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What Factors Shape AI Media Islamic Education?

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ABSTRACT

Purpose – The development of Artificial Intelligence (AI) has driven significant transformations in the development of learning media, including in the field of Pendidikan Agama Islam (PAI). Despite its potential, AI implementation in PAI raises pedagogical, ethical, and socio-cultural challenges. This study aims to synthesize conceptual developments of AI in PAI learning media through scientific mapping, addressing the lack of comprehensive studies that systematically identify key development factors grounded in pedagogy, Islamic values, and the context of Islamic higher education. This synthesis is essential to mitigate the misuse of generative AI and to support the development of ethical and relevant learning media.

Design/methods/approach – This study employed a bibliometric meta-analysis using Bibliometrix in R Studio (biblioshiny), analyzing 446 selected publications from reputable sources related to AI, learning media, and Islamic education.

Findings – The analysis identified technically intensive themes, including machine learning, deep learning, data mining, information retrieval, natural language processing, and text processing. Broader strategic themes such as digital transformation, big data, and investment reflect system-level implementation trends. Conceptual mapping revealed key factor clusters encompassing pedagogical, technological, ethical, social, and institutional dimensions. These findings provide a conceptual foundation for developing integrative, contextual, and sustainable AI-based PAI learning media.

Research implications/limitations – The study is limited by time and funding constraints, which restricted data sources and prevented deeper comparative analyses across regions and educational levels.

Originality/value – This study offers originality by providing a systematic conceptual synthesis of AI-based learning media development. By integrating pedagogical principles, Islamic values, and socio-cultural considerations into a bibliometrix conceptual mapping, this study provides a new integrative framework that supports the ethical, contextual, and sustainable use of AI in Islamic Religious Education learning media development.

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Introduction

Artificial Intelligence (AI) is developing rapidly along with the digital transformation of higher education learning (Alqahtani & Wafula, 2025). AI personalizes and enhances learning experiences (Ellikkal & Rajamohan, 2025). AI learning in universities is no longer limited to conventional classrooms, but has shifted towards a digital learning ecosystem (Nguyen & Tuamsuk, 2022) with the characteristics of developing interactive media and AI-based technology (Syifa, 2025). This condition requires lecturers to develop learning media that are not only informative but also able to adapt to students' individual learning needs (Kurniawan et al., 2025).

In the context of Pendidikan Agama Islam (PAI), the challenges of learning in higher education are increasingly complex (Sudradjat & Alim, 2025). PAI focuses not only on the transfer of religious knowledge but also on the formation of students' attitudes, values, and spiritual awareness amidst social dynamics, digital culture, and massive technological developments (Herak, 2025; Hidayat & Arqam, 2026; Sugianto, 2024). However, Islamic Religious Education (PAI) learning in universities is still often dominated by conventional approaches, such as one-way lectures and the use of statistical media, which are less able to address the characteristics of today's digital generation (Rohman & Kurniawan, 2025). This situation demands innovation in Islamic Education learning media that is relevant, contextual, and responsive to students' needs (Hidayati & Hafidz, 2025).

AI is present as one of the key technologies that is capable of transforming learning media (Cecchini et al., 2025). For over 30 years, AI development has shown significant progress and has been applied to various disciplines, particularly in education and learning media. AI can personalize learning experiences, provide real-time feedback, analyze student learning patterns, and support independent and collaborative learning through digital technology (Albakry et al., 2025; Ellikkal & Rajamohan, 2025; George, 2023). The need to modernize Islamic Religious Education (PAI) Learning through the active implementation of AI values is not only located in the cognitive aspect, but can also support the understanding of Islamic values through the presentation of adaptive and interactive materials (Hrytsiv, 2025).

However, the development and utilization of AI in Islamic Education learning media cannot be separated from various supporting and inhibiting factors, such as educator readiness, student characteristics, media design, pedagogical aspects, and Islamic values and ethics (Sagala, 2025). Therefore, research analyzing the factors influencing AI development in Islamic Religious Education (PAI) learning media is crucial for providing a comprehensive conceptualization. This factor analysis is expected to serve as a basis for designing AI-based Islamic Religious Education (PAI) learning media that are not only pedagogically effective but also aligned with the goals of Islamic education in higher education in the era of digital transformation (Nashrullah et al., 2025).

