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From Tradition to Digital Innovation: The Role of Artificial Intelligence in Driving the Transformation of Islamic Education

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Abstract

Islamic education has a strong tradition of transmitting knowledge through halaqah, Islamic boarding schools, and madrasas, but the acceleration of digital innovation, especially artificial intelligence (AI), encourages changes in the way of learning, teaching, and managing educational institutions to be more adaptive without losing core values. This research aims to compile a systematic review of the role of AI in driving the transformation of Islamic education "from tradition to digital innovation", with a focus on mapping research trends, areas of application (Qur'an Hadith learning, curriculum management, learning personalization), as well as opportunities, risks, and pedagogical ethical prerequisites. The method used is a systematic literature review (SLR) based on the PRISMA guidelines. The article was compiled from Scopus using a Boolean query strategy themed as digital innovation AI transformation digital education in the range of 2021–2025, with open access limitations, empirical articles, and the fields of social sciences and arts and humanities. An initial search yielded 518 articles, filtered into 30, and finally 18 relevant studies were analyzed. The results of the synthesis show a surge in publications in 2025 and the dominant themes include digital leadership, teacher AI literacy, personalization of learning, and governance/ethics (privacy, bias, assessment integrity). In the context of Islamic education, the findings affirm that AI needs to be positioned as a pedagogical partner that strengthens rather than replaces the role of educators, with an emphasis on value protection, equal access, and operational ethical policies. This study recommends a roadmap for value-based AI implementation, strengthening human resource capacity, and a governance framework that secures the quality of religious content and accountability for the use of AI in Islamic educational institutions.

Keywords: Islamic education; artificial intelligence; digital innovation, transformation of education, systematic literature review.

Introduction

The UNESCO report shows that more than 1.5 billion students were affected by educational disruptions during the pandemic, which in turn accelerated the adoption of digital technology and artificial intelligence (AI) in various Muslim countries, including Indonesia (Siregar et al., 2025). A survey of 11,372 Islamic education teachers in Indonesia showed a very positive response to technology integration, with an average score of 4.40 (scale 1–5) regarding the effectiveness of technology in increasing student engagement and understanding. In Islamic universities, more than 60% of lecturers stated that they have sufficient skills in using AI and electronic resources, although their use is still rare and not systematic (Suwendi et al., 2025). This data confirms that the Islamic education ecosystem is moving from the dominance of traditional patterns to new configurations that are increasingly supported by digital innovations, especially AI (Eka et al., 2025).

Historically, Islamic education has been rooted in a strong tradition of transmission of knowledge through halaqah methods, Islamic boarding schools, and madrasas, with scholars and teachers acting as the central scientific authority as well as the fosters of morality and spirituality (Khoiri & Akib, 2025). This tradition emphasizes direct presence (*face to face*), exemplary (*uswah*), and the personal relationship of student teachers as a medium of internalizing Islamic values. However, entering the era of the Industrial Revolution 4.0 and 5.0, Islamic educational institutions ranging from Islamic boarding schools, madrasas, to universities are faced with a new demand: combining classical scientific heritage with 21st-century digital competence without eroding the identity and core values of Islam (Lestari et al., 2025).

From the perspective of educational technology theory, AI is understood as a computational technology that is able to perform large-scale data analysis, adaptation to individual learning profiles, and automate various learning and managerial processes (An et al., 2025). In line with the frameworkBloom's Taxonomy, the integration of AI has the potential to strengthen the cognitive and psychomotor domains through adaptive learning, structured exercises, and automated feedback, while the affective domains including moral and spiritual coaching still require the presence of educators as moral and spiritual guides. Approach*personalized learning*AI-based and*intelligent tutoring systems*allowing for material differentiation, learning rhythms, and more precise formative assessments, so that it is in line with the student-centered learning paradigm that is now the mainstream of modern education theory (Hayati & Ushalli, 2024).

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Recent studies have shown that AI has a moderate but significant impact on learning effectiveness, pedagogical innovation, and socio-cultural transformation in Islamic education (Salim & Rajabiyah, 2025). The meta-analysis showed that innovation factors and socio-cultural dimensions related to the use of AI actually contributed the most to changes in Islamic education, followed by increased learning effectiveness through adaptive learning and a more connected learning environment. At the practical level, the use of AI in Islamic boarding schools and madrassas includes personalizing the learning of the Qur'an and fiqh, curriculum management, and expanding access to global learning resources, as well as demanding curriculum adjustments so that digital literacy grows without reducing the depth of Islamic studies (Salim & Aditya, 2025).

Although the study of educational technology in general has developed widely, discussions that specifically map the role of AI in the transformation of Islamic education are still relatively limited. First, part of the study focused on a SWOT analysis of the integration of AI in Islamic education, highlighting the strengthening of the cognitive and psychomotor domains, but affirming the limitations of AI in fostering affective dimensions and ethical guidance (An et al., 2025). Second, other research highlights the challenges and opportunities for AI adoption in Indonesian Islamic universities in terms of ethics (data privacy, algorithmic bias), infrastructure gaps, and tensions between AI personalization models and the central role of teachers as murabbi (Achruh et al., 2024). Third, the literature trend study shows a significant surge in AI research in Islamic education since 2018, but themes that explicitly link Islamic educational traditions (halaqah, pesantren, talaqqi) with AI-based digital innovations including Qur'an Hadith learning, AI-based educational media, and digitization of Islamic texts are still widespread and have not been systematically synthesized (Hayati & Ushalli, 2024).

