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Internalization of Muhammadiyah Life Values in the development of science and technology in the era of Industry 5.0 *(Integration, internalization, role, contribution, and challenges)*

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ABSTRACT

Industrial Revolution 5.0 brings significant disruption in the field of science and technology, but at the same time, it presents new challenges related to the need for integration between technological advancement and humanitarian, spiritual, and Islamic values. The main issue in this research is the weak integration of Islamic values, particularly the values of Muhammadiyah's way of life, in the development of science and technology in that era. The objective of this research is to integrate Muhammadiyah's life values, such as monotheism, enjoining good and forbidding wrong, noble character, respect for human dignity, and brotherhood, into the development of science and technology, as well as to analyze the role, contribution, and challenges of Muhammadiyah in this integration process. This study used a library research method with a qualitative approach. Data were collected from various primary and secondary authoritative literature sources. The data analysis techniques used were content, thematic, and critical analyses. The research results show that internalization is carried out by integrating the values of Muhammadiyah's way of life with science, technology, and Islamic values as a strategic foundation for addressing the challenges of the times. Through an integrative epistemological approach *(bayani, burhani,* and *irfani*) and the spirit of tajdid, Muhammadiyah has developed various innovations such as integrative education, digital preaching, environmentally friendly technology, big data-based management, computer and air conditioning innovations named ITMU (Innovationn Technology of Muhammadiyah), and the latest innovation, the Global Unified Hijri Calendar. Despite facing challenges such as the dichotomy of knowledge, resistance to change, concerns about losing traditional values, and the dominance of secular epistemology, Muhammadiyah remains committed to building a just, sustainable civilization rooted in divine values.

Keywords: Muhammadiyah Life Values, Science and Technology, Industry 5.0 , Islamic Value.

1. INTRODUCTION

The 5.0 Industrial Revolution is currently leading us towards a very impressive civilization, guiding humanity into an era of astonishing technology. Technology does not seem to stop evolving and always brings new innovations that are far more sophisticated and amazing (Khan 2019). In this era, it is not only machines that take center stage, but also the harmonious balance between humans and technology, which is key to significant change. Massive changes can lead to globalization and inject the progress of human civilization to a higher level than ever before (Radiansyah 2020). However, amid this progress, many values have been lost. Moral and religious values are also threatened to be marginalized by the advancement of Science and Technology, which tends to be secular and value-free (Mercer & Trothen 2021). This poses a unique challenge in the context of Indonesia's religious society. Moral and spiritual values that have long been the guiding principles of society, such as honesty, integrity, and devotion to God, are often eroded by the trends of modernization and westernization brought about by the advancement of science and technology (Mahmud 2022). Human values such as empathy, concern for others, and respect for human dignity are often eroded by individualistic and materialistic cultures that are a consequence of the rapid development of technology. As a result, society loses direction and a solid foundation for living, making it easy to fall into deviant behavior and lose its identity (Rochaniningsih 2014).

Muhammadiyah, one of the largest Islamic organizations in Indonesia, plays an important role in integrating Islamic values based on the Qur'an and Sunnah into the development of science and technology (Refinal et al. 2024). Since its establishment in 1912, Muhammadiyah has emphasized the importance of education and mastery of knowledge for the advancement of humanity (Huda & Kusumawati 2019). Muhammadiyah believes that knowledge is the path to the progress and revival of Muslims from backwardness. Therefore, Muhammadiyah established many educational institutions ranging from elementary to higher education with the aim of enlightening the nation's life and shaping virtuous intellectuals (Nuryami et al., 2024). However, in addition to emphasizing the importance of education and mastery of science and technology, Muhammadiyah also stresses that science and technology must be grounded in strong religious and moral values (Qorib & Afandi 2024). Muhammadiyah views that science and technology are not value-free, but must align with Islamic values such as monotheism, justice, enjoining good and forbidding wrong, and the balance between worldly life and the hereafter, in accordance with the teachings of the Qur'an as outlined in the Muhammadiyah Islamic Life Guidelines (ILGM) (Muhammadiyah, 2010). Thus, science and technology not only provide technical benefits, but also bring goodness to human life.

In the era of the 5.0 industrial revolution, the integration of Muhammadiyah's life values into the development of science and technology has become increasingly important (Sugianto et al., 2022). Amid the rapid advancement of technology, there is a risk that humans may lose their grip on spiritual and moral values that have long guided their lives. The 5.0-industrial revolution brings significant changes in the way humans work, interact, and even in their lifestyles (Kaliongga et al., 2023). If not accompanied by strong humanitarian values, technological advancement can cause humans to become alienated from themselves and their environments. Therefore, Muhammadiyah, as one of the gladiators of change in this regard, plays a role in ensuring that the development of science and technology remains in line with Islamic values such as justice, simplicity, brotherhood, and concern for others (Nasution et al., 2024). Muhammadiyah must continue to emphasize the importance of maintaining a balance between the advancement of science and technology and religious and moral values, so that science and technology not only become tools for achieving material prosperity but also bring happiness and inner peace to humanity (Al Faruq, 2020).

One practical example of the internalization of Muhammadiyah's values in the realm of worldly transactions towards science and technology is the development of environmentally friendly and sustainable technology (Qorib & Afandi 2024). Muhammadiyah has long emphasized the importance of preserving nature as part of humanity's responsibility as stewards on Earth. In the Quran, Allah SWT commanded humans not to cause corruption on earth (Wijayanti, 2018). Therefore, technological development must focus on aspects such as energy efficiency, waste minimization, and the protection of natural ecosystems. Muhammadiyah can promote the research and development of environmentally

friendly technologies such as renewable energy, recycling technology, and sustainable agriculture (Wardokhi et al., 2023). Furthermore, the values of Muhammadiyah's way of life can be integrated into the development of science and technology that focuses on community welfare (Budiman et al. 2025). For example, there is the development of more productive and sustainable agricultural technology or affordable health technology for all layers of the society (Thoriq et al., 2024). Muhammadiyah has a network of charitable enterprises throughout Indonesia, including hospitals, orphanages, and educational institutions. By utilizing this network, Muhammadiyah can become a pioneer in developing and implementing technology that benefits a wider community, especially those who are less fortunate (Ma'arif & Imam 2024). Thus, science and technology not only serve as tools to enhance economic productivity but also as a means to achieve social justice and collective welfare. Muhammadiyah plays a role in bridging the development of Science and Technology through efforts to realize a just, prosperous, and thriving society, as envisioned by Islam (Asmy et al., 2022).