Although AI is able to help make work easier and more efficient, it is important to consider the analysis factors of utilization (Xing & Jiang, 2025). Sometimes the results of AI products are invalid (hallucinations). Furthermore, factors such as their suitability to the social and ethical context, algorithmic bias, incomplete data and inaccurate content, and pedagogical foundations are also considered (Cecchini et al., 2025). Analysis of AI utilization factors to protect against the misuse of generative AI is becoming very important. The use of AI from the perspective of students has grown rapidly and has even become part of their lifestyle (Barrera Castro et al., 2025).

The challenge of critical reflection on risks, the appropriateness of pedagogical theories, and ethical issues. Analysis of AI factors in Islamic religious education is a crucial issue (George, 2023). Modern technologies, such as smart machines and computers, are designed to understand and accommodate the unique needs of each individual (Khanfar et al., 2025). AI is transforming and disrupting society, morality, law, and education. The core goal of AI is to develop a computational approach to intelligent behavior, encompassing various aspects of human cognitive activity. However, they are not susceptible to fatigue, emotions, or irrational thinking, and they engage in auditing activities (Calvin et al., 2025).

AI offers significant potential for personalized learning, automated assessment, and increased administrative efficiency (George, 2023). e integration also supports immediate feedback and addresses students' specific needs. Thus, compared to human learning without feedback, AI tutors outperformed, and students perceived their affective and cognitive domains as being similar to humans (Albakry et al., 2025). AI technology is transforming teaching methodologies and learning styles, and shifting the role of teachers to facilitators (Ellikkal & Rajamohan, 2025). AI-powered devices are enhancing instructional design by providing personalized learning and engaging multimedia, demonstrating potential in creating learning outcomes, assessments, and standard-setting parameters. The integration of AI in education often overlaps with instructional AI, creating a multifaceted impact on learning and teaching methodologies (Anua et al., 2025).

Artificial Intelligence in learning (learning AI) has emerged as a significant area of research, combining AI techniques with learning science to enhance the teaching and learning experience (Jangde & Ahmad, 2025). The years 2021-2023 were a peak and booming year for AI learning. This was likely due to the launch of one of the most popular AI platforms, ChatGPT. Other AI chatbots on the market include Microsoft's Bing Chat, Google's Bard, and Anthropic's Claude (Olumati et al., 2025). In other words, in terms of learning activities, AI has brought significant progress and convenience (Mutmainah & Saputra, 2025). The implementation of AI in education has the potential to improve the quality of learning worldwide by providing new platforms for learning and re-adapting teaching approaches (Sahabuddin et al., 2025). Isu ini menjadi latar belakang penelitian ini. Studi ini mengkaji secara mendalam penggunaan AI dan hubungannya dengan Pendidikan Agama Islam.

Methods

This study aims to explore the development and utilization of Artificial Intelligence (AI) in Islamic Religious Education (PAI) to identify key factors influencing its use over time. The research focuses on mapping the topics and conceptual structure of AI studies in Islamic Religious Education (PAI) based on relevant scientific publications. Thus, this study not only explores temporal trends but also uncovers the dynamics and interrelationships between themes that shape the landscape of AI research in the context of Islamic religious education. Technically, this study utilizes bibliometric methods with the assistance of R Studio software through the bibliometrix package and the Biblioshiny interface. The analysis stages include collecting and importing scientific publication data from scopus, data cleaning, and standardizing metadata such as authors, keywords, and publication year. Next, co-word analysis is performed to identify the occurrence and interrelationship of keywords. This is then processed using factor analysis and visualized in the form of a dendrogram. This dendrogram serves to demonstrate the proximity and grouping of research topics based on their conceptual similarities.

The results of the dendrogram analysis are then synthesized within a science mapping framework to map the conceptual structure of the field of AI studies in Islamic Religious Education. This mapping allows for the identification of key topic clusters, dominant factors in AI utilization, and the relationships between these factors as they evolve. Through this approach, the research provides a comprehensive overview of conceptual patterns, research development directions, and opportunities for further research related to AI integration in Islamic Religious Education.

Result

This research results section outlines the general findings obtained from the bibliometric analysis using Biblioshiny, with an emphasis on the key factors emerging from the research topic mapping. These results reflect the theme trends, the intensity of keyword artificial intelligence, and the grouping of factors that shape the pattern of Artificial Intelligence (AI) utilization in Islamic Religious Education. Through this mapping, the dominant factors and the conceptual relationships between them can be more comprehensively understood as a representation of the developing direction and focus of research in AI and Islamic Religious Education studies.