At the same time, various structural and cultural challenges remain to the forefront. The limitations of technology infrastructure and internet access, especially in remote areas, make the application of AI in Islamic boarding schools and madrasas uneven (Lestari et al., 2025). The resistance of some educators to change, concerns about the loss of traditional character, as well as ethical issues related to the validity of religious knowledge generated by AI systems, data privacy, and the potential for overdependence are also important obstacles (Achruh et al., 2024). Therefore, the transformation agenda from tradition to digital innovation in Islamic education requires a framework that is able to place AI as a*mitra pedagogis*that reinforce, not replace, the role of human beings and Islamic values (Norman et al., 2025; Studi et al., 2024). Departing from this context, this article aims to compile a systematic review of the literature on the role of artificial intelligence in driving the transformation of Islamic education, by conceptually linking the transition "from tradition to digital innovation". The focus is on identifying trends, methods, and areas of AI application (e.g., Qur'an Hadith learning, curriculum management, learning personalization), while mapping the opportunities, risks, and pedagogical ethical prerequisites necessary for digital transformation to remain in line with maqāṣid al-syarī'ah and Islamic scientific traditions (Muhammad, 2025). Thus, this study is expected to enrich the theoretical and practical discourse on how AI can be critically and creatively integrated to accelerate the transformation of Islamic education without abandoning its traditional roots (Santika et al., 2025).

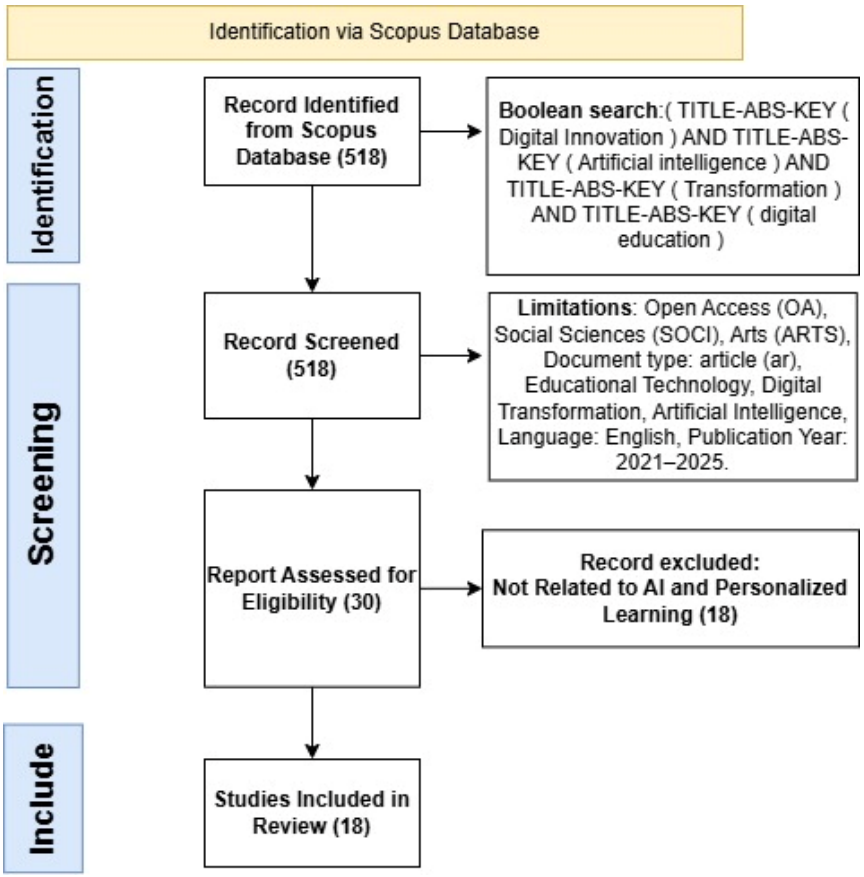
Table 1. Country Distribution and Number of Publications.

Country	Number of Publications
India	2
Australia, UK	1
Germany	1
Indonesia	1
Italy	1

Research Methodology

This study uses a systematic review approach to examine the role of digital innovation and artificial intelligence in the digital education transformation process. All articles were collected from the Scopus database with the following Boolean query-based search strategy: (TITLE-ABS-KEY (Digital Innovation) AND TITLE-ABS-KEY (Artificial intelligence) AND TITLE-ABS-KEY (Transformation) AND TITLE-ABS-KEY (digital education)) AND PUBYEAR > 2020 AND PUBYEAR < 2026 AND (LIMIT-TO (OA,"all")) AND (LIMIT-TO (EXACTKEYWORD , "Educational Technology") OR LIMIT-TO (EXACTKEYWORD , "Digital Transformation") OR LIMIT-TO (EXACTKEYWORD , "Artificial Intelligence")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ARTS") AND (LIMIT-TO (LANGUAGE , "English")).

Tabel 2. Diagram PRISMA.



An initial search using these criteria yielded 518 articles. Furthermore, the selection process is carried out in stages based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure that the stages of identification and study selection are transparent and systematic. In the first screening stage, articles were filtered using the main inclusion criteria of the study, namely only Scopus articles that are empirical studies, available open access, and included in the fields of social sciences and arts and humanities, so that the number of articles was reduced from 518 to 30 articles. After that, a follow-up screening stage is carried out (based on the suitability assessment of the title, abstract, and focus of discussion on the topic of digital innovation AI transformation in digital education). At this stage, articles that do not directly address the scope of the research or are not aligned with the focus of the discussion are eliminated, bringing the number of studies that are truly relevant and included in the final analysis to 18 articles. The selection flow was reported in PRISMA format, including the identification stage (518 articles), selection based on inclusion criteria (30 articles), and final inclusion after screening topic suitability (18 articles).

