

Integrating Philosophy of Science into Islamic Education: Enhancing Relevance and Effectiveness in the Fourth Industrial Revolution Era

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ABSTRACT

The Industrial Revolution 4.0 has created unprecedented challenges and opportunities for educational systems, including Islamic education. In this context, re-evaluating foundational frameworks becomes crucial. This study explores the role of the philosophy of science in enhancing the effectiveness of Islamic education management amidst technological transformation. A qualitative-descriptive approach was employed using literature research. The study analyzed existing scholarly works on the philosophy of science, Islamic education management, and the implications of the Industrial Revolution 4.0. The findings reveal that the philosophy of science serves as a rational epistemological foundation for modernizing Islamic education. It supports adaptive curriculum development, facilitates the integration of Islamic values with technological advancements, and promotes hybrid learning models that blend traditional pedagogy with digital tools. These elements contribute to institutional effectiveness in the digital era. Applying the philosophy of science in Islamic education management enables strategic decision-making, leadership development, and technology integration aligned with Islamic pedagogical principles. It acts as an intellectual compass guiding Islamic education toward societal welfare and sustainable progress.

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1. INTRODUCTION

The Fourth Industrial Revolution represents a transformative period characterized by rapid technological advancement, digital communication proliferation, and fundamental shifts in societal values and information landscapes. This era demands that educational institutions become proactive and swift in their technological adoption, as computer-based examinations and digital learning platforms become integral to modern educational processes. The revolution's impact extends beyond mere technological integration, promising enhanced global income levels, improved quality of life, reduced communication costs, and increased productivity across various sectors (Maritsa, 2021). However, these advances also present significant challenges for human resources in educational

institutions, requiring both students and teachers to adapt to continuously evolving technological environments.

The pervasive nature of digital and internet-based communication devices has fundamentally altered how society engages with information and learning. Educational facilities, teaching methodologies, and curriculum design must undergo substantial transformation to remain relevant and effective. This technological shift necessitates new approaches to infrastructure development, pedagogical techniques, and educational management systems that can accommodate the demands of an increasingly digitized world (Sudarjat, 2024). Philosophy of science serves as a critical foundation for educational development, providing comprehensive, systematic, and rational approaches to understanding and addressing educational challenges. This philosophical framework encompasses various aspects of scientific inquiry and knowledge development, offering both theoretical grounding and practical guidance for educational institutions. The philosophy of science influences the overall progression of scientific knowledge by establishing methodological foundations for knowledge transfer and curriculum development.

In the context of modern educational advancement, philosophy of science becomes essential for analyzing real and rational problems within educational management. It provides the intellectual framework necessary for developing educational approaches that are both theoretically sound and practically applicable. This philosophical foundation ensures that educational institutions can navigate the complexities of technological integration while maintaining academic rigor and pedagogical effectiveness. The systematic and critical approach inherent in scientific philosophy enables educational leaders to make informed decisions about curriculum design, teaching methodologies, and institutional management.

Islamic education faces unique challenges in the context of the Fourth Industrial Revolution, particularly in maintaining its character-forming mission while adapting to rapid technological and social changes. The integration of Islamic educational principles with modern technological demands requires a sophisticated philosophical approach that can bridge religious teachings with contemporary educational needs (Camelia, 2020). This integration becomes crucial for developing technological literacy among educators while preserving the fundamental values and character education that define Islamic educational institutions.

The philosophy of Islamic education encompasses three fundamental dimensions: ontological aspects focusing on belief systems and creation principles, epistemological foundations that establish methodological bases for knowledge transfer, and axiological components that emphasize transcendental and universal values. These philosophical dimensions work together to create educational frameworks that successfully merge religious and general sciences, demonstrating how Islamic educational institutions can maintain their spiritual mission while embracing technological advancement (Oktavani, 2023). The theological and pragmatic approaches within Islamic educational philosophy provide a comprehensive foundation for curriculum development and institutional management. This integration ensures that Islamic education remains relevant and effective in modern contexts while adhering to core religious principles. The emphasis on character formation, balanced with technological literacy, positions Islamic educational institutions to produce graduates who are both spiritually grounded and technologically competent.