Table 1

Main Bibliometric Characteristics of AI Research in Islamic Religious Education (1989–2026)

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1989:2026
Sources (Journals, Books, etc)	204
Documents	446
Annual Growth Rate %	5,4
Document Average Age	2,54
Average citations per doc	5,229
References	3710
DOCUMENT TYPES	
article	221
book	18
book chapter	73
conference paper	88
conference review	21

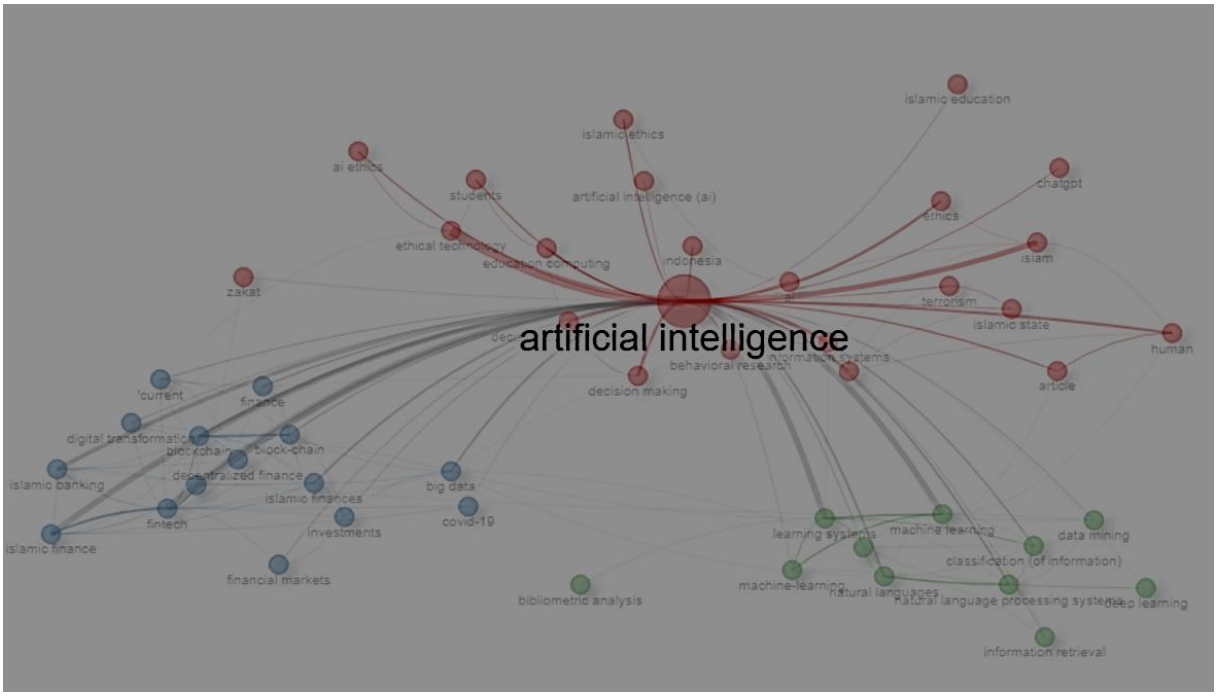
Based on the bibliometric data summary table, this study covers publications spanning a long period, from 1989 to 2026, with a total of 446 documents sourced from 204 scholarly sources such as journals, books, and proceedings. The annual publication growth rate was recorded at 5.4%, indicating a consistently low level of academic attention to the topic under study. The average document age of 2.54 years indicates a relatively limited literature exchange, supported by an average citation rate of 5,229 per document. Furthermore, the total of 3,710 references used reflects the depth of the theoretical foundation and the interconnectedness of this research with previous studies.

In terms of document type, journal articles dominate with 221 documents, followed by conference papers with 88 and book chapters with 73, indicating that knowledge

dissemination is primarily through scholarly articles and academic forums. The presence of other document types, such as books, reviews, editorials, and data papers, although relatively small in number, demonstrates the diverse forms of scholarly contributions in this field. The article states that the development of knowledge is not only empirical through research articles, but also conceptual and reflective through books and review articles, thus enriching the perspective and overall picture of science.