Result and Discussion
Result

Trends and gaps in research results related to digital innovation

Digital innovation is now understood not only as the adoption of technology, but also as a change in the way organizations and society work through AI from data analytics, service automation, to generative AI. At the organizational/industry level, digital innovation is often framed as a digital transformation that requires internal governance and capabilities; AI is positioned as the "engine" of innovation because the flow of data from transformation can be processed into insights, predictions, and product innovations, with pillars such as monitoring/metrics, continuous learning, data analytics, predictive analytics, and product innovation marking research trends towards a sustainable innovation management framework (Aldoseri et al., 2024). In the public sector, digital innovation is increasingly "service-faced" through chatbots/virtual assistants; Its effectiveness is greatly influenced by the socio-economic context (residence, occupation, income, education), so that research shifts from neutral-technological to human-centered and highlights inequality in access and literacy (Pislaru et al., 2024). In education, generative AI such as ChatGPT accelerates innovation but raises governance, ethics, and policy issues such as challenges to the originality of assessments that force institutions to organize implementation strategies and new rules of the game (Ratten & Jones, 2023). In tourism/local communities, AI

supports smart management, VR heritage, intelligent services, and translation tools that enrich experiences and economic benefits, but also raises generation gaps, risks of cultural commodification, and shifts in communication/tradition, so that research attention is strengthened on socio-cultural impacts and ethical governance needs (Tan et al., 2025).

In summary, the major trend of digital innovation research leads to: (1) AI as the backbone of value creation through automation prediction analytics (Aldoseri et al., 2024); (2) human context and social structure as determinants of impact inequality (Pislaru et al., 2024; Tan et al., 2025); and (3) the strengthening of governance/ethics/policy issues when innovation disrupts old practices and creates new risks (Ratten & Jones, 2023; Tan et al., 2025). From this trend, there is a consistent gap: many ideas are still conceptual/reviewed, so they need a strong empirical test of the effectiveness of the framework and the impact of implementation policies (Aldoseri et al., 2024; Ratten & Jones, 2023); Cross-context generalizations are still weak, so comparative studies across regions/sectors (rural-urban, advanced-developing, public-private) are still needed (Pislaru et al., 2024; Tan et al., 2025); truly tested inclusive interventions (AI literacy, age-friendly design, public communication strategies) are still limited; and standardization of impact metrics (trust, equity impact, service quality, socio-cultural sustainability) has not been established even though monitoring/metrics are often emphasized (Aldoseri et al., 2024; Pislaru et al., 2024; Tan et al., 2025).

In the realm of education more specifically, digital innovation is understood as organizational change supported by leadership, policies, digital competencies, and AI integration. A bibliometric study on digital leadership shows that publication growth has increased, especially after 2010 and peaked around 2023, with themes that move from the general issue of technology-based leadership to digital transformation, digital competence, to AI integration, placing digital leadership as a lever for innovation success in schools and colleges (OKunlola & Naicker, 2025). A case study in Slovenia confirms that the implementation of AI in courses not only pursues learning efficiency, but is also linked to the SDGs; AI can drive many targets but carry risks that can hinder certain targets, especially data privacy and equal access, so that governance and equity are key indicators of innovation success (Jamil et al., 2025). The study in Nigeria added that the adoption of ChatGPT in education is strongly influenced by psycho-social factors (usefulness, convenience, influence of colleagues, anxiety, trust, privacy concerns) as well as the infrastructure context confirming that digital innovation depends on teacher readiness and resource conditions (Ayanwale et al., 2025). Correspondingly, business/management education features trends in platform integration, AI, hybrid learning, and micro-credentials for job market relevance (Madegowda, 2025), while the 4IR context in higher education highlights the integration of AI/big data as a catalyst for curriculum renewal and industry collaboration, implementation is still uneven and depends on institutional readiness (Samuels & Singh, 2025). Critical literature is also strengthening: criticism of technosolutionism shows that post-pandemic digitalization is often framed as a universal solution even though it has the potential to widen inequality, strengthen the dominance of EdTech, and encourage the privatization of education (Solé Blanch, 2025); even value/ethics studies emphasize the opportunity for AI transformation as well as the risk of dehumanization if there is no ethical framework that favors human dignity and marginalized groups (Niemandt & Niemandt, 2025). The gap that stands out in this cluster is the inequality of access and readiness of human resources/infrastructure, especially in developing countries (Madegowda, 2025; Samuels & Singh, 2025), weak AI policy/ethics framework and data protection (Solé Blanch, 2025), as well as the lack of long-term empirical synthesis related to the effectiveness of 4IR implementation (Samuels & Singh, 2025).

Recent trends also affirm AI as a driver of innovation through strengthening human capacity: in Vietnam, the development of AI literacy of teachers is seen as strategic and requires contextual training, collaborative networking (e.g. PLC), as well as policy support to be sustainable; AI that reduces administrative burden opens up a teacher's space to focus on learning design and student engagement (Tuan et al., 2025). In online learning, data-driven/AI-based personalization through a recommendation system is projected to increase engagement, retention, performance, and satisfaction, while being potentially inclusive if designed for a diversity of needs but research emphasizes evaluation based on performance metrics and learning experience (Sakri et al., 2025). At the macro level, bibliometrics on educational decision-making highlight the literature often focuses on the classroom but less on the systemic consequences for leadership/policy; Strong attention to AI ethics, algorithmic bias, data governance, and the need for proactive decision models (Prasad et al., 2025). Consistent gaps in these three trends are the rural-urban digital divide and funding limitations that hinder the equitable distribution of AI literacy (Tuan et al., 2025), lack of longitudinal and cross-demographic evidence to assess the impact of personalization over time (Sakri et al., 2025), as well as lagging behind governance/decision frameworks compared to the pace of technology so that institutional decisions tend to be reactive and the empirical basis for ethical governance is still lacking (Prasad et al., 2025).