On the other hand, the integration of Muhammadiyah values in science and technology also presents an opportunity for Muhammadiyah to become a pioneer in the development of science and technology that is not only technically advanced but also spiritually meaningful and beneficial to humanity (Hidayat et al. 2020; Qorib & Afandi, 2024). Muhammadiyah can collaborate with educational institutions, research agencies, and industries to develop technology that aligns with Islamic values, such as technology that respects human dignity, preserves nature, and strengthens brotherhood. By integrating the values of Muhammadiyah life into the development of science and technology, it is hoped that science and technology will not only become a tool for improving material welfare, but also a means to achieve true happiness and bring blessings to the entire universe (Purwati et al. 2025). Anggraeni and Mukhlis (2023) have previously researched the Strengthening of Islamic and Science Literacy as an Enhancement of the Awareness of the Islamic Youth Generation in the Society 5.0 Era in the Muhammadiyah Youth Association of Batu City. The research findings indicate that this community service activity aims to enhance Islamic and scientific literacy in the 5.0-society era. This program involved the Muhammadiyah Youth Association of Batu City. They were given training, mentoring, and outreach in Islamic literacy and science. The outreach aims to strengthen and deepen the understanding of how to integrate Islam into various fields of knowledge as a foundation for intelligent young Muslims who are ready to face the challenges of the 5.0 society era (Anggraeni & Mukhlis 2023). Ruslan et al. (2020) researched the instillation of morality education and pancreatic values in early childhood in the development of science and technology. The research findings indicate that value and moral education from an early age are expected to shape students to understand the difference between good and bad, and right and wrong, so that they can apply it in their daily lives. This education also involves instilling Pancasila's moral values. The approaches used in moral education include indoctrination, value clarification, modeling or examples, and habituation of good behavior provided through formal and informal education (Ruslan et al., 2020).

Hamdy et al. (2020) in their journal article once researched the Model of Integration of Religion and Science at Muhammadiyah High School Pekanbaru. The research findings indicate that teachers and some alumni generally understand the concept of integration and recognize that the school's vision and mission encompass the potential to combine religion and science. However, they had different views on the operational model. At Muhammadiyah High School, the model of integrating religion and science focuses more on instilling Islamic values in individuals who are involved in the development of science (Hamdy et al. 2020). Apniar (2022), in the Book Chapter of Proceedings Journey-Liaison Academia and Society, once researched the Analysis of the Integration Model of General Science and Religion at SD Muhammadiyah 31 Medan. The research findings indicate that the integration model applied in science education at Al-Azhar Medan Elementary School uses an Islamic modernization approach. At Muhammadiyah 31 Medan Elementary School, the integration model applied in science education uses a purifying approach. Meanwhile, SD Muhammadiyah 08 Bromo Medan implemented the neo-modernism integration model in science education (Apniar 2022).

This study presents a significant novelty by focusing on the internalization of Muhammadiyah life values derived from the Qur'an and Sunnah into the development of science and technology, which has already been documented in the Muhammadiyah Citizen's Handbook (ILGM). This approach differs from

previous studies that separate the development of technology and Islamic values. The main novelty lies in the effort to harmonize science and technology with core Islamic values, such as tawhid as the foundation of existence and the source of knowledge, amar ma'ruf nahi munkar as social ethics, and noble character as the foundation of the personality of scientists and technology developers. These values are combined with universal humanitarian principles such as the dignity of human beings, brotherhood, and social justice, so that technology does not stand alone as a neutral instrument, but becomes part of the mission of Islamic civilization as rahmatan lil 'alamin.

The urgency of this research is becoming increasingly strong, considering the reality of technological development that often strays from ethical and spiritual values. (Gul & Abrar 2024). Technological and scientific advancements without moral foundation risk give rise to social inequality, environmental degradation, and a crisis of human meaning (Persson and Savulescu 2014). Therefore, a conceptual and practical framework is required to bridge the gap between the spirit of modern science and Islamic values. In this regard, Muhammadiyah, an Islamic organization with extensive networks in education, social services, and da'wah, occupies a strategic position as a key actor in the effort to integrate religion and science. The concept of "Progressive Islam" championed by Muhammadiyah serves as an important foundation in viewing science and technology not merely as tools for material advancement, but also as means to spread spiritual, social, and intellectual welfare for humanity.

The purpose of this research is to explain how the values of Muhammadiyah life are internalized in the development of science and technology, both in discourse and institutional practice. This study also aims to describe the role and contribution of Muhammadiyah in directing technological development in accordance with Islamic principles, particularly through educational institutions, research centers, and digital preaching programs. In addition, this study aims to identify the challenges faced by Muhammadiyah and Islamic groups in integrating science and technology with Islamic values, as well as how this organization strategizes to maintain a balance between technological innovation and commitment to religious morality. Therefore, it is hoped that a deeper understanding of the role of Muhammadiyah in the development of value-based science and technology, as well as a proposed model for the integration of Islam and technology, is not only locally relevant but also contributes to the global discourse on the ethics of science in the 21st century.

2. THEORETICAL FRAMEWORK

In building the framework of thought, this research refers to the theory of the integration of knowledge in Islam, which has developed in contemporary discourse. One of the central figures in this thought is Prof. Amin Abdullah, who proposed the concept of "interconnection between sciences" (integration-interconnection) (Lubis et al. 2024). This idea stems from the criticism of the epistemological dichotomy that separates *ulum ad-din* (religious sciences) and *ulum ad-dunya* (worldly or general sciences), which is considered a legacy of colonialism and secular modernism that separates religion from science and public life. According to Amin Abdullah, the integration approach that merely unites the curriculum between religious and general sciences administratively is insufficient (Riwanda 2023). What is more fundamental is building a critical and productive epistemological dialogue between various disciplines, whether based on revelation (*bayani*), rationality *(burhani*), or intuitive-spirituality *(irfani*). In this framework, knowledge is not positioned hierarchically but in a dialogical relationship that mutually enriches and interprets reality more comprehensively. This concept emphasizes that to build a superior Islamic civilization in the modern era, an interdisciplinary, transdisciplinary, and integrative approach to knowledge is required, where social sciences, humanities, sciences, and Islamic studies do not operate independently but are interconnected within a single-value system.