Figure 1

Co-occurrence Network



The image represents a keyword network map (mapping science) centered on the topic of artificial intelligence, represented by the largest red bubble. The dominant bubble size indicates that artificial intelligence is the most central and frequently occurring keyword in the entire literature corpus. The strong connections between the central bubble and various other keywords illustrate the role of AI as a central conceptual node integrating diverse research themes across fields.

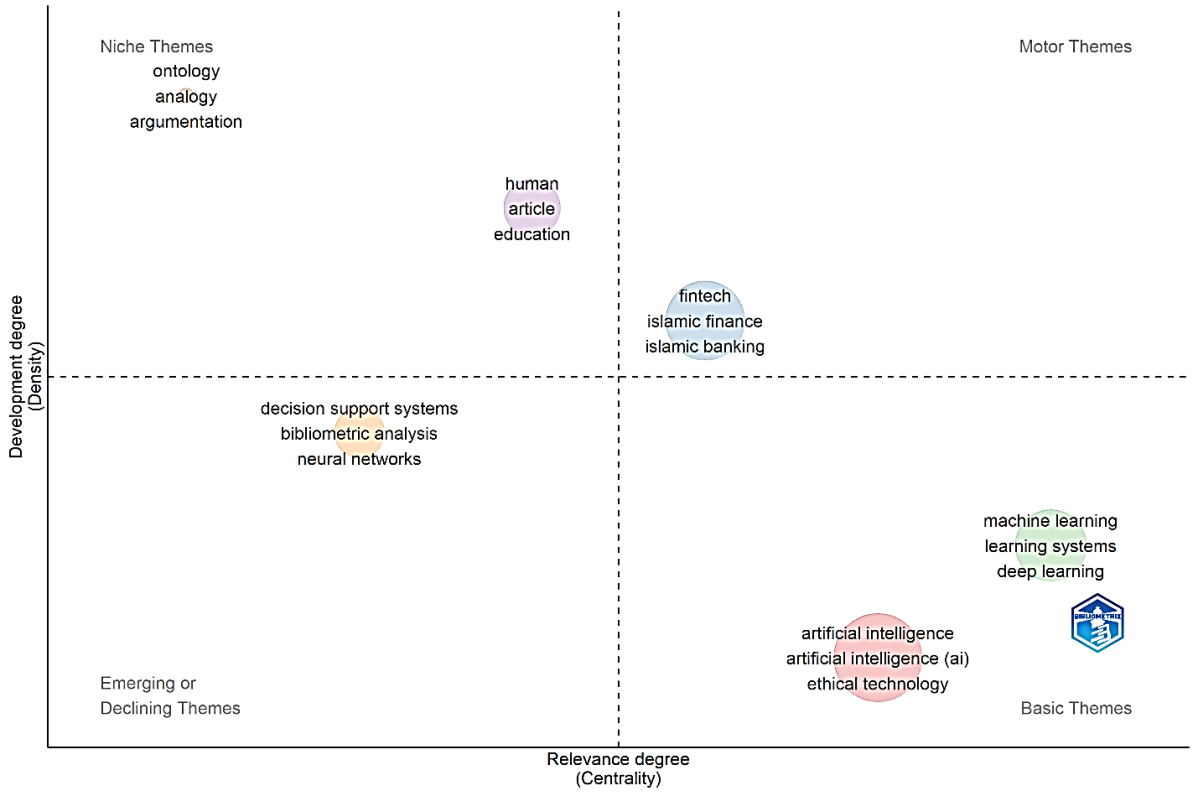
The red bubble clusters represent cluster concepts related to normative, ethical, and Islamic contexts, such as ethics, Islam, Islamic education, ChatGPT, Islamic state, and terrorism. The bubble sizes in these clusters vary, indicating varying levels of discussion intensity, but they remain directly related to AI as a central issue. This relationship indicates that AI research focuses not only on technical aspects but also on moral, social, and religious aspects, particularly in the context of education and Islamic society.

Meanwhile, the blue and green bubbles represent more technical and applied clusters. The blue cluster is primarily concerned with aspects of the digital economy and finance, such as fintech, blockchain, Islamic finance, and financial markets. Its medium-sized bubbles indicate significant contributions but do not limit the primary cluster. Meanwhile, the green cluster focuses on methodological and computational approaches, such as machine learning, natural language processing, deep learning, and information retrieval. The relatively smaller bubble size of this cluster demonstrates its role as a

supporting technical foundation, strengthening the development and application of AI across various research domains.