At the micro level of educational meso, AI is seen as improving the quality of educational services through personalization, assessment, and management efficiency; including opportunities to support diverse learning needs and strengthen adaptive learning experiences (Nazarena Patrizi et al., 2024). The trend of using smart agents (chatbots/virtual tutors) is strengthening as scaffolding and feedback, but still demands teacher supervision so as not to trigger exclusion (Nazarena Patrizi et al., 2024). At the institutional level, the success of AI transformation is increasingly associated with a leadership mindset (proactivity, empathy/perspective taking) and ambidextrous leadership to balance innovation exploration and targeted implementation (Pietsch & Mah, 2025). The institutional context is also important: in religious education, digital transformation requires institutional strategies (infrastructure, stakeholder collaboration) as well as learning updates (LMS, flipped classroom) that remain in line with values, including content ethics and strengthening teacher competencies (Wedi et al., 2025). The recurrent gap in this cluster includes the need for a more robust evaluation

methodology (Nazarena Patrizi et al., 2024), generalizations and cross-contextual longitudinal evidence (Pietsch & Mah, 2025), barriers to access/infrastructure and human resource readiness (Wedi et al., 2025), as well as the limitations of ethical implementation models that are measurable and can be tested for their long-term impact (Pietsch & Mah, 2025; Wedi et al., 2025).

Table 3. included.

Authors	Title	Year	Journal	Country	Author Affiliation	Subject or Educational Level
Tan, X., Ismail, N.A., Hussein, M.K.	Evaluation of AI, communication, and social behavior in ancient Chinese villages: A systematic review of tourism's role in resident adaptation	2025	Environment and Social Psychology	Malaysia	Universiti Putra Malaysia	Tourism, AI, Communication, Social Adaptation, Rural Areas
Ratten, V., Jones, P.	Leading the AI transformation in schools: It starts with a digital mindset	2025	The International Journal of Management Education	Australia, UK	La Trobe Business School, Swansea University	Management Education, AI, Digital Transformation in Schools
Abdulaziz Aldoseri, Khalifa N. Al-Khalifa, Abdel Magid Hamouda	AI-Powered Innovation in Digital Transformation: Key Pillars and Industry Impact	2024	Sustainability	Qatar	Engineering Management Program, College of Engineering, Qatar University, Doha, Qatar	Engineering Management, AI, Digital Transformation, Industry Impact

Marius Pislaru, Ciprian Sorin Vlad, Larisa Ivascu, Iulia Ioana Mircea	Citizen-Centric Governance: Enhancing Citizen Engagement through Artificial Intelligence Tools	2024	Sustainability	Romania	Department of Engineering Management, Faculty of Industrial Design and Business Management, 'Gheorghe Asachi' Technical University of Iasi, Romania; Department of Management, Research Center for Engineering and Management (RCEM), Politehnica University of Timisoara, Romania	Citizen-Centric Governance, AI Tools in Governance, Public Administration
Hajar Darif, Mohammed Amine Lafraxo	Teaching and Learning in Health Sciences in the Era of Educational Technologies: A Bibliometric Analysis	2025	Educational Process: International Journal	Morocco	Higher Institute of Nursing Professions and Health Techniques, Oujda, Morocco; Laboratory of Biology and Health, Ibn Tofail University, Kenitra, Morocco	Health Sciences, Educational Technology, Pedagogical Practices, Bibliometric Analysis
Musa Adekunle Ayanwale, Owolabi Paul Adelana, Nurudeen Babatunde Bamiro, Stella Oluwakemi Olatunbosun, Kabir Oluwatobi Idowu, Kayode A. Adewale	Large language models and GenAI in education: Insights from Nigerian in-service teachers through a hybrid ANN-PLS-SEM approach	2025	F1000Research	Nigeria	Department of Mathematics, Science and Technology Education, University of Johannesburg, South Africa; Institute of Educational Technology, The Open University, UK; Department of Economics, Universiti Pendidikan Sultan Idris, Malaysia; Department of Educational	Generative AI, Large Language Models, Teacher Training, Educational Technology, AI Adoption, Technology Acceptance

					Psychology, University of Johannesburg, South Africa; Department of Mathematics, Purdue University, USA; Department of Counseling Psychology and Educational Foundations, Tai Solarin University of Education, Nigeria	
Zawaqi Afdal Jamil, Nurhuda, Alfian, Siti Mariah Ulfah, Rasidin, Ahmad Youssef	Program Evaluation Study on Islamic Religious Education in Pesantren: Addressing Educational Degradation in the Digital Era	2025	Jurnal Pendidikan Agama Islam, Vol. 22(1)	Indonesia & Egypt	UIN Sulthan Thaha Saifuddin Jambi; Al-Azhar Al-Sharif Cairo	Pesantren / Islamic Boarding School Education (Teachers, Kyai, students; institutional system level)
John Olayemi OKunlola, Suraiya Rathankoo mar Naicker	Digital Leadership in Education: A Bibliometric Analysis of Research Trends from 1993 to 2024	2025	F1000Researc h	South Africa	Department of Education Leadership and Management, University of Johannesburg, South Africa	Digital Leadership, Educational Technology, Bibliometric Analysis, AI in Education, Leadership 4.0
Dr. J. Madegowda	Current Trends in Business and Management Education: Innovations, Challenges, and Future Directions	2025	Asian Journal of University Education	India	Department of Business Administration, Vidyavardhaka College of Engineering, Mysuru, Karnataka, India	Business Education, AI in Learning, Globalisation, Ethics in Education
Jordi Solé Blanch	Techno-solutionism and pedagogy in the digital age of capitalism	2025	Digital Education Review	Spain	Open University of Catalonia, Spain	Digital Pedagogy, Technosolutionism, Educational Innovation, Artificial Intelligence