Despite the recognized importance of integrating philosophical foundations with technological advancement in Islamic education, there remains a significant gap in understanding how the philosophy of science can be effectively implemented within Islamic educational management during the Fourth Industrial Revolution. Current literature addresses technological integration and Islamic educational philosophy separately, but lacks a comprehensive analysis of their synthesis in practical educational settings (Umiarso, 2018). The primary research objective is to examine how the philosophy of science can be actualized within Islamic educational management to address the challenges and opportunities presented by the Fourth Industrial Revolution. This investigation aims to develop a theoretical framework that demonstrates the practical application of scientific philosophy in creating

educational approaches that successfully integrate religious principles with modern technological demands. In the study by Afifuddin & Ishak (2022) it is emphasized that the philosophy of Islamic education is closely linked to philosophy and education, where philosophical issues essentially become the central themes conveyed through education. The ontological aspect of Islamic education focuses on the fundamental aspects of the belief system, encompassing purpose-oriented creation principles, comprehensive unity, and solid balance.

Secondary objectives include analyzing the three philosophical dimensions (ontology, epistemology, and axiology) within the context of contemporary Islamic educational challenges, evaluating the effectiveness of current integration strategies, and proposing enhanced methodological approaches for implementing the philosophy of science in Islamic educational institutions. This research seeks to bridge the theoretical understanding of Islamic educational philosophy with the practical demands of modern technological education, ultimately contributing to more effective and relevant Islamic educational management systems.

2. METHODS

This study employed a library research methodology, which involves systematically collecting and analyzing bibliographic data. According to Setyosari (2016), this method consists of activities related to sourcing and interpreting information from various textual materials. Saleh (2014) defines library research as an approach that gathers data and information using resources available in libraries—such as books, academic journals, official documents, historical accounts, and scholarly publications—relevant to the subject under investigation. Similarly, Ismayani (2019) emphasizes that researchers gather contextual insights from sources including online databases, books, journals, and articles, followed by an analytical process grounded in the collected material.

To ensure the relevance and timeliness of the literature, sources selected for this study were published between 2010 and 2024. The materials included peer-reviewed journal articles, scholarly books from reputable publishers, and academic theses and dissertations from accredited institutions. Literature searches were conducted through recognized academic databases such as Google Scholar, JSTOR, ProQuest, Garuda Portal, ResearchGate, and Academia.edu, using keywords aligned with the research focus.

The data were analyzed using two primary approaches: thematic content analysis and philosophical analysis. Thematic analysis involved identifying recurring themes, patterns, and key concepts through a structured process: familiarization with data, initial coding, theme development, review, definition, and reporting. Philosophical analysis was used to investigate the theoretical and conceptual dimensions by applying conceptual clarification, argumentative evaluation, and philosophical synthesis to integrate diverse perspectives.

This desk research approach was selected due to its suitability for conceptual and philosophical inquiries. It allows for the comparative analysis of theoretical frameworks, the integration of fragmented knowledge, and the development of a comprehensive understanding of complex, abstract issues. Desk research supports in-depth reflection, diverse theoretical engagement, and flexible analysis tailored to the philosophical nature of the research.

3. FINDINGS AND DISCUSSION

3.1. *The Relevance and Orientation of Islamic Education in the Era of the Fourth Industrial Revolution*

The industrial evolution from mechanization (1.0) through mass production (2.0) and automation (3.0) to the current cyber-physical systems of Industry 4.0 represents more than technological progression—it embodies a fundamental transformation of human-machine-knowledge relationships. Klaus Schwab's conceptualization of the Fourth Industrial Revolution, characterized by ubiquitous

connectivity through the Internet of Things, has created what is commonly termed the "Disruption Era," where traditional paradigms of learning, work, and social organization face unprecedented challenges that demand not merely adaptive responses but philosophical reconceptualization (Ekasari, 2021).

The discourse surrounding Islamic education's response to Industry 4.0 has predominantly focused on curricular adjustments and technological integration. However, this approach fundamentally misses the deeper philosophical challenge: how can Islamic educational philosophy maintain its essential character while meaningfully engaging with a world where the boundaries between physical, digital, and biological spheres are increasingly blurred? The question is not simply about making Islamic education "relevant" to contemporary demands, but about articulating a coherent Islamic epistemological framework that can both critique and constructively engage with the philosophical assumptions underlying Industry 4.0 (Sefudin & Darwin, 2020).

