Jurnal Ilmu Pendidikan dan Sosial (JIPSI)
Vol 5, No.1 April 2026
E-ISSN: 2829-2723
DOI: 10.58540/jipsi.v5i1.2125

THE UTILIZATION OF ARTIFICIAL INTELLIGENCE (AI) IN ISLAMIC EDUCATION ADMINISTRATION: AN ANALYTICAL STUDY OF IMPLEMENTATION, CHALLENGES, AND OPPORTUNITIES IN ISLAMIC EDUCATIONAL INSTITUTIONS

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Abstrak

Kemajuan pesat teknologi Kecerdasan Buatan (AI) telah mengubah berbagai sektor secara signifikan, termasuk manajemen pendidikan. Namun, penerapannya dalam administrasi pendidikan Islam masih belum dieksplorasi secara memadai, terutama dalam konteks Indonesia. Penelitian ini bertujuan untuk menganalisis implementasi teknologi AI dalam administrasi lembaga pendidikan Islam, mengidentifikasi tantangan yang dihadapi, dan memetakan peluang yang muncul dari adopsinya. Penelitian ini menggunakan pendekatan kualitatif dengan desain studi kasus multi-situs, yang dilakukan di tiga lembaga pendidikan Islam di Jawa dan Kalimantan. Data dikumpulkan melalui wawancara mendalam, observasi partisipatif, dan studi dokumentasi yang melibatkan 24 informan kunci yang terdiri dari kepala sekolah, wakil kepala sekolah urusan administrasi, staf pengajar, dan staf teknologi informasi. Analisis data dilakukan dengan menggunakan model interaktif Miles dan Huberman, sedangkan validitas data diuji melalui triangulasi sumber dan triangulasi metode. Temuan menunjukkan bahwa implementasi AI dalam administrasi pendidikan Islam mencakup lima domain utama: manajemen penerimaan siswa, penjadwalan akademik, evaluasi kinerja siswa, manajemen dokumen, dan pengembangan profesi guru. Studi ini juga mengidentifikasi tiga tantangan utama, yaitu keterbatasan infrastruktur digital, kesenjangan kompetensi sumber daya manusia, dan kekhawatiran mengenai penyelarasan nilai-nilai Islam. Sementara itu, peluang yang diidentifikasi termasuk peningkatan efisiensi operasional, pengambilan keputusan berbasis data, dan potensi pengembangan sistem AI yang didasarkan pada nilai-nilai Islam. Penelitian ini menyumbangkan kerangka konseptual baru yang ditetapkan sebagai model "AI-Based Islamic Education Administration" (ABIEA), yang mengintegrasikan prinsip-prinsip teknologi AI dengan nilai-nilai manajemen pendidikan Islam. Implikasi praktis dari penelitian ini memberikan acuan strategis bagi lembaga pendidikan Islam dalam merumuskan kebijakan adopsi AI yang efektif, etis, dan selaras dengan nilai-nilai pendidikan Islam.

Kata kunci: Kecerdasan Buatan, Administrasi Pendidikan Islam, Teknologi Pendidikan, Manajemen Madrasah, Transformasi Digital

Abstract

The rapid advancement of Artificial Intelligence (AI) technology has significantly transformed various sectors, including education management. However, its application in Islamic education administration remains inadequately explored, particularly within the Indonesian context. This study aims to analyze the implementation of AI technology in Islamic educational institution administration, identify the challenges faced, and map the opportunities that arise from its adoption. This research employs a qualitative approach with a multi-site case study design, conducted at three Islamic educational institutions in Java and Kalimantan. Data were collected through in-depth interviews, participatory observation, and documentation studies involving 24 key informants comprising school principals, vice principals for administrative affairs, teaching staff, and information technology staff. Data analysis was performed using Miles and Huberman's interactive model, while data validity was tested through source triangulation and method triangulation. The findings indicate that AI implementation in Islamic education administration encompasses five main domains: student admission management, academic scheduling, student performance evaluation, document management, and teacher professional development. The study also

identifies three primary challenges, namely digital infrastructure limitations, human resource competency gaps, and concerns regarding Islamic values alignment. Meanwhile, the opportunities identified include enhanced operational efficiency, data-driven decision-making, and the potential for developing AI systems grounded in Islamic values. This research contributes a novel conceptual framework designated as the "AI-Based Islamic Education Administration" (ABIEA) model, which integrates AI technology principles with the values of Islamic education management. The practical implication of this study provides a strategic reference for Islamic educational institutions in formulating AI adoption policies that are effective, ethical, and aligned with Islamic educational values.
Keywords: *Artificial Intelligence, Islamic Education Administration, Educational Technology, Madrasah Management, Digital Transformation*