Cornelius J.P. Niemandt, Doret Niemandt	Joining the Spirit: Missio Dei and Artificial Intelligence in Digital Missional Praxis	2025	HTS Teologiese Studies/Theological Studies	South Africa	Department of Practical Theology and Missiology, Faculty of Theology and Religion, University of Pretoria, Pretoria, South Africa; School for Theology and Ministry, Hugenote Kollege, Wellington, South Africa	Missiology, Artificial Intelligence, Theology, Digital Mission, Missio Dei
Alexander B. Samuels, Upasana Singh	Education Reimagined: South Africa's Journey Through the 4IR and Beyond	2025	Transformation in Higher Education	South Africa	Department of Transport Economics and Logistics Management, Faculty of Economics and Management Sciences, North-West University, Mahikeng, South Africa; Department of Information Systems, University of KwaZulu-Natal, Durban, South Africa	Higher Education, 4IR, Digital Transformation, South Africa, Technology Integration, Pedagogical Innovation
Kim Manh Tuan, Mai Thi Khuyen, Nghiem Thi Thanh	Developing AI Literacy for Teachers in Vietnam's Schools: Challenges, Strategies, and Best Practices	2025	International Journal of Education and Practice	Vietnam	Vietnam National University, Hanoi, Vietnam	AI Literacy, Teacher Training, Educational Transformation, Vietnam K-12 Education

Leena I. Sakri, Daneshwari N. Kori, Sachidanand S. Joshi, Arati S. Nayak, Shweta Marigoudar	AI-Enabled Transformation of Online Learning through Personalization	2025	Journal of Engineering Education Transformations	India	SDM College of Engineering and Technology, Dharwad, Karnataka, India; GM University, Davanagere, Karnataka, India	Personalized Learning, AI, Big Data Analytics, Student Engagement, Online Learning
Rabindra Dev Prasad, Lim Seong Pek, Fatin Syamilah Che Yob, Wong Yee Von, Gilbert C. Magulod Jr., Dickson Adom	Navigating the Tech Turn: A Bibliometric Analysis of Decision-Making Trends in 21st Century Education	2025	International Journal of Learning, Teaching and Educational Research	Malaysia, Philippines, Ghana	INTI International University, Negeri Sembilan, Malaysia; Universiti Selangor, Selangor, Malaysia; Cagayan State University, Tuguegarao City, Philippines; Kwame Nkrumah University of Science and Technology, Ashanti Region, Ghana	Educational Technology, Decision-Making, AI in Education, Digital Transformation, Pedagogy
Nazarena Patrizi, Angelo Girolami, Claudia Crescenzi	The Contribution of Artificial Intelligence to the Qualification of Education Processes	2024	ECPS Journal	Italy	UniCamillus - International Medical University in Rome, Departmental Faculty of Medicine, Italy; Università degli Studi di Roma Tor Vergata, Department of History, Cultural Heritage, Education and Society, Italy	Artificial Intelligence, Educational Qualification, Learning Personalization, AI Tools in Education

Fear of the Unknown, Fear of the Unknown, Fear of the Unknown	Digital Transformation Model of Islamic Religious Education in the AI Era: A Case Study of Madrasah Aliyah in East Java, Indonesia	2025	International Journal of Learning, Teaching and Educational Research	Indonesia	State University of Malang, East Java, Indonesia; University of Muhammadiyah Malang, East Java, Indonesia	Islamic Religious Education, Digital Transformation, AI, Pedagogical Innovation
Marcus Pietsch, Dana-Kristin Mah	Leading the AI Transformation in Schools: It Starts with a Digital Mindset	2025	Education Tech Research Development	Germany	Leuphana University of Lueneburg, Universitätsallee 1, 21335 Lüneburg, Germany	AI Integration, School Leadership, Digital Mindset, Transformation in Schools

Based on the inclusion table (18 publications), the most striking pattern is the surge in publications in 2025. Of the 18 articles, 15 articles will be published in 2025 (≈83.3%) and only 3 articles in 2024 (≈16.7%). This usually signifies two things: (1) the issue of AI and digital transformation is "exploding" in academic interest, and (2) many researchers are moving quickly to pursue the practical implications of AI (particularly GenAI/LLM) before policy and practice in the field are truly stable. So, it's not just a trend, but a scientific "chase" phase.

In terms of country distribution, the contribution of research seems to be quite diffuse, but there is an interesting dominance from the context of the Global South. South Africa (3 articles) was the largest contributor, followed by India (2 articles), while other countries emerged with one article each (Malaysia, Nigeria, Vietnam, Indonesia, etc.), including several cross-border collaborations (e.g. Australia–UK and Malaysia–Philippines–Ghana). This implies that AI discourse in education and digital governance is not only monopolized by developed countries; instead, many developing countries are actively discussing AI because they feel the immediate impact: resource limitations, access inequalities, the need to accelerate service quality, and the encouragement of education system adaptation.

Thethematically, these studies are moving in several large clusters. First, AI in school leadership and transformation: themes such as *digital mindset*, digital leadership, and AI transformation strategies in schools emerge strongly (there are even titles that are very similar to repeats, indicating these themes are "selling hard"). Second, AI literacy and teacher capacity, for example the development of AI literacy for teachers (Vietnam) and the use of LLM/GenAI for the context of educator training or experience (Nigeria). Third, AI for online learning personalization, which emphasizes adapting materials/feedback according to learning needs. Fourth, there are more reflective-critical themes such as technologism and pedagogy (Spanish), which basically remind us: technology does not automatically solve educational problems if the pedagogical design is weak. Fifth, the spectrum of research also extends to health education, higher education for the SDGs, to the application of AI in the realm of governance (Romania) and even socio-cultural/community contexts.

If extracted, the most plausible interpretation would be: AI research and digital transformation are entering a consolidation phase, from simply "AI is cool" to focusing on human capacity (teachers/leaders), governance, social impact, and meaningful learning design. And yes, this is the part that humans often miss because they are too fascinated by new features: AI does not just replace traditional education, but shifts education towards a more personalized, data-driven, and quick to give feedback, while giving rise to classic challenges wrapped in new packaging: teacher readiness, quality of policies, ethics, bias, and the risk of pedagogical "automation" that actually dwarfs learning.