In the context of Muhammadiyah, the idea of integrating knowledge is in line with the spirit of tajdid, which has been the main character of this movement since its inception (Takdir & Munir 2025). *Tajdid* in Muhammadiyah is not only understood as the purification of faith from practices of *shirk, bid'ah, and khurafa*t (purification aspect), but also involves efforts to modernize Islamic thought in a rational, open, and contextual manner (modernization aspect) (Khoirudin & Aulassyahied 2023). Muhammadiyah

consistently emphasizes the importance of a scientific approach to understanding religion, while also asserting that religion should not lag behind the development of science and technology.

This approach is realized through Muhammadiyah's educational policies, which integrate religious and general sciences into a unified education system (Hamami & Nuryana 2022). This can be seen from the curriculum structure in Muhammadiyah schools, the development of interdisciplinary research at Muhammadiyah universities, and the use of technology in digital preaching and organizational management. This is a manifestation of the belief that religion, science, and technology are not two conflicting entities but rather complementary in building a progressive community. Muhammadiyah also emphasizes the idea that the advancement of Islamic civilization is not sufficient with just moral and spiritual strength but must also be supported by mastery of knowledge, research, technology, and innovation (Qorib & Afandi 2024). In this view, the integration of science and technology and Islamic values is not merely a symbolic discourse or administrative formality but an epistemological process that touches on the way of thinking, perspective, and actions of Muslims in facing the challenges of the times. Thus, the theoretical framework used in this study was based on two main foundations.

- According to Abdullah, the theory of integration–interconnection of sciences encourages the formation of a dialogue space between religious sciences and general sciences through an interdisciplinary and cross-methodological approach *(bayani, burhani, irfani*) (Dasrizal et al., 2024).
- Tajdid Muhammadiyah's spirit as an ideological praxis that directs the integration of science, technology, and Islamic values into tangible actions in education, da'wah, and community empowerment (Refinal et al. 2024).

These two approaches form the foundation for understanding how Islamic values can not only coexist with science and technology, but also serve as moral guides and regulators in its development, so that science and technology truly become a means of civilization that is not only advanced but also meaningful, ethical, and liberating.

3. RESEARCH METHOD

In this study, the library research method was used. Library research is a traditional research method that has been widely used by researchers to evaluate various scientific studies (Connaway & Powell, 2010). Using this method, the researcher strives to conduct an in-depth and comprehensive analysis to obtain optimal results. In the context of this research, the library research method was used to explore and analyze the internalization of Muhammadiyah life values in response to the highly advanced development of science and technology. This research also involved data collection from various sources relevant to the research object, such as books, scientific works, and journals. The approach used was qualitative, where data were obtained through a literature review by meticulously examining articles, books, and scientific journals related to the internalization of Muhammadiyah life values in the development of science and technology in the era of Industry 5.0. In terms of data analysis techniques, this study combines three main approaches: content analysis, thematic analysis, and critical analysis. For further clarification, please refer to Figure 1.