Introduction

The era of the industrial revolution 4.0 and Society 5.0 has brought fundamental changes in almost all aspects of human life, including the education sector. Artificial intelligence (AI) technology is no longer just a futuristic concept, but a reality that is present and affects the way educational institutions are managed and operated. According to the Global Education Technology Market report published by HolonIQ (2023), global investment in the AI-based education sector reached USD 6.1 billion in 2022 and is projected to grow to USD 25.7 billion by 2030, reflecting a significant surge in the adoption of AI technology in the educational environment.

In Indonesia, the phenomenon of digital transformation in the education sector has received serious attention from the government. The Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) through the Education Digital Transformation Roadmap 2020–2035 has established AI as one of the main pillars in the modernization of the national education system. Data from the Ministry of Religion (2023) recorded that there are 83,541 madrassas and 36,715 Islamic boarding schools spread throughout Indonesia, making Islamic educational institutions the largest segment in the national education ecosystem. However, the adoption of AI technology in these institutions is still far behind that of public schools, with only 12.3% of public madrasas and 4.7% of private madrasas having implemented AI-based systems in their administrative processes (IAARD of the Ministry of Religion, 2023).

This gap creates serious problems in the context of competitiveness and quality of education services. Conventional and manual education administration not only wastes time and energy, but is also prone to human error, inefficiencies in data management, and delays in data-driven decision-making. Effendi and Wahyudi's (2022) study found that the average administrative staff in madrassas spend 68% of their total working time on repetitive administrative tasks that could potentially be automated through AI technology, so that only 32% of time is left for strategic tasks and institutional development.

The urgency of this research is reinforced by the fact that although the literature on AI in general education has developed rapidly, specific studies on the implementation of AI in the context of Islamic educational administration are still very limited. Most of the existing research focuses on pedagogical and learning aspects, while the administrative and managerial dimensions of AI-based Islamic educational institutions have not received adequate attention from the academic community. This is a significant research gap considering that Islamic educational institutions have different characteristics, values, and managerial complexity from general educational institutions.

Method

This study uses a qualitative approach with a multi-site case study design. The selection of a qualitative approach is based on the consideration that the phenomenon of AI implementation in Islamic education administration is a complex, contextual, and requires a deep understanding that cannot be reduced to numerical data alone (Creswell & Poth, 2018). The multi-site design was chosen to allow comparison and analytical generalization between research sites that have different characteristics but are relevant to the focus of the study (Yin, 2018).

The research was conducted in three purposively selected Islamic educational institutions based on criteria: (1) have implemented at least one AI-based system in the past two years; (2) representing a variety of types of institutions (state madrasas, private madrasas, and modern Islamic boarding schools); and (3) located in different regions to represent diverse socio-cultural contexts. The research sites include: (a) Madrasah Aliyah Negeri (MAN) 1 Yogyakarta which has implemented AI for the new student admission system and academic scheduling since 2022; (b) Madrasah Tsanawiyah (MTs) is a private pesantren based in East Java that uses AI applications for student management and reporting to guardians; and (c) Madrasah Ibtidaiyah Negeri (MIN) in West Kalimantan which adopts an AI system for document management and digital report cards.

The technique of determining informants uses purposive sampling and snowball sampling. The total number of informants involved was 24 people consisting of: heads of madrasas/institutions (3 people), deputy heads of curriculum (3 people), deputy heads of administration (3 people), information technology staff (3 people), educators (6 people), education/administration staff (3 people), and committee/foundation administrators (3 people). The selection of informants takes into account direct involvement in the AI implementation process and in-depth knowledge of the administration of Islamic educational institutions.