Ismail Raji al-Faruqi's paradigm of knowledge Islamization provides a crucial lens for understanding how Islamic education must respond to Industry 4.0. Al-Faruqi's framework demands that Muslims critically examine the metaphysical and epistemological foundations of contemporary knowledge systems rather than merely adopting their methodologies. In the context of Industry 4.0, this means interrogating the philosophical assumptions about human nature, knowledge acquisition, and the purpose of technology that underlie artificial intelligence, big data analytics, and algorithmic decision-making systems. Islamic education must develop the capacity to engage with these technologies not as neutral tools but as expressions of particular worldviews that may conflict with Islamic anthropology and cosmology (Sefudin & Darwin, 2020). Presently, the industry is interfacing with the virtual domain, epitomized by a ubiquitous connectivity among humans, machines, and data, commonly referred to as the Internet of Things.

Syed Muhammad Naquib al-Attas's educational philosophy offers another critical framework for navigating Industry 4.0 challenges. Al-Attas's concept of *ta'dib* (proper education that encompasses both knowledge and moral cultivation) becomes particularly relevant when considering how digital technologies reshape human consciousness and social relationships. His critique of secular educational paradigms that separate knowledge from moral formation provides insight into why Islamic education cannot simply add technological skills to existing curricula but must fundamentally reconceptualize how knowledge, character formation, and spiritual development intersect in a digitally mediated world.

In its contemporary application, the term "relevant" assumes a wider significance, denoting a significant correlation or suitability to the context under consideration (Ainissyifa, 2017). When we proclaim an entity as relevant, we are acknowledging its import or pertinence to the extant issue, or its harmonious integration within a specific scenario.

The traditional distinction between internal and external relevance in Islamic education becomes philosophically complex in the Industry 4.0 context. Internal relevance—the coherence of Islamic educational objectives with Islamic epistemology and anthropology—faces new challenges when educational processes are increasingly mediated by artificial intelligence systems that operate according to different logical frameworks. External relevance—adaptation to societal needs and market demands—risks compromising Islamic education's distinctive character if pursued without philosophical grounding. The resolution of this tension requires what we might term "critical relevance"—a form of engagement that neither uncritically adopts external demands nor retreats into intellectual isolation. This approach demands that Islamic educational institutions develop sophisticated philosophical tools for discerning which aspects of Industry 4.0 align with Islamic educational objectives and which require fundamental critique or alternative formulation.

In the context of education, relevance is a measure of how effective an institution is in meeting the needs and demands of both students and society as a whole. The relevance of a higher education institution is measured by how many of its graduates can find employment in the field they have studied. It is not just about providing theoretical knowledge, but also about how that knowledge can

be applied in the real world so that graduates can enter and contribute to the job market (Priatmoko, 2018).

This relevance can be divided into two categories, consisting of internal and external categories. Internal relevance relates to the internal consistency of the education program. While internal relevance is about how well all aspects of the education program from objectives to implementation support each other and create a coherent and effective learning experience.

External relevance, on the other hand, looks at how well educational institutions respond and adapt to the needs and developments of society. This includes preparing students for the challenges and opportunities of the future workplace, as well as ensuring that the curriculum reflects wider social, economic and cultural needs. It also involves adapting to technological developments, changes in the job market, and the ever-moving socio-cultural dynamics.

Both forms of relevance are important for the sustainability and growth of educational institutions. Without internal relevance, students may not acquire the skills and knowledge needed to succeed in their field. Without external relevance, educational institutions may become obsolete, as they no longer meet the demands of the job market or the needs of society. The balance between these two forms of relevance will determine how an educational institution is perceived in terms of the quality and value it provides, both by its students and society at large.

According to Muhammad Fadhil al-Jamaly, the objectives of Islamic education according to the Qur'an include (1) explaining the position of students as humans among other creatures of God and their responsibilities in this life; (2) explaining their relationship as social creatures and their responsibilities in the order of social life; (3) explaining the relationship between humans and nature and their duty to know the wisdom of creation by prospering the universe; (4) explaining their relationship with the Creator as the creator of the universe Roslan & Malim (2014). Islamic education is recognized in the education system which is divided into three things. First, Islamic education as an institution explicitly recognizes the existence of Islamic education institutions. Second, Islamic Education as a Subject is the recognition of religious education as one of the lessons that must be given at the basic level to college. Third, Islamic Education as a value, namely the discovery of Islamic values in the education system (Daulay, 2009).