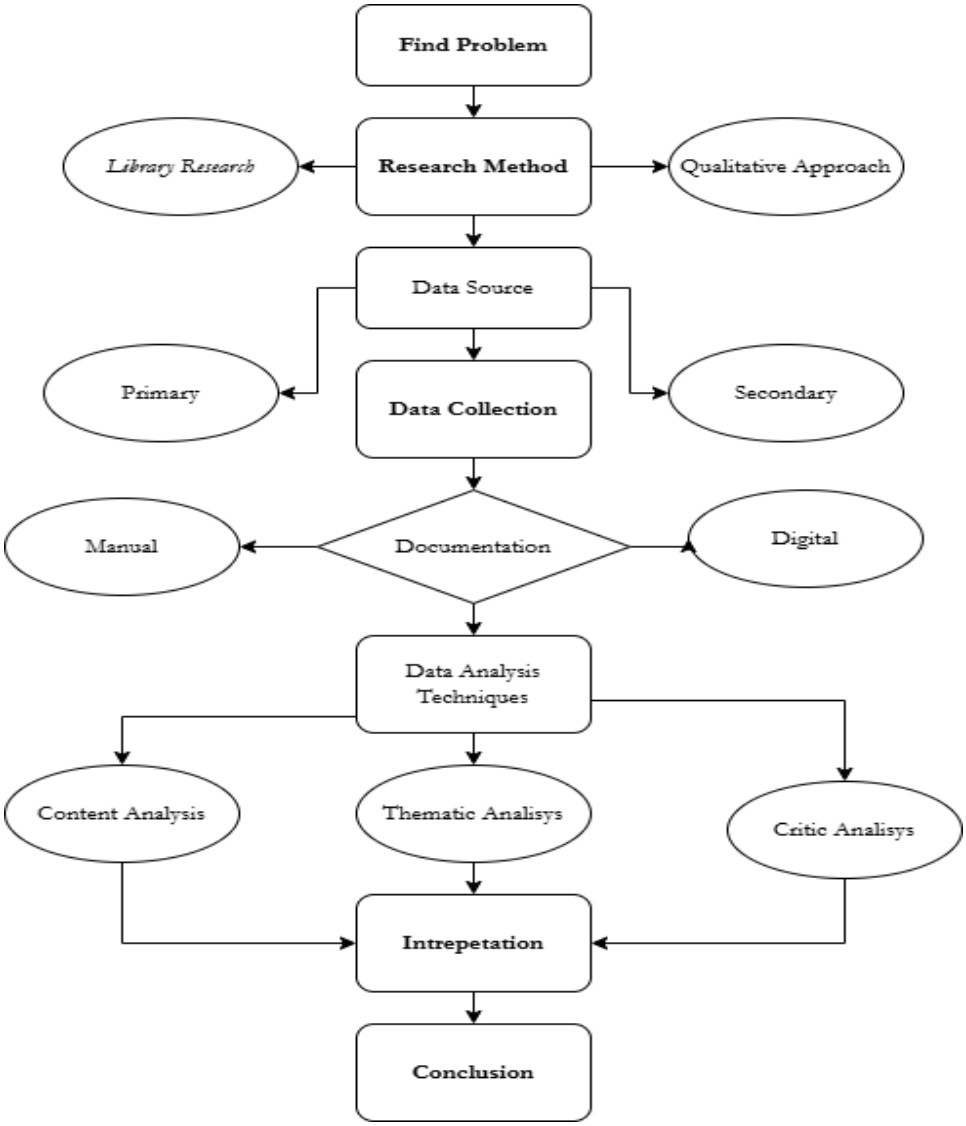

Figure 1. Research Flow

This research method is expected to provide a deep and comprehensive understanding of how the values of Muhammadiyah's life can be constructively internalized in response to the dynamics of scientific and technological development in the 5.0 industrial era through a systematic literature review and critical analysis of relevant literature.

4. RESULT AND DISCUSSION

4.1. Integration of Science and Technology with Islamic Values

The issue of integrating science and Islamic values is not a new question in the discourse on Islamic thought (Abdullah, 2014). Since the medieval period, especially during the golden age of the Abbasid Dynasty, Muslims have grappled with the concept of the relationship between revelation and reason, between religion and science (Rusydi 2023). The dichotomy of knowledge that distinguishes religious science from general science began to emerge when the influence of Greek philosophy, particularly Aristotle and Plato's thoughts, was adopted and integrated into the framework of Islamic thought (Bintoro, 2019). On the one hand, this has driven extraordinary advancements in the fields of mathematics, astronomy, medicine, and philosophy; however, on the other hand, it has created epistemological tensions

between theologians and Muslim philosophers that are still felt to this day. Although this dichotomy is an old debate, the discourse remains relevant to continue discussion, especially in the context of contemporary Islamic education, including Indonesia. The reality on the ground shows that the Islamic education system in various institutions still separates religious knowledge from general knowledge in terms of curriculum, teaching staff, and teaching approaches (Daulay & Tobroni 2017). This has the potential to give birth to a generation that is not well rounded in knowledge, with one excelling in spiritual aspects but weak in technology, and the other proficient in science but lacking in moral and religious values.

Islam itself has never separated religious knowledge from scientific knowledge (Komarudin, 2022). In the Islamic view, all knowledge comes from Allah SWT, whether it is revealed directly through revelation (the Qur'an and Sunnah) or obtained by humans through the process of thinking and observing the universe (*kauniyah* Versses) (Andini 2024). Science and technology are part of Allah's gifts that must be utilized for the good, advancement of civilization, and welfare of humanity. The intellect and senses bestowed upon humans by Allah become important instruments in understanding the signs of His greatness in the universe. The Qur'an itself places great emphasis on the importance of learning, thinking, and reflecting. About 750 verses, or one-eighth of the entire Quran, directly or indirectly discuss life, including topics on knowledge, the universe, and the thinking process (Mustofa, 2024). These verses show that the pursuit of knowledge is a noble form of worship, and even in several hadith narrations, the Prophet Muhammad SAW emphasized that seeking knowledge is an obligation for every Muslim, both male and female. This shows that, in the Islamic paradigm, knowledge is not only a worldly tool but also a means to draw closer to Allah and strengthen faith. To address the dichotomy between religious knowledge and general knowledge that still looms the Islamic education system, a theoretical framework capable of bridging the epistemological gap is needed.

In this context, this research employs two theoretical approaches that are not only conceptual but also applicable as tools or media for the integration of science and Islamic values:

a. Theory of Integration-Interconnection of Sciences (Amin Abdullah)

Amin Abdullah, one of the contemporary thinkers in Islamic education, offers a new paradigm in addressing the dichotomy of knowledge by formulating an approach of integration-interconnection of knowledge. According to him, the separation between religious and general knowledge is a legacy of colonial history and the secular education system that weakens the cohesion of scholarship in the Islamic world. This theory proposes an open and dynamic epistemological dialogue between various branches of knowledge by integrating the three main approaches in Islamic epistemology (Abdullah et al. 2014):

1) *Bayani*, which is a textual approach that emphasizes the authority of revelation, the verses of the Qur'an, and Hadith as the primary sources of truth.

2) *Burhani*, a rational-empirical approach that serves as the foundation of modern and secular sciences.

3) *Irfani,* an intuitive and spiritual approach derived from inner experiences, dhikr, and existential contemplation.(Ulviana 2024).

When synergistically combined, these three approaches can form a comprehensive, holistic, and responsive knowledge system to meet the needs of the times. In the context of the integration of science and technology with Islam, this theory acts as an epistemological medium that enables the meeting and mutual enrichment between the dimensions of spirituality and scientific inquiry between revealed texts and empirical reality. The implementation of this theory can be seen in the efforts to reconstruct the Islamic education curriculum, which no longer separates general subjects from religious ones but unites them within an integrative framework. For example, physics lessons not only teach Newton's laws but also relate them to signs of Allah's greatness in the universe. Similarly, lessons in fiqh can be contextualized with the principles of ecology or modern bioethics. Here, the theory of integration-interconnection works as a tool for educational transformation, making knowledge a means of worship, not just an accumulation of data and technical skills.

b. The Spirit of Tajdid Muhammadiyah as a Medium for Integration Practice

Meanwhile, as a modernist Islamic organization, Muhammadiyah has shown a strong commitment to the idea of *tajdid* (renewal) (Takdir & Munir 2025). Renewal in the view of Muhammadiyah is not merely an innovation of thought, but also a practical movement that is grounded in social life, education, and da'wah. This spirit of tajdid makes Muhammadiyah an agent of social transformation, balancing Islamic values with science and technology. Muhammadiyah integrates science and technology with Islam through various charitable endeavors spread across Indonesia, including schools, universities, hospitals, and research institutions. These institutions not only teach modern sciences but also instill Islamic values, such as ethics, justice, simplicity, and social responsibility (Latief & Nashir 2020). In this context, the spirit of *tajdid* in Muhammadiyah functions as a socio-cultural medium that encourages Muslims not to lag behind in the advancement of science and technology, while still adhering to the noble values of religion.