Data was collected through three main techniques. First, in-depth interviews were conducted in a semi-structured manner with a duration of 60–90 minutes per session with all informants, using interview guidelines that have been validated by two Islamic education management experts. Second, participatory observations were conducted for two weeks each at each research site to directly observe the running AI-based administrative processes, user interaction with the system, and the social dynamics that accompany the implementation of the technology. Third, the documentation study includes an analysis of internal policy documents, system usage reports, administrative performance data before and after the implementation of AI, and correspondence archives related to technology adoption.

Data analysis uses the interactive analysis model of Miles, Huberman, and Saldaña (2014) which consists of four simultaneous activity flows: (1) data condensation through coding, categorizing, and memoing; (2) data display in the form of matrices, charts, and descriptive narratives; (3) drawing and verifying conclusions; and (4) the researcher's reflexivity as the main instrument. The coding process uses three stages: open coding to identify the initial theme, axial coding to connect related themes, and selective coding to formulate core themes.

The validity of the data was tested through four criteria by Lincoln and Guba (1985): (1) credibility through source triangulation (comparing data from different informants), method triangulation (comparing interview, observation, and document data), and member checking; (2) transferability through the preparation of thick descriptions that allow readers to assess the

relevance of findings to other contexts; (3) dependability through trail audit and peer debriefing with two research colleagues; and (4) confirmability through reflexivity journal and negative case analysis.

Result and Discussion

Domain of AI Implementation in Islamic Education Administration

Based on cross-site data analysis, this study identifies five main domains of AI implementation in the administration of Islamic educational institutions studied, as summarized in Table 1.

Table 1. Domain of AI Implementation in Islamic Education Administration

No.	Domain	AI Technology Used	Adoption Rate
1	Student Admission Management (PPDB)	ML-based recommendation system, document OCR	Height (MAN, MTs)
2	Academic Scheduling	Genetic optimization algorithms, AI scheduler	Medium (MAN)
3	Student Performance Evaluation	Predictive analytics, NLP for feedback	Medium (MAN, MIN)
4	Document Management	OCR, automated document classification, DMS-AI	Low (MIN)
5	Professional Development of Teachers	AI-based training recommendation system	Low (MTs)

The first domain, new learner admission management (PPDB), is the area with the highest adoption of AI among research sites. MAN 1 Yogyakarta and MTs based on Islamic boarding schools in East Java have implemented an AI system that is able to process registration documents automatically using Optical Character Recognition (OCR) technology, verify population data in real-time, and provide recommendations for admission decisions based on report card scores, entrance test results, and institution-specific criteria. This system has been proven to cut the PPDB process time from an average of 14 days to only 3 working days, with a document verification accuracy rate of 94.7%.

"In the past, we needed more than a week just to verify the file. Now with the AI system in place, within one day all files have been verified and the recommendations are out. But we are still the ones who decide the final," said the Head of Administration of MAN 1 Yogyakarta in a research interview (Informant A-2, March 14, 2024).

The second domain, academic scheduling, was implemented specifically at MAN 1 Yogyakarta using a multi-criteria optimization-based AI algorithm that was able to compile lesson schedules for 42 study groups by considering 17 simultaneous variables, including teacher availability, space capacity, needs for Islamic religious subjects at a given time, and pedagogical preferences. The system produces an optimal schedule in less than 10 minutes, compared to manual processes that previously took three to four weeks.

The third domain, student performance evaluation, was implemented at MAN 1 Yogyakarta and MIN West Kalimantan. The AI-based predictive analytics system helps identify students who are at risk of declining achievement or dropping out of school, with a predictive accuracy of 82.6% based on analysis of attendance patterns, daily test scores, interactions with digital learning platforms, and demographic data. These findings allow for more effective early intervention from educators and academic advisors.

The fourth domain, AI-based document management, is implemented mainly in MIN West Kalimantan through a Document Management System (DMS) system equipped with AI

capabilities to classify, index, and archive administrative documents automatically. The system has successfully reduced document search time from an average of 23 minutes to less than 2 minutes, while increasing the accuracy rate of document classification by 91.3%.

The fifth domain, AI-based teacher professional development, was found in the early stages of implementation in Islamic boarding school-based MTs in East Java. The AI-based recommendation system analyzes teacher competency profiles, performance assessment results, and student feedback to provide personalized training program recommendations. Although it is still in the trial stage, the system received a positive response from 73% of the teachers involved.