Figure 2

Thematic Map



The thematic map in the figure illustrates the distribution of research themes based on their perceived relevance (centrality) and degree of development (density) across four quadrants. In the upper right quadrant (Motor Themes), relatively large blue bubbles represent fintech, Islamic finance, and Islamic banking. The color and size of these bubbles indicate that these themes are strongly linked to the main scientific framework and have matured, thus serving as key drivers of research in this field.

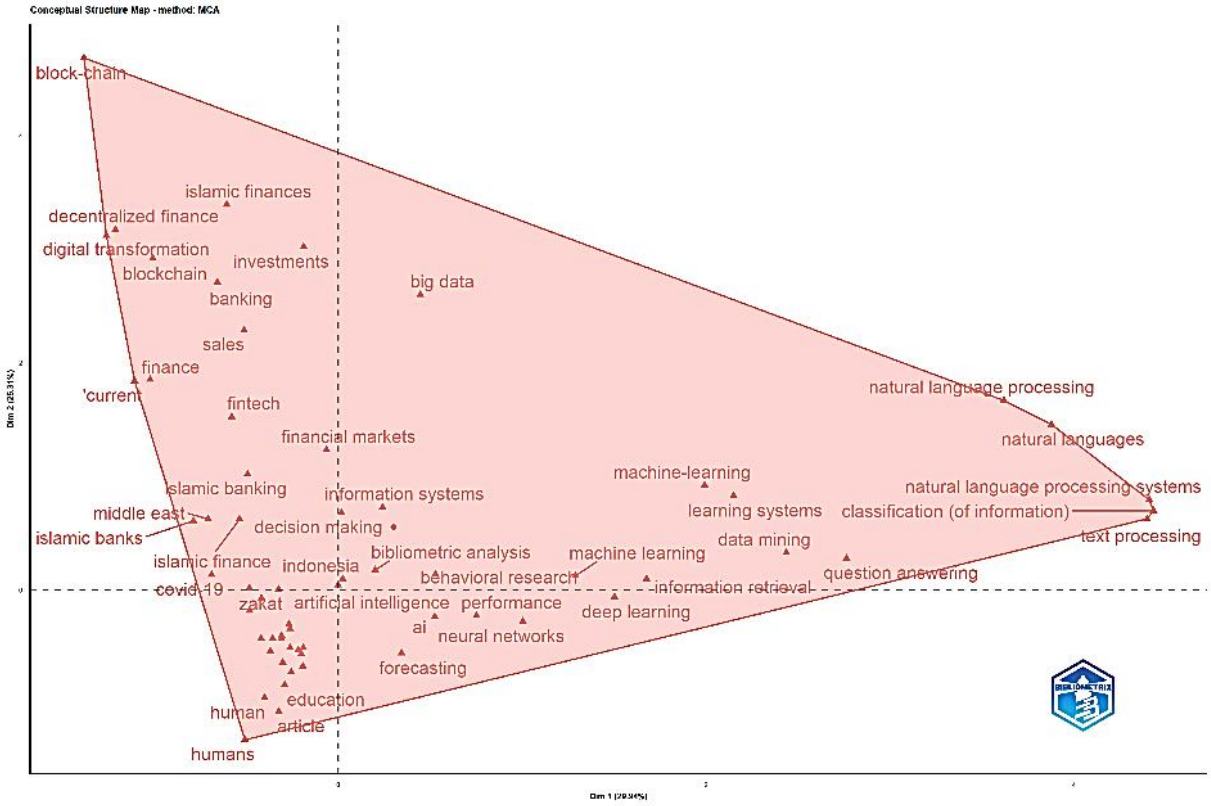
The lower right quadrant (Basic Themes) is dominated by the largest red and green bubbles, particularly in the themes of artificial intelligence (AI), ethical technology, and machine learning, learning systems, and deep learning. The larger bubbles indicate high frequency and centrality, but the lower quadrants indicate that while these themes are fundamental and serve as the basis for research, their level of development remains general and evolving. Different colors represent interrelated technology subclusters with different methodological focuses.

In the upper left quadrant (Niche Themes), there are relatively small to medium-sized purple bubbles covering the themes of ontology, analogy, and argumentation, as well as the human, article, and education clusters. This position indicates that these themes have a relatively high level of conceptual development, but their relevance to the main structure of the research field is still limited. Smaller bubbles indicate that the study is specific and in-depth, but has not yet become mainstream in scientific discussions.