These two theories, the integration-interconnection of knowledge and the *tajdid* (renewal) of Muhammadiyah, do not stand alone, but complement each other. One forms the foundation of thought and epistemology, whereas the other drives action and social transformation. In the context of the integration of knowledge and Islamic values, both play the role of strategic tools and media in shaping the generation of Muslims who are knowledgeable, ethical, and capable of contributing to global civilization with dignity.

4.2. Internalization of Muhammadiyah Life Values in the Development of Science and Technology

Muhammadiyah, an Islamic organization that places great emphasis on the development of science, upholds several core values that underpin its efforts to advance the world of knowledge (Mirwanto, 2018). These values are deeply rooted in Islamic teachings that emphasize the importance of seeking knowledge and developing an understanding of the benefits of humanity. In the context of scientific development, Muhammadiyah integrates Islamic values with principles of rationality, freedom of thought, and appreciation of scientific research results (Abror, 2019). The following is an explanation of the values of Muhammadiyah life that serve as the foundation for the development of science, which the researcher developed from (Islamic Life Guidelines for Muhammadiyah Members) in the field of Science and Technology (see Table 1):

Table 1. Internalization of ILGM (Islamic Life Guidelines for Muhammadiyah Members) science and technology in facing the 5.0 Revolution era

Point	ILGM Science and Technology	Form of Internalization
Point I	Every Muhammadiyah member is required to master and excel in knowledge and technology as an important means of life to achieve happiness in this world and the hereafter.	Prioritizing the learning of science, technology, and practical skills that can be applied in everyday life. Provision of regular training and workshops on the latest technological developments, both for members and the general public. Improving members' digital literacy by optimizing the use of social media, online platforms, and the latest communication technologies.
Point II	Every Muhammadiyah member must possess the qualities of a scholar, namely being critical, open to accepting the truth from wherever it comes, and always using reasoning.	Approaching every problem that needs to be solved with a bayani, burhani, irfani approach. The organization of training and workshops that discuss the importance of critical thinking, openness to truth, and the use of reasoning in everyday life. Creating an organizational environment that values differing opinions, openness to truth, and the use of reasoning.
Point III	The ability to master science and technology is an inseparable part of faith and righteous deeds that	The implementation of a curriculum that integrates religious knowledge and general science in a balanced manner at Muhammadiyah educational institutions.

Point	ILGM Science and Technology	Form of Internalization
	demonstrate the status of Muslims and shape the character of ulil albab.	The procurement of regular studies on Quranic verses and Hadiths that examine the importance of science and technology for the Muslim community. Presenting Muhammadiyah figures who serve as role models in integrating faith, good deeds, and mastery of knowledge and technology.
Point IV	Every Muhammadiyah member with their knowledge has the obligation to teach the community, provide warnings, utilize it for the common good, and enlighten life as a form of worship, jihad, and da'wah.	The provision and encouragement of Muhammadiyah members to engage in teaching and learning activities, both in formal and informal educational institutions. Provision of social service by offering consultation, outreach, or assistance to the community in specific fields according to each individual's expertise. Exemplifying behavior that reflects a devout Muslim scholar, striving with knowledge, and preaching wisely.
Point V	Exciting and inspiring the movement to seek knowledge and master technology, both through education and activities within the family and community, as an important means to build Islamic civilization. In this activity, it includes enlivening traditions throughout the Muhammadiyah community.	Creating a conducive learning environment at home by providing adequate learning facilities and implementing a regular study schedule. The organization of competitions or contests related to science and technology, such as quiz competitions, science olympiads, or technological innovation works The awarding of prizes to individuals or institutions excelling in the field of science and technology as a form of appreciation.

Source: Islamic Life Guidelines for Muhammadiyah Members (Muhammadiyyah, 2022).

Muhammadiyah, as an Islamic organization with a progressive movement to respond to the challenges of the modern era, has a strong commitment to advancing the development of science based on noble Islamic values. As an Islamic organization born from the spirit of renewal and enlightenment, Muhammadiyyah upholds the principles of rational and scientific thinking in understanding religious teachings (Muhammadiyyah, 2022). Muhammadiyah rejects the attitude of blind imitation that follows without understanding its basis. Conversely, Muhammadiyah advocates always refer to the primary sources of Islamic teachings, namely the Quran and Hadith, with deep and rational understanding (Agustina 2020). This principle encourages Muslims, especially members of Muhammadiyah, to continue learning, researching, and developing knowledge to understand Islamic teachings more comprehensively and in accordance with the context of the times. Furthermore, Muhammadiyah upholds the spirit of continuously seeking knowledge and providing freedom of thought to its members. This is based on Islamic teachings that command followers to pursue knowledge without limit. Muhammadiyah encourages its members to continuously learn, research, and develop knowledge in various fields, both the religious and general sciences (Muhammadiyyah, 2022). The freedom of thought provided by Muhammadiyah allows its members to explore new ideas, conduct research, and develop scientific theories without being constrained by dogma or blind imitations.

Moreover, Muhammadiyah highly valued scientific research results obtained using correct and objective methods. Muhammadiyah considers that knowledge obtained through scientific research is one way to understand kauniyah verses (signs of God's greatness in the universe) (Muhammadiyyah, 2022). Therefore, Muhammadiyah encourages its members to conduct scientific research and supports efforts to develop knowledge through research. Muhammadiyah also appreciates scientific findings that can benefit human life and contribute to the advancement of civilization. Nevertheless, Muhammadiyah emphasizes the importance of integrating Islamic values in the development of knowledge. Muhammadiyah believes that knowledge must be based on the values of faith and piety to Allah SWT (Muhammadiyyah, 2022). Science should not contradict Islamic teachings and must be directed towards the welfare of humanity. Muhammadiyah encourages Muslim scientists to develop knowledge that aligns with Islamic values such as justice, humanity, welfare, and environmental sustainability (Supriatna 2017). Thus, knowledge not only serves as a means to understand the universe but also as a means to draw closer to Allah SWT and to realize a better life.