Challenges of AI Implementation in Islamic Education Administration

The data analysis shows three main groups of challenges faced by Islamic educational institutions in implementing AI, as visualized in Table 2.

Table 2. AI Implementation Challenges by Category and Severity

Challenge Categories	Sub-Challenges	Frequency	Severity
Digital Infrastructure	Limitations of the internet network; inadequate hardware; Power outages	21/24 (87,5%)	Height
HR Competencies	Low digital literacy; resistance to change; Lack of ongoing training	19/24 (79,2%)	Height
Harmony of Islamic Values	Concerns about dehumanization; data privacy issues; loss of personal touch in the service	16/24 (66,7%)	Medium
Financing	The cost of software licensing is high; maintenance costs; Budget constraints of private madrassas	20/24 (83,3%)	Height
Regulations and Policies	Unclear data protection regulations; lack of guidance from the Ministry of Religion on AI	14/24 (58,3%)	Medium

Digital infrastructure challenges are the most common obstacles complained about by informants (87.5%). In MIN West Kalimantan, for example, an unstable internet connection with an average speed of only 4 Mbps for all institutions causes cloud-based AI systems to often not be able to operate optimally. The head of MIN West Kalimantan stated: "The system is good, but if the internet goes down, everything stops. We still have to have a plan B with a manual system" (Informant C-1, April 22, 2024).

HR competency challenges are also very significant, with 79.2% of informants citing it as the main obstacle. An interesting finding here is that resistance to AI stems not solely from technical incompetence, but also from existential anxiety that AI will replace the role of humans. An administrative staff at MTs East Java said: "I'm afraid that if everyone uses AI, I won't be needed anymore. Even though I have served here for 15 years" (Informant B-5, April 8, 2024).

The challenge of the alignment of Islamic values reflects a unique dimension that is only found in the context of Islamic education. As many as 66.7% of informants expressed concern that the use of AI could reduce the quality of personal relationships (ukhuwah) between institutions and students and parents, a value that is highly upheld in the Islamic educational tradition. In addition, the issue of data privacy is a serious concern considering the Islamic principles of safeguarding the honor and privacy of individuals (hifdz al-nafs).

Strategic Opportunities for AI Implementation in Islamic Education Administration

Behind the existing challenges, this study identifies three groups of strategic opportunities that Islamic educational institutions can take advantage of from AI adoption. First, the opportunity for operational efficiency: based on a comparison of performance data before and after the implementation of AI at the research site, the average efficiency of administrative time increased by 58.3%, administrative operational costs decreased by 34.7%, and the rate of data processing errors decreased from 12.4% to 2.1%. These figures represent a very significant potential for improving the quality of service for learners and other stakeholders.

Second, data-driven decision-making opportunities: the implementation of AI allows leaders of Islamic educational institutions to access real-time analytics dashboards that provide a comprehensive picture of the institution's performance, student development trends, and other critical indicators. MAN 1 Yogyakarta reported that since the implementation of the AI-based analytics system, madrasah heads have been able to identify and handle students' academic problems 3.2 times faster than before.

Third, opportunities for the development of AI based on Islamic values: this study finds great potential to develop AI systems that inherently reflect Islamic values, such as fairness in selection (al-adl), transparency in assessment (al-amanah), and orientation to the excellence of students (maslahah al-mutaallim). Several educators at MTs East Java even conveyed the vision of developing "AI that can understand the values of Islamic boarding schools" as an innovation worth pursuing.

Discussion

Implementation of AI in Islamic Education Administration: Linking Findings to Theory

The findings of this study show that the implementation of AI in Islamic education administration is selective and gradual, following a pattern that Rogers (2003) in Diffusion of Innovation Theory calls the "early adoption phase" with the characteristics of adoption by innovators and early adopters amounting to about 10–15% of the total population. The PPDB domain as the highest adoption area can be explained through the perspective of Davis' (1989) Technology Acceptance Model (TAM): AI technology is perceived to have high usefulness and perceived ease of use in the context of PPDB, which is a process with a high workload and tight deadlines.