Islamic education's engagement with Industry 4.0 must ultimately be grounded in a philosophy of digital wisdom that draws upon classical Islamic intellectual traditions while addressing contemporary challenges. This involves developing frameworks for understanding how concepts such as *hikmah* (wisdom), *ma'rifah* (gnosis), and *tawhid* (unity) apply to digitally mediated learning environments and artificial intelligence systems.

Rather than viewing technology as merely instrumental, Islamic educational philosophy must grapple with how digital technologies embody particular conceptions of rationality, efficiency, and human flourishing that may conflict with Islamic understandings of these concepts. This philosophical engagement is not merely academic but practical, as it will determine whether Islamic education can maintain its transformative potential in an era of unprecedented technological change.

The ultimate question facing Islamic education in the Industry 4.0 era is not whether it can adapt to technological change, but whether it can articulate a compelling alternative vision of human development and social organization that both engages with and transcends the limitations of purely technological solutions to human challenges. This requires moving beyond reactive adaptation toward proactive philosophical engagement that demonstrates Islam's continued relevance as a comprehensive framework for understanding reality and guiding human action in all its dimensions.

The orientation of education, as envisioned nationally, may in the context of the current era become erratic, or blurred lose orientation given the demands of pragmatic life patterns in Indonesian society. It is worth criticizing that globalization does not merely bring positive effects, with its conveniences, but the various demands of life caused by it make education disoriented. Education tends to be based on pragmatic needs, or the needs of the job market, so that the spirit of Islamic education as a foundation of culture, morality, and social movement is lost (Aisyah, 2022). Curriculum

Issues. The centralized system is closely related to the authoritarian top-down bureaucracy that seems that the "lower" side must carry out all the wishes of the "upper" side.

In such a system, innovation and renewal will not emerge. In the field of curriculum, this centralized system also affects educational output. Tilaar mentions the centralized curriculum, the implementation of a management system controlled from above has produced robotic human education output. In addition to the centralized curriculum, there is also some criticism of educational practice with regard to the overloading of the curriculum. This also affects the quality of education. Children are overloaded with subjects (Daulay, 2009).

In its historical reality, the development of the Islamic Education curriculum experienced paradigm changes, although the previous paradigm was maintained. This can be observed from the following phenomena: (1) the change from the emphasis on memorization and memory of the texts of Islamic teachings, as well as mental and spiritual disciplines as influenced by the Middle East, to the understanding of the meaning and motivation of Islamic religion to achieve the learning objectives of Islamic Education. (2) changes from textual, normative, and absolutist ways of thinking to historical, empirical, and contextual ways of thinking in understanding and explaining Islamic teachings and values. (3) changes from the emphasis on the product or results of Islamic religious thought from its predecessors to the process or methodology that produced the product. (4) a change from the pattern of Islamic education curriculum development that only relies on experts in selecting and compiling the content of the Islamic education curriculum towards the broad involvement of experts, teachers, students, and the community to identify the objectives of Islamic education and ways to achieve them (Mahmudi, 2019).

The discussion highlights that Industry 4.0 represents not merely a technological advancement but a deep philosophical shift in how humans relate to knowledge, machines, and education. Islamic education's response to this disruption cannot be limited to integrating digital tools or updating curricula. Instead, it must engage with the underlying epistemological and metaphysical assumptions of technologies such as artificial intelligence, big data, and the Internet of Things. Scholars like Ismail Raji al-Faruqi and Syed Muhammad Naquib al-Attas offer foundational frameworks for this engagement. Al-Faruqi emphasizes the Islamization of knowledge, encouraging critical evaluation of modern knowledge systems from an Islamic worldview. Meanwhile, al-Attas's concept of *ta'dib* (moral and intellectual education) underlines the importance of integrating ethics and spirituality in learning, especially as technology increasingly shapes human identity and consciousness.