For the Indonesian context, the emergence of articles on the digital transformation of Islamic Religious Education in the AI era shows that AI discourse no longer stops at STEM or general edtech, but begins to enter the area of more specific and socially valuable educational curricula and practices. This means that the direction of research going forward is likely to be increasingly demanding: not only *whether AI is used*, but how AI is used with a clear value framework, learning objectives, and accountability. Without it, only cosmetic modernization happens: it looks sophisticated, the results are ordinary.

Application of Artificial Intelligence in Islamic Education

The application of AI in Islamic Education is now more appropriately understood as a transformation of the learning ecosystem and institutional governance, not just the addition of applications. The case study of Madrasah Aliyah in East Java shows that technology/AI integration runs through strengthening institutional strategies (infrastructure, stakeholder support) and pedagogical updates (LMS, flipped classroom) so that PAI is more adaptive, with the characteristic of "value

protection" through content alignment, teacher coaching, and moral dimension integration so that technology becomes a means of strengthening the goals of tarbiyah, not a substitute for educators (Wedi et al., 2025).

The influx of generative AI (e.g. ChatGPT) expands opportunities for learning and creativity support, but triggers academic integrity challenges because it is difficult to detect and disrupts traditional assessment patterns; In Islamic Education, this issue extends to the formation of manners, honesty, and scientific responsibility, so that more authentic assessments, habituation of reference literacy, and ethics of using AI to be productive without sacrificing trust are needed (Ratten & Jones, 2023).

The success of implementation is also determined by leadership: AI transformation is an organizational adaptation that requires a proactive and empathetic leader digital mindset so that change does not trigger resistance, as well as ensuring that AI policies are aligned with the Islamic vision, including data privacy, bias control, and ethical signs of religious content (Pietsch & Mah, 2025). At the implementation level, another key is teacher AI literacy which includes technical, pedagogical, and ethical aspects: teachers need to utilize AI for feedback/assessment/learning companions while controlling the risk of dependency, bias, and misinformation; in PAI, this requires the ability to verify references so that the material remains valid (Tuan et al., 2025).

Prominent research gaps include: infrastructure inequality and teacher competence that make madrasah transformation models difficult to generalize (Wedi et al., 2025); the lack of empirical evidence that measures the impact of AI on the typical achievements of Islamic Education (understanding of evidence, strengthening morals, learning manners), not just the general impact of education (Ratten & Jones, 2023; Wedi et al., 2025); and the need for an operational and tested governance framework in Islamic Education institutions to link leadership and AI literacy into consistent curriculum policies, assessments, and character development (Pietsch & Mah, 2025; Tuan et al., 2025).

Benefits and Challenges of AI Integration in Islamic Education

The integration of AI in Islamic Education offers the main benefits in the form of more personalized and adaptive learning: AI systems can adjust materials, tempo, and feedback according to the needs of relevant students, for example, for Qur'an reading exercises that can provide direct pronunciation/intonation corrections so that learning is more interactive and efficient. AI is also expanding access to Islamic learning resources for students in remote areas or with limitations, as digital services can bridge geographical and physical barriers (Pislaru et al., 2024). In terms of learning quality, AI-based personalized learning recommendations have been proven to have the potential to increase academic engagement, satisfaction, and performance through a more relevant and interactive learning experience. At the system level, AI supports a more responsive curriculum transformation with real-time learning progress analytics and curriculum adjustments to stay relevant to socio-technological changes (Madegowda, 2025).

However, the challenge is also big. First, there is a risk of cultural and epistemic bias because many models/algorithms are built from dominant Western data and paradigms, so caution is needed to ensure that the content and logic of AI are aligned with Islamic values and epistemology. Second, the digital divide (device and internet access) can uneven the benefits of AI and even widen educational inequalities, especially in less developed regions (Pislaru et al., 2024). Third, ethical and privacy issues increase because student data collection and algorithmic decisions risk data misuse, injustice, and low transparency; Therefore, a data protection policy and the use of accountable algorithms are needed (Madegowda, 2025). In madrasah practice, AI can help learning innovation (e.g. LMS and active learning reinforcement), but it still needs to strengthen values, teacher training, and content control to be in line with the goals of tarbiyah (Wedi et al., 2025). In addition, the adoption of AI in higher education as a 4IR response also demonstrates the need for institutional readiness—without training and organizational support, implementation tends to be uneven (Samuels & Singh, 2025; Tuan et al., 2025).

In summary, AI has the potential to enrich Islamic Education through personalization, access, and adaptive curriculum, but it must be supported by value-sensitive design, equitable distribution of infrastructure, teacher competency improvement, and clear ethical-privacy governance so as not to create bias, inequality, and data risks (Madegowda, 2025; Pislaru et al., 2024; Wedi et al., 2025).

The Impact of AI on the Quality of Islamic Education

The impact of AI on the quality of Islamic education can be understood as a lever for quality as well as a source of risk of inequality, so the results are highly dependent on human resource readiness, access, and governance. On the positive side, the quality of learning can improve when AI is used for personalization: online learning recommendation systems have the potential to increase engagement, retention, academic performance, and learning satisfaction which in the context of Islamic Education helps students learn according to their rhythm and needs (Sakri et al., 2025). At the institutional level, AI also strengthens quality through data analytics/predictive analytics, performance monitoring, and continuous learning that support academic decisions and continuous service improvement (Aldoseri et al., 2024). The learning experience can also be more interactive and inclusive through features such as translations, audio descriptions, instant feedback, and personalized content by AI agents.