By prioritizing the principles of rational thinking, the spirit of seeking knowledge, appreciation for research results, and the integration of Islamic values, Muhammadiyah hopes to produce a generation of outstanding Muslim scholars, not only in the mastery of knowledge but also in morality and piety towards Allah SWT. The value of Muhammadiyah's life in the development of knowledge serves as a solid foundation for Muhammadiyah to continue contributing to the advancement of knowledge and human civilization sustainably (Halim & Abdul, 2024).

4.3. The Role of Muhammadiyah in Technological Development in the Era of the 5.0 Industrial Revolution

In the era of the 5.0 Industrial Revolution, there has been a massive transformation in the way humans live and work, emphasizing collaboration between advanced technologies, such as artificial intelligence and big data, with human values (Taj & Jhanjhi, 2022). Muhammadiyah, one of the largest religious and social organizations in Indonesia, actively and constructively responded to this era (Budiman et al. 2025). Based on the spirit of tajdid (renewal), which has been the breath of this movement since its inception, Muhammadiyah not only becomes a user of technology but also plays the role of a guardian of morality to ensure that the use of technology is always in line with Islamic principles, ethical values, and the broader welfare of the community.

a. The Utilization of Technology for Educational Transformation

One of the most strategic contributions of Muhammadiyah in this era is the transformation of the field of education through the adoption of digital technology (Aditya & Suranto, 2024). Education is the main pillar of Muhammadiyah's vision of a progressive society. Therefore, the application of technology has become an integral part of efforts to improve the quality of learning at all levels of Muhammadiyah education from elementary to higher education. Various innovations have been implemented, including the utilization of Learning Management Systems (LMS), the use of interactive learning media, and the integration of online learning resources to expand access to inclusive and responsive education to the needs of the times (Sa'adah & Mufidah 2025). In this way, the teaching and learning process not only takes place in physical classrooms but also crosses geographical boundaries through the digital world, allowing for broader and more equitable engagement of learners from various backgrounds.

b. Digitalization of Da'wah and Broadcasting of Islamic Teachings

In the field of preaching, Muhammadiyah has also demonstrated its adaptive capacity to developments in information and communication technology (Agung et al. 2025). *Dakwah*, which was previously limited to traditional study spaces, is now expanding into the digital world through a more creative and contextual approach. The use of various social media platforms such as YouTube, Instagram, TikTok, and podcasts allows Islamic content to be delivered in a more engaging and easily digestible manner for the digital generation. In addition, the use of official websites and da'wah applications allows for rapid and reliable dissemination of religious materials. This expands the reach of Muhammadiyah's da'wah message to the global public and serves as an effective medium in shaping a moderate, inclusive, and enlightening understanding of Islam in accordance with the principles of progressive Islam (Prayogi and Saputro 2025).

c. Development of Environmentally Friendly and Sustainable Technology

Muhammadiyah's commitment to environmental issues is also manifested in its encouragement of the development of technology oriented towards ecological sustainability (Harimurti and Alam 2024). In response to the challenges of climate change and global environmental crisis, Muhammadiyah encourages research and technological innovation that supports sustainable living. These efforts are reflected through

initiatives that support the use of renewable energy, development of technology-based waste management systems, and implementation of environmentally friendly agricultural concepts in various regions where Muhammadiyah operates.. In addition, this movement is also actively conducting educational campaigns to the public about the importance of a green lifestyle, energy efficiency, and ecosystem awareness as part of Islamic responsibility towards the universe as a trust from Allah SWT.

d. Integration of Technology in Organizational Management Systems

As a large organization that manages thousands of charitable enterprises across Indonesia, Muhammadiyah demonstrates modernization in organizational management by systematically adopting information technology (Latief & Nashir, 2020). Big data is utilized to manage member databases, organizational assets, and work program performance efficiently and integratively. These steps not only support the effectiveness and efficiency of governance but also reflect Muhammadiyah's readiness to build a digital organization that is responsive to the challenges of the times.

e. Maintaining Ethics and Islamic Values in Technological Development

Muhammadiyah consistently positions technology as a tool rather than as an end goal (Fathurrahman, 2025). Technology must be an instrument for strengthening spiritual character, building public morality, and upholding social decency. Therefore, in every policy and utilization of technology, Muhammadiyah encourages ethical reflection, strengthens critical digital literacy, and protects universal human values (Mar & Purnama Sari 2025). Thus, the role of Muhammadiyah in the era of the 5.0 Industrial Revolution is not limited to technical aspects and technology adoption alone but also involves normative and transformative dimensions. Muhammadiyah proved that technology, if managed with a vision based on Islamic and humanitarian values, can be an effective means to strengthen the civilization of the ummah, overcome inequalities, and create a more just and sustainable future.

4.4. The Contribution of Muhammadiyah in Realizing an Intelligent, Adaptive, Constructive, and Moderate Society in the Era of the 5.0 Industrial Revolution

The massive technological development in the era of the 5.0 Industrial Revolution not only offers advancements in the fields of economy and industry but also has serious implications for culture, education, social aspects, and spiritual values (Tavares et al., 2022). This era demands that humans not only become users of technology but also be able to adapt wisely and ethically when facing the flow of information, automation, and artificial intelligence (AI), which is becoming increasingly widespread (Kumar & Kumar, 2024). In this context, Muhammadiyah emerges as a proactive and transformative socio-religious force, playing an important role in shaping a society that is not only intellectually intelligent but also possesses a strong character, adapts to change, and is constructive in building a humanistic and religious civilization. Muhammadiyah understands that technological advancement cannot be avoided, but it also cannot be separated from ethical, moral, and spiritual values (Qorib & Afandi, 2024). Therefore, Muhammadiyah's contribution to facing the challenges of this era encompasses various fields, ranging from education, preaching, health, economy, and information and communication technology.