The finding that AI systems are able to cut PPDB time from 14 days to 3 days (a 78.6% decrease) is in line with the research of Chen et al. (2022) who reported an average increase in administrative efficiency of 45–80% through AI implementation. However, the context of Islamic education adds a new dimension that is not found in general research: consideration of certain times that are sacred in the Islamic educational calendar (e.g., avoiding the selection process in the month of Ramadan) is also a parameter that must be considered in the design of AI systems. This is a novelty that has never been discussed in the AI-educational literature before.

Within the framework of Senge (1990) Organizational Learning theory, the implementation of AI in Islamic educational institutions that was studied encouraged the occurrence of two levels of learning: single-loop learning (increasing efficiency in existing processes) and double-loop learning (paradigm change in how Islamic education administration should be run). MAN 1 Yogyakarta showed signs of double-loop learning when madrasah heads reformulated the vision of "madrasah as a data-driven institution" in response to the analytical capabilities provided by the AI system.

Challenges and Relevance to Previous Research

The infrastructure challenges identified in this study strengthen and expand the findings of Anwar and Islamiyah (2022) on the digital divide in Islamic educational institutions. If Anwar and Islamiyah only examine the limitations of infrastructure as a constraint, this study reveals a more complex dimension: inadequate infrastructure not only hinders technical implementation, but also creates a dual dependency (AI and manual) that actually increases the administrative workload in the short term. This is a new finding that enriches understanding of the challenges of AI adoption in the context of educational institutions with limited infrastructure.

The identified HR competency challenges are in line with the findings of Budiarto and Setiawan (2023), but this study finds a new dimension called "AI anxiety". This phenomenon, where administration personnel are worried that AI will replace their role, differs from conventional technological resistance that generally stems from discomfort with using new technologies. AI anxiety in the context of Islamic education has an additional nuance because it is related to the philosophical question of the meaning of devotion (khidmah) in the Islamic tradition: can administrative work performed sincerely as worship be replaced by algorithms?

The challenge of aligning Islamic values is the most original finding of this study. Although Al-Mubarak and Hanafi (2021) have touched on the issue of the compatibility of technology with Islamic values, they do not specifically analyze the dimensions of AI. This study found three specific concerns related to Islamic values in the implementation of AI: (1) the risk of dehumanization that is contrary to Islamic principles of respect for human dignity (karamah al-insan); (2) data privacy issues related to the principles of HIFDZ al-NAFS and HIFDZ al-IRD; and (3) the potential for algorithmic bias that can contradict the principles of al-ADL (justice). These three concerns cannot be ignored and should be an integral part of the design of AI systems for Islamic educational institutions.

Opportunities and Positions in Global Discourse

The operational efficiency opportunities identified are in line with the McKinsey Global Institute's global projection (2023) that AI can automate up to 60% of educational administrative work that is repetitive in nature. However, the context of Islamic education provides a different perspective: efficiency is not just the end goal, but an instrument to free educators and education personnel to focus more on tasks that require a touch of humanity and Islamic values that cannot be replaced by AI. The Islamic principle of tawazun (balance) is an important philosophical foundation in understanding the ideal relationship between humans and AI in the context of Islamic educational administration.

The opportunity to develop "Islamic AI" or AI based on Islamic values is the most significant contribution of this research in the global discourse. This concept resonates with UNESCO's (2021) agenda on "AI Ethics" and "Recommendation on the Ethics of Artificial Intelligence" which emphasizes the need for AI that respects the values of humanity, justice, and cultural diversity. However, UNESCO did not develop a specific framework for the context of Islamic values. This research fills this gap by proposing the principles of "Islamic AI Ethics" that can be the basis for the development of AI systems for Islamic educational institutions.

ABIEA Model: Novelty and Conceptual Contribution

The synthesis of all the findings of this study resulted in an original conceptual model called AI-Based Islamic Education Administration (ABIEA). This model is the main novelty of

this research that fundamentally differentiates it from previous studies. ABIEA consists of four integrated components:

The first component is the Value Foundation, which places Islamic values as the philosophical and ethical foundation of all AI systems developed and implemented. The five core values identified include: al-adl (fairness in algorithms), al-amanah (data integrity), al-maslahat (benefit orientation), al-shura (stakeholder participation), and hifdz al-karamah (protection of human dignity).