However, this impact is not automatically evenly distributed: personalization faces the digital divide so that students with limited device/internet access are at risk of falling behind (Sakri et al., 2025), and the adoption of AI services such as chatbots is influenced by socio-economic factors (e.g., education and the living environment) so that the benefits can be

concentrated in a specific group without mentoring (Pislaru et al., 2024). In addition, AI brings ethical and epistemic consequences of data privacy, potential injustice, and epistemic bias if it is not contextualized and does not prioritize local knowledge that can shift the curriculum away from needs and values. Quality risks also arise from GenAI which is difficult to detect in tasks/assessments; Without assessment policies and designs that demand originality, academic integrity and learning authenticity can be weakened (Ratten & Jones, 2023).

Therefore, the quality of Islamic education tends to improve when AI is integrated as a measurable and value-based transformation: strengthening institutional strategies (infrastructure and stakeholder collaboration), updating pedagogy (LMS, flipped classroom), and maintaining values through ethical content filtering and teacher training based on Islamic principles (Wedi et al., 2025). Strengthening teacher AI literacy is also important because it can reduce administrative burdens and open up space for learning design, student engagement, and real-time feedback, but still address resource gaps between regions (Tuan et al., 2025). Digital leadership and capacity-building support is needed to close the digital divide and ensure the ethical use of AI (OKunlola & Naicker, 2025), in line with findings that the integration of 4IR technology drives curriculum reform and educator training, but is often hampered by resource limitations, digital inclusivity, and policy gaps (Samuels & Singh, 2025).

Factors Influencing AI Adoption in Islamic Education

The adoption of AI in Islamic Education (madrasas, pesantren) is mainly influenced by the pedagogical benefits that feel that AI is more acceptable when proven to increase engagement, retention, academic performance, and learning satisfaction through personalization (Sakri et al., 2025), and expand access and a more interactive learning experience across space/language limitations. At the institutional level, adoption strengthens when there is readiness for digital transformation: data availability, analytical capacity, monitoring/metrics, and a culture of continuous learning for effective and sustainable implementation (Aldoseri et al., 2024).

The next determining factor is the readiness of human resources and change management: gradual integration, structuring of digital learning components (organizational methodology of evaluation resources), and continuous professional development to make adoption more stable, strengthening teachers' AI literacy through structured training and collaboration to improve the ability to utilize AI for learning (Tuan et al., 2025). In the context of madrasas, adoption is helped when institutions build infrastructure and stakeholder collaboration and then operationalize them through LMS and flipped classrooms, while maintaining value alignment through ethical content filtering and teacher training based on Islamic principles (Wedi et al., 2025).

In contrast, adoption is often held back by structural barriers: the digital divide, device/internet limitations, and cost/resources make adoption uneven (Sakri et al., 2025; Tuan et al., 2025), as well as resistance to pedagogical innovation and inequality of access to digital resources (Madegowda, 2025). Acceptance is also strongly influenced by trust, fairness, and ethical governance of data privacy, bias mitigation, transparency of algorithmic decisions, and usage policies that protect users and prevent inequality (Aldoseri et al., 2024; Pislaru et al., 2024). This is crucial for Islamic Education because AI that is not contextualized risks bringing knowledge bias/narrative that is not aligned with local scientific values and authorities, so it needs to audit accuracy and culturally-sensitive policies.

Finally, adoption is largely supported by leadership and system policies: strengthening digital leadership to close the digital divide, building data literacy/digital pedagogy, and ensuring the ethical use of AI (OKunlola & Naicker, 2025), as well as curriculum updates, ongoing training, and strategic partnerships within the 4IR framework with key barriers of resource constraints, digital inclusivity, and policy gaps (Samuels & Singh, 2025).

Discussion

The results of the synthesis of 18 publications show that digital innovation research is accelerating strongly (majority by 2025), indicating that GenAI/LLM is shifting the focus from mere tool adoption to system change; This acceleration is also largely driven by the context of the Global South (South Africa, India, Nigeria, Vietnam, Indonesia) which faces limited resources and access inequality (Ayanwale et al., 2025; OKunlola & Naicker, 2025; Samuels & Singh, 2025; Tuan et al., 2025; Wedi et al., 2025). Theoretically, digital innovation is increasingly understood as the transformation of organizational work based on AI analytics, automation, and generative AI—with the need for governance pillars (monitoring/metrics, continuous learning, data/predictive analytics, product innovation), so that research moves from "what is AI used for" to "how is it managed sustainably" (Aldoseri et al., 2024). In education, similar trends are seen in the integration of platforms, AI, hybrids, and micro-credentials for graduate relevance (Madegowda, 2025), as well as linkages to the SDGs that require measures of success including access to and protection of data (Jamil et al., 2025).

However, cross-sector results confirm that digital innovation is strongly influenced by the human context: the effectiveness of chatbot-based public services is related to socio-economic factors (education, income, employment status, residence), so the impact is uneven (Pislaru et al., 2024) in tourism/communities, AI provides benefits (smart management, VR heritage, translation tools) but poses the risk of generation gaps, cultural commodification, and socio-cultural behavior changes (Tan et al., 2025). In education, GenAI/ChatGPT shifts the focus to ethical governance of policy because it interferes with assessment and originality, so institutions need a clear implementation strategy (Ratten & Jones, 2023). This is in line with the findings that digital leadership is increasingly central (digital transformation, digital competence,

AI integration) (OKunlola & Naicker, 2025), as well as the importance of digital mindset and ambidextrous leadership to balance innovation exploration and targeted implementation (Pietsch & Mah, 2025).

At the micro level, the main prerequisite is teacher AI literacy: in Vietnam, the biggest barriers come from rural–urban gaps and training funding (Tuan et al., 2025) in Nigeria, GenAI adoption is influenced by usability/ease perceptions, peer influence, technology anxiety, trust, and privacy concerns (Ayanwale et al., 2025). AI-based personalization is projected to increase engagement retention performance satisfaction, but is prone to reinforcing the digital divide and needs longitudinal evidence across demographics (Sakri et al., 2025).