Furthermore, the concept of "relevance" in Islamic education is reconceptualized to address both internal and external dimensions. Internal relevance ensures alignment with Islamic objectives and epistemology, while external relevance responds to societal and technological developments. The proposed solution is "critical relevance"—a balance that avoids both passive adaptation and isolation. This philosophical grounding is crucial to maintain the integrity of Islamic education amid pressures toward market-oriented, pragmatic approaches. Criticism is also directed at centralized and rigid curriculum systems that limit innovation and overload students. Historically, Islamic education has undergone shifts from memorization to understanding, from absolutism to contextual thinking, and from expert-only curriculum design to participatory models involving teachers, students, and communities. These changes signal a need for Islamic education to proactively define its role and values in an era of rapid technological and cultural transformation.

In the context of Islamic education in Indonesia, the conceptual idea of "critical relevance" and the integration of moral-spiritual values in responding to the challenges of Industry 4.0 can be actualized through educational policies and practices that go beyond mere technological competence to include character development based on Islamic values. For instance, the implementation of the *Merdeka Curriculum* (Independent Curriculum) in Islamic schools (*madrasah*) offers a strategic opportunity to incorporate al-Attas's concept of *ta'dib* through student projects aligned with the Pancasila student profile, contextualized with Islamic ethics. Moreover, al-Faruqi's vision of the Islamization of knowledge can be reflected in the integration of religious and secular subjects, emphasizing

epistemological synthesis—a model already being pioneered by several State Islamic Universities (PTKIN) under the Ministry of Religious Affairs. Such educational practices aim to address both internal and external challenges: producing technologically competent learners who remain grounded in a holistic, critical, and transformative Islamic worldview.

3.2. Situating the Effectiveness of Philosophy of Science against the Challenges of Islamic Education in the Era of the Fourth Industrial Revolution

The era of disruption is currently sweeping across the world, including the realm of education. As stated by Rhenald Kasali, the era of disruption is characterized by the emergence of various innovations and technologies (Sefudin & Darwin, 2020). As one of the nation's pillars, the education sector must adopt a positive stance to endure and thrive in the global competitive landscape.

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Hussin (2018) predicts that there will be many future evolutions. He anticipates changes in classroom layout, the impact of augmented reality and virtual reality on education, the implementation of flexible tasks to accommodate various learning preferences, and the influence of Massive Open Online Courses (MOOCs) and other online learning options. Syed Muhammad Naquib al-Attas's educational philosophy offers another critical framework for navigating Industry 4.0 challenges. Al-Attas's concept of *ta'dib* (proper education that encompasses both knowledge and moral cultivation) becomes particularly relevant when considering how digital technologies reshape human consciousness and social relationships. His critique of secular educational paradigms that separate knowledge from moral formation provides insight into why Islamic education cannot simply add technological skills to existing curricula but must fundamentally reconceptualize how knowledge, character formation, and spiritual development intersect in a digitally mediated world.

In the process, the nature of knowledge itself shapes a discourse on multicultural education, where different fields of knowledge interconnect. Gibson (1976) examines the literacy of multicultural

education and identifies five approaches, noting the differences between these approaches and how they overlap and intersect. Subsequently, Sleeter and Grant, 11 years later, identify five approaches to multicultural education.

According to scholars in the field, the primary aim of multicultural education is to transform schools and educational institutions into inclusive environments that provide equitable opportunities for students from diverse racial, ethnic, and social backgrounds. This study also emphasizes the importance of empowering both male and female students to succeed through the application of multicultural knowledge. This objective is consistent with the view of Banks and McGee (2019), who assert that multicultural education serves communities of color and supports efforts to promote gender equity by integrating multicultural perspectives into educational and societal frameworks.

Reflecting on the narrative above, philosophy plays a role in the development of knowledge, which is inherently multicultural. In its early stages, philosophy was marked by human endeavors to address social, natural, and theological issues. From there, philosophy was able to give birth to the major sciences we are familiar with today, including physics, biology, ethics, metaphysics, and mathematics, which form the solid foundation of human civilization (Latif, 2014)..

Furthermore, human reason has evolved into a tool that interacts with various elements: the world, society, and the self. It has become a versatile and effective instrument, simultaneously shaping individual identities. In contemporary Indonesian society, there is a significant amount of tension arising from the rapid growth of technology, particularly in the form of social media. This has been exacerbated by the spread of hoaxes and has even escalated to the point of racial tensions. Philosophy emerges as a solution to combat the spread of hoaxes.

