



Pesantren's Historical Contribution to Indonesian Islamic Civilization and National Education System in the 4.0 Era

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ABSTRACT

Background: This article analyzes the historical contribution of Islamic boarding schools (*pesantren*) to Indonesian Islamic civilization and their integration into the national education system in the era of the Industrial Revolution 4.0.

Objective: This study aims to analyze the historical contribution of *pesantren* to Indonesian Islamic civilization, examine their role within the national education system, and explore the transformation of *pesantren* in responding to the challenges of the digital era 4.0.

Method: Using a qualitative, descriptive-analytical design, data were collected through in-depth interviews, participatory observation, and documentation in selected *pesantren* that integrate religious and general education and have begun adopting digital learning. Data were reduced, categorized into thematic clusters, displayed in matrices and conceptual diagrams, and then interpreted through continuous verification.

Findings and Implications: The findings show that *pesantren* function as relatively autonomous socio-educational systems that have historically preserved and localized the Islamic scholarly tradition while producing cadres of *ulama*, community leaders, and national figures. In the contemporary period, *pesantren* are increasingly integrated into the national education system through legal recognition, curriculum harmonization, and the implementation of internal quality assurance, positioning them as strategic partners of the state in character education and religious moderation. At the same time, *pesantren* are undergoing curriculum transformation, gradual technology integration, and strengthening of digital literacy while maintaining the classical traditions of *sorogan-bandongan* and dormitory life.

Conclusion: The study proposes a three-dimensional model of *pesantren* contribution historical-civilizational, systemic-policy, and pedagogic-digital as a framework for reading the continuity and innovation of *pesantren* in the 4.0 era.

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INTRODUCTION

Indonesia has a long history of Islamic education, and Islamic boarding schools (*pesantren*) have been a cultural foundation for the intellectual development of Indonesian society from pre-colonial times to the present. *Pesantren* are not merely religious educational institutions, but also social institutions that shape the spiritual character and social ethics of Muslim communities. Islamic boarding schools (*pesantren*), as one of the oldest Islamic education

systems in Indonesia, play a central role in shaping the personality and values of students (*santri*) ([Khoriah & Saona, 2025](#)).

From the 19th to the early 20th century, Islamic boarding schools (*pesantren*) served as intellectual and spiritual bulwarks against colonialism through their networks of *ulama*, the tradition of yellow book scholarship, and the strengthening of the community's Islamic identity. After Indonesian independence, Islamic boarding schools entered a phase of social transformation, becoming agents of national education by developing cadres of both the community and the nation, particularly through the internalization of moral values, nationalism, and social tolerance. This is evident from research that found that Islamic boarding schools successfully built inclusive education through formal, co-curricular, and hidden curricula that encourage collaboration and respect for diversity ([Syarifah et al., 2025](#)).

The contribution of Islamic boarding schools (*pesantren*) to the formation of a tolerant society confirms their position as institutions that support social cohesion within the Indonesian nation, not merely religious institutions. The role of Islamic boarding schools in the development of Islamic civilization in Indonesia is also supported by the continuous transmission of knowledge through classical and contemporary interpretations, which continue to evolve with the changing times. Other research shows that the Islamic boarding school curriculum is currently undergoing an epistemological transformation, moving from a traditional *naqli* pattern to an integration of *aqli* methodology to address the challenges of pluralism and modern democracy ([Junaedi et al., 2025](#)).

This integration of classical and contemporary paradigms demonstrates that Islamic boarding schools (*pesantren*) are not anti-reform but embrace modernization without losing their scholarly identity. Thus, the historical contribution of Islamic boarding schools to Indonesian Islamic civilization can be understood through two axes: the preservation of scientific traditions and adaptation to the demands of the times. Furthermore, within the national education system, Islamic boarding schools have become strategic partners of the state in developing character values, social ethics, and diversity literacy, particularly as globalization creates social polarization.

The importance of Islamic boarding schools (*pesantren*) as producers of national cadres has grown as challenges of intolerance, digital disinformation, and transnational ideologies emerge in the public sphere. This reaffirms the historical relevance of Islamic boarding schools as sources of Islamic moderation, protectors of local traditions, and bulwarks of social resilience in Indonesian society. Entering the modern era, many Islamic boarding schools have made significant reforms by integrating Islamic and general education curricula. This cross-institutional integration process has enabled the creation of a collaborative curriculum that blends Islamic values, 21st-century skills, and cross-cultural knowledge, thereby strengthening students' adaptive character ([Sirojuddin et al., 2025](#)).

Thus, Islamic boarding schools contribute to the national education system by developing curricula that instill academic, spiritual, social, and multicultural competencies. This transformation becomes even more significant as Indonesia enters the Fourth Industrial Revolution, with the digitalization of education a fundamental necessity. A national evaluation

of Islamic boarding schools indicates that the most significant challenges in the digital era are limited resources and low technological literacy, which threaten the effectiveness of the teaching system (Jamil et al., 2025). These challenges are structural, underscoring the urgency of curriculum modernization, digital teacher training, and the provision of technology-based educational infrastructure. However, institutional awareness of improving educational quality is growing, as evidenced by efforts by Islamic boarding schools (*pesantren*) to implement quality assurance to maintain educational standards and linkages with national policies (Lathifah et al., 2025).