Meanwhile, the bottom left quadrant (Emerging or Declining Themes) is filled with small, light brown bubbles, such as decision support systems, bibliometric analysis, and neural networks. The position and size of these bubbles indicate that these themes have relatively low interconnectedness and density, thus interpreting them as themes that are either developing toward strengthening or declining in attention. Overall, the differences in color, size, and position of the bubbles in the four quadrants provide a dynamic picture of the structure, maturity, and direction of research development related to artificial intelligence and its derivative fields.

Figure 3

Conceptual Structure Map-method: MCA



This figure represents a Conceptual Structure Map generated using the Multiple Correspondence Analysis (MCA) method, which is used to map the contextual proximity between keywords in the research corpus. The horizontal axis, Dim 1 (±29.94%) represents the primary dimension explaining the greatest variation in the data, generally related to the shift from contextual-applicative themes to technical-computational themes. Meanwhile, the vertical axis, Dim 2 (±25.45%) depicts the second dimension, reflecting differences in conceptualization levels and study focus, such as between socio-institutional and methodological approaches. The percentages for each dimension indicate the proportion of data diversity explained by that axis.

Judging from the quadrant division, the right quadrant (positive Dim 1) is dominated by technology-based and data processing themes, such as machine learning, deep learning, data mining, information retrieval, and natural language processing and text processing. This position indicates that these themes have a strong technical character and are conceptually close to each other. In contrast, the left quadrant (Dim 1 negative) is mostly filled with Islamic economic and financial themes, such as Islamic finance, Islamic banking,

fintech, financial markets, as well as blockchain and decentralized finance, which reflect the applicative and institutional orientation of AI studies.On the vertical axis, the upper quadrant (Dim 2 positive) displays themes that tend to be strategic and macro, such as digital transformation, investment, big data, and banking, indicating a focus on system transformation and broad implementation scales. Conversely, the lower quadrant (Dim 2 negative) contains more operational and micro themes, such as artificial intelligence, neural networks, forecasting, decision-making, and education and people. This pattern emphasizes that the context map separates themes not only by domain of study but also by level of abstraction and application.

Overall, the red polygons surrounding the keyword points indicate the key research conceptual space, while emphasizing the close relationship between artificial intelligence, machine learning systems, and AI applications in Islamic finance and education. The proximity of keywords within the same quadrant indicates high levels of co-occurrence, while the distance between quadrants reflects the differentiation of research focuses. Thus, this MCA map provides a comprehensive structural overview of the conceptual landscape and the direction of AI research development across various study contexts.

The results of the hierarchical cluster dendrogram analysis illustrate the grouping of keywords based on their level of similarity and contextual proximity within the analyzed literature. The vertical axis indicates the distance or degree of dissimilarity, where the lower the merging point between branches, the higher the similarity between keywords. This tree structure demonstrates how research themes emerge gradually, from being closely related at the lower level to forming large clusters at the upper level.

Overall, the dendrogram results indicate the presence of several main clusters. On the left side, technical themes such as machine learning, deep learning, learning systems, information systems, and natural language processing and text processing converge at low distances, indicating strong methodological linkages. This cluster represents the computational and algorithmic foundations of artificial intelligence development. In the center, a cluster emerges that connects AI with analytical and decision-support aspects, such as decision-making, bibliometric analysis, behavioral research, and ethical technology, serving as a bridge between technical approaches and contextual studies.

Meanwhile, on the right side of the dendrogram, a more applied and contextual cluster appears, encompassing themes such as fintech, financial markets, Islamic finance, Islamic banking, blockchain, and decentralized finance. The convergence of these themes at relatively higher distances indicates that, while still related to AI, the focus of the studies is more specific to implementation and institutional contexts. Overall, this dendrogram confirms a layered thematic structure, ranging from the technical cluster as the core, to the analytical cluster as the connecting link, to the applied cluster as the domain of application, which together shape the artificial intelligence research landscape.

Discussion

From a conceptual structure map (MCA) and dendrogram perspective, a clear separation is visible between the technical-computational cluster (e.g., natural language processing, data mining, information retrieval) and the applicative-contextual cluster (e.g., Islamic finance, banking, education, and human resources). This structure suggests that AI research still tends to be fragmented between technology development and implementation studies. However, the presence of connecting themes such as ethical technology, decision-making, and behavioral research supports the hypothesis that there

are initial efforts to integrate the technical dimension with ethical, social, and pedagogical considerations. This aligns with previous literature emphasizing the importance of a human-centered approach to AI, particularly in the context of education and religious values.