Therefore, Islamic education should be designed to enable students to develop their natural and creative potentials within an atmosphere of freedom, while remaining faithful to the teachings of Islamic law, promoting unity, and fostering responsibility.

In addition, Islamic education must produce graduates who can understand their society with all the factors that can either support success or hinder it in social life. One alternative that can be pursued is the development of a broad-minded education. These various challenges require educational institutions, especially Islamic educational institutions, to engage in reflection and reevaluation of what needs to be done to anticipate these challenges. What kind of Islamic education models should be offered in the future that can prevent or address these challenges?

Engaging in reflection can mean "*attaammul wa al-fahsh*," which is contemplation or careful and profound examination. It can also mean "*taqlib al-bashar wa al-bashirah li idrak al-syai' wa ru'yatihi*," which involves changing perspectives (mindsets) and reasoning approaches (frameworks) to perceive and understand things, including alternative thinking and analysis of ideas and action plans from various perspectives to anticipate a better future (Afifuddin & Ishak, 2020). Thus, here are several contributions of the philosophy of science in the process of Islamic education in the era of the Fourth Industrial Revolution, according to researchers.

First, to analyze Islamic education in the era of the Fourth Industrial Revolution, Islamic philosophy of education serves as the primary foundation. Understanding it enables researchers and policymakers to create education that aligns with the context and challenges of this era. With the changing times and technological advancements, many students are starting to neglect moral values, which contradicts Islamic teachings. However, teachers must instill moral values in their students through the intensity and quality of education.

Second, curriculum development in Indonesia should focus on multiculturalism when utilizing Islamic philosophy of education. This is crucial because the Fourth Industrial Revolution has brought about more complex social developments and globalization. In line with Islamic Multicultural Education by Suparta (2008), there are over ten definitions of multicultural education. There are several types of multicultural education: firstly, multicultural education emphasizes that ethnic and cultural diversity is important, acceptable, and should continue to thrive in the lives of individuals, groups, and nations. Secondly, multicultural education incorporates the philosophy of cultural pluralism into the

education system and upholds the principle of equality. Thirdly, multicultural education utilizes comprehensive teaching and learning approaches.

Third, the digital society is a crucial element in the Fourth Industrial Revolution. Information technology can assist in Islamic education by creating effective and efficient education, such as using online learning systems and information technology to support the learning process. Nowadays, education has some shortcomings, such as a lack of information about the relevance of knowledge to existing old theories. The primary goal of technology-based education (TBE) is to improve the quality of learning and teaching as well as enhance information technology literacy (Kristiawan, 2014).

Fourth, in Islamic education, the philosophy of science can help enhance creative skills, critical thinking, and high-level cognitive analysis. Islamic education should educate students to adapt and be creative in a rapidly changing environment in the era of the Fourth Industrial Revolution. Jean Piaget supports his theory of the cognitive abilities of junior high school students when they are in the formal operational stage. In this stage, students face the real world, concrete experiences, abstract reasoning, and greater logical thinking.

Fifth, the Fourth Industrial Revolution requires students with global skills, particularly in the context of foreign language education. The application of Islamic philosophy of education can help develop students' foreign language skills and prepare them for global challenges. Institutions that serve as the foundation for the development of students' language skills include boarding schools, Islamic boarding schools, and international schools. Despite various countries promoting different languages as explicit goals of educational institutions at all levels, including universities.

Boarding schools are traditional Islamic educational dormitories where students live together and study under the guidance of a religious scholar. Holistically, boarding schools have been the starting point for human civilization as educational institutions. This is based on a report by the Dutch government in 1831 on indigenous education institutions in Java, with 1,853 institutions and a total of 16,556 students. Students in that era were already learning Arabic, and to this day, the evolution of Islamic boarding schools in Indonesia has led to modern Islamic boarding schools that incorporate communication in Arabic and English, and even other languages.

Overall, the contributions of the philosophy of science in the process of Islamic education in the era of the Fourth Industrial Revolution involve understanding Islamic philosophy of education, developing a curriculum based on multiculturalism, utilizing information technology, engaging in high-level cognitive-based learning, and developing students' global skills.