a. Muhammadiyah Education: The Foundation of Intellectual and Moral Intelligence

One of Muhammadiyah's most fundamental contributions to creating an intelligent and moderate society is the national education system, which has developed extensively and sustainably. Muhammadiyah currently manages more than 170 higher education institutions, thousands of elementary to secondary schools, Islamic boarding schools, and vocational training institutions across the country (Rusyad, 2022). In its approach, Muhammadiyah not only emphasizes the mastery of science and technology but also the formation of morals, spirituality, and national commitment. The curriculum of Muhammadiyah

educational institutions is designed to integrate general knowledge and Islam (Santoso et al., 2023). Students are not only encouraged to master STEM (Science, Technology, Engineering, Mathematics) but are also trained to think critically, care for social issues, and uphold humanitarian values. Through this value-based education, Muhammadiyah strives to shape the generation of young Muslims who are not alienated from the realities of the times but also remain rooted in their spiritual heritage, a generation capable of being key players in technological innovation, while also being pioneers of ethics in its application.

b. Digitalization of Muhammadiyah's Charitable Endeavors and Technological Leap

In the era of the 5.0 Industrial Revolution, Muhammadiyah is accelerating digital transformation in the management of Muhammadiyah Business Enterprises (MBE) in the fields of education, health, the economy, and social services. This step is taken to enhance service efficiency, expand community reach, and strengthen the competitiveness of Muhammadiyah institutions amid digital disruption. Several forms of digital transformation implemented by Muhammadiyah include the following.

- Integrated information systems based on big data in the management of Muhammadiyah schools, hospitals, and universities.
- MBE digital marketing to introduce services to the public in a professional, attractive, and contemporary manner (Ulinuha, 2025).
- Internal service applications and platforms, such as Muhammadiyah ID, integrate membership services and digital identity (Prasetia, 2025).

This digital transformation not only demonstrates Muhammadiyah's adaptive capacity to the progress of the times but also serves as a model for other Islamic organizations in managing modern technology-based organizations without abandoning the values of Islamic spirituality.

c. Technology Product Innovation: Independence and Social Justice

As a form of contribution to creating a productive and independent society, Muhammadiyah, through (Institute for the Development of Micro, Small, and Medium Enterprises) has developed its own technology products named ITMU (Innovation Technology of Muhammadiyah). These products include laptops, desktops, all-in-one pcs, interactive flat panels, workstations, and various technology accessories (Redaktur, 2025). The goal of developing ITMU is to meet the technological needs within the Muhammadiyah community while also promoting the economic independence of the people so that society does not always depend on foreign products. These innovations prove that Muhammadiyah is not merely reactive to technology, but also capable of creating a constructive innovation ecosystem that aligns with the needs of the community and is in harmony with the spirit of Islam *rahmatan lil 'alamin*.

d. Digital Da'wah and Islamic Media Literacy

As a missionary organization, Muhammadiyah utilizes advancements in digital technology to spread enlightening and liberating Islamic values, especially to the younger generation, who are familiar with the digital world. Through channels such as YouTube, Instagram, TikTok, and podcasts, Muhammadiyah conveys literacy-based preaching, a culture of dialogue, and an approach that is friendly towards differences (Huda & Fil 2022). Muhammadiyah also encourages the strengthening of digital literacy among teachers, preachers, and students, so that they can filter information, counter hoaxes, and combat digital radicalism. With this approach, Muhammadiyah strives to create a moderate, open, and critical digital society while also having a strong foundation in Islam.

e. Moderation, Social Constructivism, and Sustainable Adaptation

Amid the challenges of social polarization, value degradation, and the global ecological crisis, Muhammadiyah takes on a strategic role as a mediator that promotes peace. Muhammadiyah's moderate stance is reflected in its commitment to pluralism, national spirit, and support for vulnerable and oppressed groups (Fathurrahman, 2025). In the context of the 5.0 Industrial Revolution, this moderation is translated into the use of technology for the empowerment of the poor, not for exploitation, with an emphasis on technology ethics so that humans remain subjects, not objects, of technology. Cultivation of a scientific culture that is critical and solution-oriented, non-destructive, and manipulative. With these values, Muhammadiyah not only creates adaptive and competent generations, but also shapes constructive citizens who make real contributions to the progress of the nation and global humanity.

e. Global Unified Hijri Calendar (GUHC): Efforts for Global Muslim Unity

One of Muhammadiyah's strategic initiatives in contemporary Islamic science is the idea of a Global Unified Hijri Calendar (GHUC). This initiative aims to establish a uniform, accurate, scientific, and globally usable Hijri calendar for Muslims around the world. GHUC is expected to be a solution to the differences in determining the beginning of Ramadan, Eid al-Fitr, and Eid al-Adha, which have often caused social disintegration and confusion among communities (Anwar, 2025). GHUC did not emerge in a vacuum, but rather as a continuation of classical Islamic scientific heritage. Figures such as Al-Battani, Al-Biruni, and Nasir al-Din al-Tusi laid the foundations of astronomy and celestial science that remain relevant to this day. Muhammadiyah continued this tradition by combining contemporary calculation methods and modern astronomical approaches to create a Hijri calendar system that is scientifically and religiously accountable. GUHC reflects Muhammadiyah's ethos of progress in the field of science and the integration of Islam, while also being a concrete effort to strengthen the global Islamic brotherhood in the context of an increasingly interconnected and interdependent community.

4.5. The Challenges of Muhammadiyah and Other Islamic Groups in Integrating Science and Technology with Islamic Values

In its commitment as a progressive Islamic movement, Muhammadiyah consistently promoted the agenda of integrating science and technology with Islamic values. However, this ideal vision is not free from serious multidimensional challenges, including epistemological, cultural, social, and structural aspects. These challenges are not only faced by Muhammadiyah as an organization but also become a broader problem in the contemporary Islamic world. If not addressed appropriately, the vision of Islam as a mercy to the universe *(rahmatan lil 'alamin)* in the realm of knowledge will stagnate or even degrade because of the unstoppable currents of globalization and secularization (Mar & Sari 2025).

a. The dichotomy between Religious Studies and General Studies due to methodological differences