In Islamic Education, AI-based digital innovation requires value preservation and contextual implementation: the transformation of PAI in Madrasah Aliyah East Java takes place through strengthening institutional strategies (infrastructure, stakeholder collaboration) and pedagogical renewal (LMS, flipped classroom), accompanied by ethical content filtering, teacher development based on Islamic principles, and value-based design (Wedi et al., 2025). This governance need is in line with the issue of academic integrity and GenAI policies (Ratten & Jones, 2023) and leadership demands to manage privacy, content quality, and direction of change (Pietsch & Mah, 2025). Criticism of techno-solutionism also warns that technology does not automatically improve education, which has the potential to widen inequality and shift pedagogical orientation if there is no institutional control (Solé Blanch, 2025) Meanwhile, the humanitarian-ethical perspective emphasizes the importance of maintaining human dignity and partiality towards marginalized groups so that dehumanization does not occur. (Niemandt & Niemandt, 2025).

Consistent output gaps emerge at four points: (1) the dominance of conceptual/review/bibliometric studies so that the effectiveness of the AI pillar framework and the impact of GenAI policies still need strong field evidence (Aldoseri et al., 2024; Ratten & Jones, 2023) (2) weak cross-contextual generalizations so that cross-cultural/regional comparative studies are needed (Pislaru et al., 2024; Tan et al., 2025) (3) lack of truly tested inclusion interventions for vulnerable groups (rural, elderly, low-power institutions) (Tan et al., 2025; Tuan et al., 2025) and (4) the standardization of metrics (trust, equity impact, service quality, privacy, socio-cultural sustainability) has not been established even though monitoring/metrics are often emphasized (Aldoseri et al., 2024; Pislaru et al., 2024; Tan et al., 2025). Therefore, further research needs to strengthen empirical-longitudinal evidence, expand the cross-regional context, and develop operational metrics and policies to ensure that digital innovation is truly inclusive and ethical, especially in assessments, data privacy, and cultural/religious value spaces (Jamil et al., 2025; Prasad et al., 2025; Sakri et al., 2025; Solé Blanch, 2025; Wedi et al., 2025).

Conclusion

A synthesis of the literature shows that AI-based digital innovations, especially GenAI/LLM, have shifted educational reform from simply "using technology" to transforming learning systems and institutional governance. On the one hand, AI has the potential to improve the quality of learning through personalization, learning analytics, and more responsive services; This can be seen in the findings that personalized learning can increase engagement, retention, academic performance, and learning satisfaction (Sakri et al., 2025), as well as in a digital innovation framework that emphasizes data analytics, predictive analytics, monitoring/metrics, and continuous learning to strengthen decisions and improve services in a sustainable manner (Aldoseri et al., 2024). However, these positive impacts are not automatically evenly distributed because they are heavily influenced by the human context and access: the digital divide, literacy variations, and socio-economic determinants can make the benefits of innovation concentrated in certain groups (Pislaru et al., 2024; Sakri et al., 2025). In the realm of education, GenAI such as ChatGPT also poses disruptions to assessment and academic integrity, so the adoption of AI requires clear policies and implementation strategies, not just the use of tools (Ratten & Jones, 2023). In the context of Islamic Education, the findings affirm the need for "value guarding" so that AI integration is in line with the goal of tarbiyah: PAI's digital transformation becomes effective when strengthening institutional strategies (infrastructure and stakeholder collaboration) followed by pedagogical updates (LMS and flipped classrooms), and are monitored through ethical content filtering, teacher coaching based on Islamic principles, and value-based learning design (Wedi et al., 2025). Thus, AI can strengthen the quality of Islamic education when guided by good leadership, literacy, and governance, but also risks widening inequality and weakening the authenticity of learning if applied without control (Niemandt & Niemandt, 2025; OKunlola & Naicker, 2025; Pietsch & Mah, 2025; Solé Blanch, 2025).

Recommendation

Islamic educational institutions are advised to integrate AI in a gradual, measurable, and value-based manner through a clear implementation roadmap starting from high-impact but low-risk needs, while establishing success indicators that are not only academic but also include integrity, equity of access, and alignment of values. Strengthening the capacity of human resources needs to be a priority: multi-level training for teachers/ustadz and leaders so that AI literacy includes technical, pedagogical, and ethical aspects, considering that adoption is strongly influenced by the perception of usability/convenience, social influence, technological anxiety, trust, and privacy issues (Ayanwale et al., 2025; Tuan et al.,

2025). At the managerial level, strengthening digital leadership is important so that transformation does not stop at the use of platforms, but rather becomes consistent system changes, including the ability of leaders to balance innovation exploration and targeted implementation (OKunlola & Naicker, 2025; Pietsch & Mah, 2025). At the policy level, institutions need to build operational governance: data protection, transparency of the use of AI, bias mitigation, curation/control of religious content, and guidelines for the use of GenAI in assignments and assessments to maintain scientific authenticity and trust (Rats & Jones, 2023). The equitable access strategy also needs to be a core agenda so that AI does not widen the digital divide, for example through minimum infrastructure support and mentoring schemes for low-power institutions (Pislaru et al., 2024; Samuels & Singh, 2025). For the development of knowledge, further research needs to be directed at empirical-implementive and longitudinal studies that test the impact of AI in Islamic education not only on general academic achievements, but also typical indicators such as reference quality, scientific mandate, learning manners, and internalization of values as well as cross-contextual comparative studies (rural urban, high-power, low-power) so that the findings can be more generalized (Niemandt & Niemandt, 2025; Solé Blanch, 2025; Wedi et al., 2025).

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