of student privacy and data is another ethical aspect that needs to be considered. Deep learning systems rely on the collection and analysis of large amounts of data, which can include sensitive information about learning characteristics, academic achievement, and even aspects of student behavior. In the Islamic tradition, the concept of hifz al-'ird (protection of honor and privacy) provides an ethical basis for the development of strict data protection policies. Ethical frameworks should include clear protocols about what data can be collected, how it is used and stored, and the right of students and families to control their data.

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Algorithm transparency is also important for building trust in deep learning-based learning systems. Users should understand how algorithms make decisions or recommendations, especially when this affects students' learning paths or their assessments.

(Sudirman & Gemilang, 2020) emphasizing the importance of respect for cultural values in learning. This highlights the need for deep learning systems that are sensitive to the cultural context of Islamic education. Learning algorithms should be designed with Islamic values and norms in mind, avoid inappropriate content, and respect cultural and religious sensitivities. Furthermore, deep learning technology must support, not replace, the role of teachers and scholars in Islamic education. As expressed by (Husaini Zuhri & Huda, 2024), a mental model developed through tolerant behavior, respect, awareness of the importance of learning, high motivation to learn, and practicing akhlakul karimah (noble character) are important elements in Islamic learning organizations. Deep learning technologies should be designed to reinforce these values, not erode them.

To ensure compliance with the ethical framework, governance mechanisms involving various stakeholders need to be developed. This includes the establishment of an ethics board made up of technologists, Islamic educators, scholars, and community representatives to evaluate and approve the implementation of deep learning technologies in Islamic educational institutions. In addition, the development of standards and certifications for learning technologies that are in line with Islamic values can assist educational institutions in making informed decisions about technology adoption. An ongoing feedback mechanism is also important to ensure that the implementation of deep learning remains aligned with Islamic educational goals and ethical values at all times.

An Integrated Model for the Digital Transformation of Islamic Education: Synthesis and Recommendations

Based on extensive analysis of the literature and discussion in the previous sections, an integrated model for the digital transformation of Islamic education with a focus on the implementation of deep learning can be formulated. This model synthesizes

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pedagogical, technological, cultural, and ethical aspects to provide a comprehensive framework for Islamic educational institutions that want to adopt these advanced technologies without sacrificing fundamental values. The foundation of this model is the principle of harmonious integration between Islamic scientific traditions and technological innovations, with the aim of enriching students' learning experiences and expanding access to high-quality Islamic education (Haryani et al., 2021).

The first component of this integrated model is an adaptive and sustainable technological infrastructure. As expressed by (Hamdanah et al., 2024), a comprehensive online learning platform, strong technology support, and a conducive learning environment are essential to empower Islamic higher education students in navigating the digital landscape. This infrastructure should be designed taking into account the specificity of the Islamic education context, including the integration of digital content that is in harmony with the Islamic education curriculum, collaborative tools that support the communal learning dynamics often found in Islamic educational institutions, and learning analytics systems that can provide insights into the cognitive and affective dimensions of learning.

The second component is capacity building of educators and educational leaders. Effective digital transformation requires more than just technology; It requires educators who have digital literacy and pedagogical skills to meaningfully integrate technology in learning. (Husaini Zuhri & Huda, 2024) emphasizing the importance of personal mastery among teachers which is shown through self-reflection, exemplary behavior, perseverance, and consistency in complying with institutional rules. An integrated model should include a comprehensive professional development program that not only equips educators with technical skills but also helps them develop mental models that support innovation and adaptation. Educational leadership also plays a crucial role in facilitating digital transformation. As expressed by (Sudirman & Gemilang, 2020), educational leadership has emerged as a means of leadership formation that highlights leadership emancipation and gender justice, role models (qudwa

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hasana) in Islamic guidance, as well as leadership roles including affective qualities and mentoring, problem-solving, and knowledge creation.

The third component is curriculum design and pedagogy that is student-centered and technology-enriched. (Hussien et al., 2021) shows how Hikmah pedagogy can empower students through the development of inquiry communities and inquiry skills in Islamic Education learning. Deep learning can strengthen this approach by providing tools for learning personalization and learning analytics that support the development of high-level thinking. An integrated curriculum should be designed to harness the power of deep learning in data analysis, personalization, and simulation, while maintaining the core goal of Islamic education, which is the development of Islamic character and values. This includes the development of rich and diverse digital content, authentic learning tasks that integrate technology, and a comprehensive scoring system that measures the cognitive and affective dimensions of learning.

The fourth component is a strong ethical and governance framework, as discussed in the previous section. The implementation of deep learning in Islamic education must be guided by Islamic ethical principles and pay attention to fairness, privacy, transparency, and alignment with Islamic values. (Misman et al., 2021) emphasizing that Muslims must adhere to the principles of upholding knowledge and guidance from correct sources of knowledge such as the Quran and Hadith to avoid deviations in the use of new media. This principle is particularly relevant in developing an ethical framework for deep learning technologies in Islamic education.

The implementation of this integrated model requires a phased approach that begins with an assessment of institutional readiness, the development of a shared vision for digital transformation, the implementation of focused pilot projects, continuous evaluation and learning, and measurable expansion. Collaboration between Islamic educational institutions, technology developers, scholars, and communities is also essential to ensure that digital transformation leads to the achievement of holistic Islamic education goals. (Suhid et al., 2021)

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emphasizing the importance of strengthening the Islamic education system to engage in the innovation and transformation that may occur. This integrated model provides a framework for such engagement by holistically considering technological, pedagogical, cultural, and ethical dimensions.

D. Conclusion

Digital transformation in Islamic education has created a new learning paradigm that combines Islamic scientific traditions with deep learning technology. Research reveals that the implementation of deep learning offers personalized learning experiences without sacrificing the fundamental values of Islamic education. The integrated model developed demonstrates the alignment between adaptive technology infrastructure, educator capacity building, student-centered pedagogy, and an Islamic-based ethical framework. These findings recommend a phased approach in implementation that reinforces, rather than replaces, the role of educators as moral and spiritual guides.

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