The implications of these findings are quite broad. Theoretically, the findings of this study enrich the conceptual mapping of AI by showing that the development of AI in the Islamic context is not only focused on normative aspects but is also heavily influenced by dominant application domains, particularly finance and information systems. Practically, these findings highlight a research gap in the application of AI in Islamic education, particularly in terms of pedagogy, ethics, and meaningful learning. AI is still more often positioned as a technical tool than as a medium for transforming values and learning processes. A clearly articulated theoretical contribution to AI in Islamic education, utilizing educational technology, marks a significant step in the development of AI-based Islamic education media.

Figure 4

PAI media instructional development design model

Based on these findings, future research needs to be directed at several strategic aspects. First, strengthening interdisciplinary research that integrates machine learning and natural language processing with Islamic educational theory and Islamic ethics is necessary. Second, empirical studies examining the effectiveness of AI as a medium for Islamic education learning are still very limited and represent a significant research opportunity. Third, developing a conceptual framework for AI based on Islamic values (value-based AI) is a crucial agenda for bridging the gap between technology and the humanities. Thus, future research is expected to strengthen not only the technological aspects of AI but also its contribution to the holistic formation of human beings, knowledge, and values within the context of Islamic education.

Conclusion

This study presents a comprehensive overview of the intellectual structure and thematic development of artificial intelligence (AI) research, particularly at the intersection of ethics, education, and the Islamic context. At the current stage of scientific development, the field of AI is characterized by rapid growth, increasing conceptual diversification, and the dominance of basic technological themes such as artificial intelligence, machine learning, and deep learning. Bibliometric analysis and science mapping show that although AI plays a fundamental role, its integration into value-based domains—particularly education and Islamic studies—is still underdeveloped compared to applied sectors such as Islamic finance and fintech.

The main argument emphasized in this study is that AI research to date is still dominated by a technology-first paradigm, in which ethical, humanistic, and pedagogical dimensions are often positioned as complementary rather than integral components. The research findings reveal a clear thematic separation between the technical-computational cluster and the contextual-normative cluster. This situation indicates a conceptual gap that has the potential to limit the transformative use of AI in education, particularly Islamic Religious Education (PAI). However, the emergence of connecting themes such as ethical technology, decision-making, and behavioral research signals a new direction towards developing AI that is more human- and value-oriented.

In terms of practical application, the findings of this study provide a conceptual basis for the development and utilization of AI in a more integrative educational context. The resulting thematic mapping can serve as a reference in curriculum development, learning media design, and educational policy formulation by aligning AI technology with pedagogical objectives, ethical principles, and Islamic values. In practice, AI-based learning systems in Islamic Education (PAI) should not function solely as learning automation or evaluation tools, but also as a means to foster critical thinking, moral reasoning, and contextual understanding in students.

Implications for further research emphasize the need to strengthen empirical studies that examine the impact of AI use on the cognitive, affective, and ethical dimensions of Islamic education. Furthermore, future research should focus on developing value-based AI models that integrate machine learning and natural language processing with Islamic epistemology and pedagogy. Longitudinal and comparative studies across institutional and cultural contexts are also crucial for understanding the dynamics of sustainable AI adoption in education. Thus, the development of AI research in the future is expected to not only be oriented towards technological innovation, but also contribute to the formation of knowledge, character, and values holistically.

Declarations

Author contribution statement

The authors are responsible for all aspects of the study conception and design, development of the research framework, data collection and analysis, interpretation of the findings, and preparation of the manuscript. The authors assert full accountability for the accuracy and integrity of the work.

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Data availability statement

Data that support the findings of this study are available from the authors upon reasonable request.

Declaration of interests statement

The author declares that there are no known personal interests or relationships that could have appeared to influence the work reported in this paper.

Additional information

Further information concerning this study, including its theoretical foundation, methodological approach, data analysis procedures, and implications for the development of Artificial Intelligence (AI)-based media in Islamic education, may be obtained by contacting the corresponding author via email. The author welcomes academic correspondence, constructive feedback, and potential scholarly collaboration related to this field of research.

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