Based on the research and discussion above, several key themes emerge regarding the role and transformation of Islamic education in the era of the Fourth Industrial Revolution. First, the disruption brought by Industry 4.0, marked by innovations such as AI, big data, and ubiquitous connectivity, calls for more than technological adaptation—it demands a fundamental philosophical response from Islamic education. Rather than merely updating curricula or integrating new tools, Islamic education must develop a coherent epistemological foundation rooted in Islamic philosophy. Scholars like Ismail Raji al-Faruqi and Syed Muhammad Naquib al-Attas emphasize the Islamization of knowledge and the integration of moral and spiritual cultivation (*ta'dib*), positioning Islamic education not just as a transmitter of knowledge but as a transformative force in shaping ethical, holistic individuals capable of engaging critically with modernity.

Second, the application of the philosophy of science in Islamic education offers practical strategies to address contemporary challenges. This includes the development of multicultural curricula, the incorporation of digital learning technologies, and the cultivation of higher-order thinking skills and global competencies, particularly in language education. In Indonesia, pesantren (Islamic boarding schools) exemplify how traditional institutions can evolve into modern centers of multilingual and multicultural learning. Additionally, philosophy is seen as a vital tool for critical reflection, helping students and educators shift paradigms, combat disinformation, and respond ethically to the complexities of a rapidly changing society. These themes collectively underscore the importance of

grounding Islamic education in philosophical reflection, cultural pluralism, and technological awareness to ensure its relevance and resilience in the digital era.

The conceptual ideas discussed above find practical expression in various current policies and practices within Indonesia's Islamic education system. One prominent example is the integration of digital platforms in madrasahs and pesantren through initiatives like the *Madrasah Digital* program by the Ministry of Religious Affairs, which equips Islamic schools with digital infrastructure while maintaining Islamic ethical values in content delivery. In parallel, many pesantren have evolved into modern institutions by incorporating foreign language instruction (Arabic and English) and vocational training alongside traditional Islamic studies, reflecting efforts to cultivate global competencies rooted in religious identity. Furthermore, Islamic higher education institutions (PTKIN) are increasingly embedding multicultural and interreligious dialogue into their curricula, reflecting the philosophical emphasis on cultural pluralism and moral-spiritual development. These initiatives demonstrate how Indonesia's Islamic education system is not only responding to the technological imperatives of Industry 4.0 but doing so through frameworks that preserve its philosophical foundations, thus ensuring that students are both tech-savvy and morally grounded.

4. CONCLUSION

The philosophy of science makes a significant contribution to the effectiveness of Islamic education in the Fourth Industrial Revolution. As a foundation for analysis, the philosophy of Islamic education enables the development of a critical and reflective framework for responding to the challenges and changes of the times. This approach also strengthens the development of a multicultural curriculum, enabling Islamic education to appropriately address social complexities and the dynamics of globalization. Furthermore, the philosophy of science encourages the use of information technology in the educational process, in line with the need for efficiency and effectiveness in learning in the digital age. This philosophical approach also supports the creation of high-level cognitive-based learning necessary to address rapid and unpredictable changes. Furthermore, the philosophy of Islamic education plays a role in developing students' global skills, including foreign language proficiency, to prepare them to compete in a global context. Overall, the philosophy of science is a crucial pillar in the transformation of Islamic education to be adaptive, progressive, and relevant amidst the ever-evolving industrial revolution.

The practical implications for Islamic educational institution managers, policymakers, and teachers are the need to design an education system that is not only responsive to the challenges of the Fourth Industrial Revolution but also deeply rooted in Islamic philosophy and values. Educational institution managers are required to develop visionary and adaptive leadership capable of integrating Islamic philosophical thought into the institutional vision. Policymakers need to promote regulations that support a multicultural, cognitive-based curriculum that is open to the use of technology without neglecting Islamic principles. Teachers, as the spearhead of education, are required to develop pedagogical competencies that incorporate critical thinking, digital literacy, and Islamic moral values in the learning process. Implementation recommendations include curriculum development based on the integration of modern science and Islamic values; educational leadership training that emphasizes ethics, long-term vision, and technological adaptability; and the application of digital technology that not only supports learning efficiency but also strengthens students' character and spirituality. This approach is expected to create relevant, progressive, and meaningful Islamic education amidst rapid global transformation.

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