One of the greatest historical and structural obstacles is the legacy of the dichotomy between religious and general knowledge, which is firmly entrenched in the education system, both in state institutions and within the Islamic community itself (Muna et al. 2024). In many Islamic educational institutions, despite a commitment to integrating general and religious curricula, educational practices still often maintain a separation between "*religious subjects*" and "*general subjects*." As a result, epistemological duality emerges in shaping the personalities of their students, where those who are religious tend to be weak in science, and those who excel in technology often experience spiritual emptiness. This phenomenon not only limits the Muslim generation's potential to think holistically, but also weakens the ability of Muslims to become key players in the development of an ethical and transcendental modern civilization. Therefore, the challenge ahead is not only to eliminate curriculum barriers administratively but also to formulate an integrative curriculum that can ground the concept of Tawhid in the entire scientific process, from introductory mathematics to the philosophy of science.

b. Literacy and Technology Access Gap

Although Muhammadiyah has a strong educational and social infrastructure, the gap in digital literacy and access to technology remains a challenge, especially in remote areas (Putri, 2025). Many teachers, preachers, and MBE administrators have not yet mastered digital tools. This challenge is also experienced by Muslims, especially in developing countries. This condition exacerbates the digital divide between older and younger generations. Without strategic and sustainable intervention, Muslims will only become passive consumers of Western technological products, not creators of technology that meet the needs of the community. Therefore, Muhammadiyah requires mainstream community-based digital literacy training with a contextual, affordable, and empowering approach. Digital preaching and online learning should not only be an agenda for urban elites but must also reach grassroots.

c. Resistance to change

One of the major challenges in integrating science and technology with Islamic values is resistance to change (Hikma et al., 2024).Many remain trapped in a conservative paradigm that views technology as a threat to the purity of teaching. This attitude is often based on a fear of modernization, which is considered capable of eroding religious identity and tradition. This resistance is not merely a technical issue but is closely related to an epistemological crisis: the unpreparedness to engage in a dialogue between revelation texts (the Qur'an and Hadith) and the development of science and technology. To address this, the Bayani approach must be activated dynamically, not only as a reaffirmation of textual authority but also as a means to discover meanings that are contextual and relevant to the realities of the times. Scholars, teachers, and academics are required to bridge the gap between normative Islamic values and the new challenges in the digital era.

d. Concern about losing traditional values

The integration of technology into education and Islamic preaching systems is often met with concerns that traditional values will erode (Dalimunthe et al., 2023). On one hand, digitalization accelerates access to knowledge and expands the reach of da'wah; however, on the other hand, there is concern that this process will create a disconnection from classical teaching methods that are rich in etiquette, exemplary conduct, and spirituality. These concerns are valid and should serve as the foundation for developing a wise integration model. The *irfani* (intuitive) approach here becomes very relevant as it emphasizes the importance of spiritual depth, inner awareness, and direct relations with divine values. Technology should be made a vessel, not a substance, so that Islamic education can continue to instill manners, not just knowledge.

e. Dominance of Secular Epistemology

The hegemony of the modern secular-materialistic science paradigm poses a global challenge to Islam. Knowledge is produced within a framework that dismisses transcendent values in universities, academic journals, and research institutions (Soleh, 2003). Muhammadiyah, which has historically been open to modernity, is now faced with the dilemma of how to develop modern science without falling into epistemological secularism. This challenge requires the decolonization of knowledge projects, which means challenging the dominant structures of knowledge and offering an Islamic epistemology capable of engaging in critical and productive dialogue with modern science. Approaches such as the integration of bayani, burhani, and irfani offered by thinkers such as Amin Abdullah have become important starting points, but they still require real implementation in curricula, laboratories, and research works. Without these steps, Muslims will only become operators of technology and not owners and directors of the direction of knowledge development.

5. CONCLUSION

The integration of science and technology with Islamic values is an urgent necessity to address the challenges of the times and to avoid the epistemological divide between religious knowledge and general knowledge. Although this dichotomy has long been a classic debate in Islamic thought discourse, the reality of contemporary Islamic education still shows a structural and methodological separation between the two. In fact, Islam from the very beginning has affirmed that all knowledge, whether derived from revelation or obtained through reason and observation of the universe, comes from the Allah SWT and is an important instrument in building a civilized civilization. To bridge this gap, two strategic approaches offer both a solution and a transformative opportunity. First, the theory of integration-interconnection of Knowledge by Amin Abdullah combines three approaches of Islamic epistemology: *bayani* (textual), *burhani* (rational-empirical), and *irfani* (intuitive-spiritual) into a comprehensive and synergistic framework of thought. This approach allows for a productive dialogue between the text of revelation and empirical reality and between the dimensions of spirituality and scientific inquiry. Second, the spirit of tajdid in Muhammadiyah is not only about the renewal of thought but also a praxis movement in the fields of education, health, da'wah, economy, and social affairs, which concretely integrates science and technology with Islamic values.

Through the internalization of the values of (Islamic Life Guidelines for Muhammadiyah Members) into science and technology through the spirit of tajdid and commitment to rationality and renewal, Muhammadiyah makes the mastery of science and technology an integral part of faith and good deeds. This is reflected in various forms of internalization, such as integrative education, moderate digital preaching, the development of local technology known as the Innovation Technology of Muhammadiyah (ITMU), and the idea of a Unified Global Hijri Calendar (UGHC) based on modern astronomical science. In the era of the 5.0 Industrial Revolution, Muhammadiyah proves that technology can be an instrument to strengthen character, expand inclusive preaching, and build a humane and just Islamic civilization.

However, these integration efforts still face serious challenges, both from within the Muslim community and from external global influence. Among these are the legacy of the dichotomy of knowledge, the gap in literacy and access to technology, resistance to change, concerns about the erosion of traditional values, and the dominance of secular epistemology in the world of education and research. To address these challenges, an applicable integrative approach model is needed, one that not only unifies the curriculum administratively but also instills the paradigm of Tawhid throughout the entire scientific process and social practices.

Informed Consent Statement

All participants were informed of the purpose of the study and informed consent was obtained prior to data collection. Participation was voluntary, and all responses were kept confidential and used solely for academic research purposes.

Authors' Contributions

Conceptualization, YSH and MLA; methodology, YSH; validation, YSH and MLA; formal analysis, YSH; resources, YSH; writing original draft preparation, YSH; writing review and editing, YSH; Translate support AH

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