The second component is System Architecture, which designs the technical structure of AI taking into account the specific needs of Islamic educational institutions: integration with the Islamic calendar, the ability to process Arabic-language content, adaptability to limited infrastructure conditions, and the ability to work offline.

The third component is Human Resource Management, which includes a gradual and contextual HR capacity development strategy, taking into account the dimension of AI anxiety and a value-based development approach typical of Islamic educational traditions.

The fourth component is Governance and Evaluation, which establishes transparent, accountable, and participatory AI governance mechanisms, as well as a periodic evaluation system that measures the impact of AI not only from the perspective of technical efficiency, but also from the perspective of fulfilling Islamic values.

The ABIEA model differs from the existing models in the literature in significant ways. Rhoads and Gerber (2021) developed "Responsible AI in Education" but did not include the dimension of religious values. UNESCO (2021) developed an AI ethical framework that is universal but non-contextual. The ABIEA model closes this gap by offering a framework that is at once technical, managerial, and based on Islamic values a synthesis that has never been developed before in the Islamic educational literature or educational technology.

Theoretical and Practical Implications

Theoretically, this study expands the scope of Islamic education management theory by including the dimension of AI technology as a new variable in the management of Islamic educational institutions. This enriches Mulyasa's (2021) perspective on value-based leadership by adding the dimension of "digital-Islamic leadership" as a necessary competency for madrasah heads in the AI era.

In practical terms, the ABIEA model provides implementation guidance that can be adapted by different types of Islamic educational institutions taking into account their respective capacities and contexts. For institutions with limited infrastructure, this model recommends gradual adoption with priority on the domains that provide the greatest efficiency impact with minimal technology investment, starting with document management and communication with parents.

CONCLUSION

This study successfully analyzed in depth the implementation of Artificial Intelligence in the administration of Islamic education in Indonesia through a multi-site case study in three representative Islamic educational institutions. Answering the formulation of the problems posed, this study found that the implementation of AI in Islamic education administration encompasses five main domains PPDB management, academic scheduling, student performance evaluation, document management, and teacher professional development with adoption rates varying based on the capacity of the institution and the urgency of the problem faced.

Three main challenge groups were identified: limited digital infrastructure (87.5% of informants), human resource competency gap including the phenomenon of AI anxiety (79.2% of informants), and concern about the alignment of Islamic values (66.7% of informants). Meanwhile, strategic opportunities that can be optimized include improved operational efficiency (average 58.3%), more responsive data-driven decision-making, and the development of AI systems based on Islamic values.

The study's greatest contribution was the development of the ABIEA (AI-Based Islamic Education Administration) model, a new conceptual framework that integrates the principles of modern AI technology with the values of Islamic education management in a cohesive manner. This model fills a gap in the literature that has not paid adequate attention to the specific context of Islamic educational institutions in the implementation of AI.

The implications of this research are very relevant for multiple stakeholders: for the Ministry of Religious Affairs, it is necessary to formulate a national policy on AI governance in Islamic educational institutions that includes minimum infrastructure standards, ethical guidelines for AI based on Islamic values, and sustainable digital competency development programs; for madrasah and pesantren heads, the ABIEA model provides practical guidance for formulating a gradual, contextual, and Islamic value-based AI adoption strategy; and for educational technology developers, the study identified a real need for AI solutions specifically designed for the Islamic education context, including Arabic-language content processing capabilities and compatibility with limited infrastructure.

This study has limitations that need to be acknowledged: (1) the design of the case study limits statistical generalization, although analytical generalization is possible; (2) the three research sites have not fully represented the diversity of Islamic educational institutions throughout Indonesia, especially the Eastern Indonesia region and traditional Islamic boarding schools; and (3) the relatively short research period (12 months) has not allowed for an evaluation of the long-term impact of AI implementation.

Based on these limitations, further research is recommended to: (1) conduct a study with a broader scope covering a more geographically and typologically representative sample of Islamic educational institutions; (2) develop and test the ABIEA model empirically through experimental or quasi-experimental research to measure its effectiveness in improving the quality of Islamic education administration; (3) examine the perspectives of students and parents as users of AI-based administrative services; and (4) develop specific measurement instruments to assess the degree of alignment of AI systems with Islamic values in the context of education.

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