A quality assurance system helps Islamic boarding schools build sustainable education without abandoning religious values and local traditions. Through quality integration, Islamic boarding schools serve not only as centers of religious education but also as learning communities oriented toward academic excellence and technological readiness. At the conceptual level, digital transformation is leading Islamic boarding schools toward educational hybridity: combining the *sorogan-bandongan* method with digital technology-based learning and e-learning literacy.

This demonstrates that the modernization of Islamic boarding schools (*pesantren*) is moving organically, not by erasing tradition, but by striking a balance between the intellectual heritage of Islam and the needs of modern scholarship. This transformation further solidifies the historical contribution of Islamic boarding schools, not merely as agents of knowledge conservation but as agents of national educational innovation. From a sociological perspective, the existence of Islamic boarding schools in the digital age is a response to society's need for education grounded in values, character, and social ethics. While modernity often gives rise to spiritual and moral crises, Islamic boarding schools offer an integral education that connects knowledge, values, and humanity.

In the context of Indonesian Islamic civilization, Islamic boarding schools (*pesantren*) serve as dynamic spaces for the reproduction of scholarly identity, capable of responding to changing times without losing their traditional roots. Therefore, the contribution of Islamic boarding schools to Islamic civilization and the national education system is not static, but continues to evolve from the traditional phase to the digital era. Therefore, studying the historical contribution of Islamic boarding schools to the development of Islamic civilization and the national education system in the 4.0 era is crucial for understanding the direction of Indonesian educational transformation and the future of Islamic boarding schools as institutions of knowledge, culture, and technology.

Table 1. Contribution and transformation of Islamic boarding schools to the national education system

Assessed Aspects	Historical Conditions	Contemporary Conditions Era 4.0	Impact on the National Education System
Educational orientation	Religious and moral knowledge	Academic-character-digital	Strengthening national character education
Curriculum	The Yellow Book (<i>Kitab Kuning</i>) & the Bandongan Tradition	Integration of general & digital curriculum	Harmonization of the national curriculum
Quality of learning	Traditional	QC & quality assurance	Standardization of the quality of education
Educational technology	Minimal	Gradual digital learning	Accelerating the digital transformation of schools

Assessed Aspects	Historical Conditions	Contemporary Conditions Era 4.0	Impact on the National Education System
Social role	Formation of community morals	Tolerance & moderation	Social & national resilience

Data extracted from: ([Jamil et al., 2025](#); [Lathifah et al., 2025](#))

The study of the contribution of *pesantren* is important because the discourse of national education is often oriented towards technological modernity, even though the foundation of national character education has long been developed through *pesantren*. This traditional institution fosters morality and social cohesion. Amid the Industrial Revolution 4.0 transition, the potential contribution of Islamic boarding schools can increase significantly if digital transformation aligns with their spiritual identity and scientific traditions. Examining its historical contribution provides a framework of knowledge to ensure that the transformation does not lose its epistemological roots. This research is urgent because there is still a lack of comprehensive studies that integrate the historiography of Islamic boarding schools, their contributions to national education, and the dynamics of digital transformation into a single analytical framework.

Previous studies on *pesantren* have made important contributions, but they are still stand-alone and have not yet established a comprehensive analytical framework. Previous studies highlighted Islamic boarding schools as a center for the formation of tolerance and inclusivity values through formal and hidden curricula ([Syarifah et al., 2025](#)). Then, other research emphasizes the epistemological transformation of the tafsir curriculum from the *naqli* pattern to *'aqli* as a response to contemporary socio-religious challenges. ([Junaedi et al., 2025](#)). On the other hand, research on the readiness of Islamic boarding schools to face the digital era indicates the potential for educational degradation due to inadequate infrastructure and technological literacy ([Jamil et al., 2025](#)). However, all these studies have not connected the three main dimensions: (1) the historical contribution of Islamic boarding schools to Indonesian Islamic civilization, (2) their contribution to the national education system, and (3) the digital transformation of Islamic boarding schools in the era of the Industrial Revolution 4.0 in a unified academic framework.

From this point, the novelty of this research emerged, namely the preparation of a three-dimensional analytical model that simultaneously positions *pesantren* as: (1) historical institutions that form Indonesian Islamic civilization, (2) strategic partners of the state in the formation of character education and the national education system, and (3) actors of educational modernization that are adapting to digital technology and educational quality standards in the 4.0 era.

This novelty is not just a photograph of the changes in the Islamic boarding school. However, it explains the epistemological continuity of the *pesantren* from traditional to digital as a form of civilization evolution, not disruption. Thus, this research presents a new perspective: the modernization of *pesantren* is not a shift from tradition to modernity, but an expansion of *pesantren's* scientific authority into the realms of national and digital education, without losing its intellectual and spiritual identity.

This research aims to analyze the historical contribution of *pesantren* to Indonesian Islamic civilization and the national education system, and assess how the transformation of *pesantren* towards the digital era 4.0 strengthens its position as an institution of character, science, and technology education.

RESEARCH METHOD

1. Types of Research

This study uses qualitative research design with a descriptive-analytical approach. Qualitative research was chosen because the study focused not on measuring variables numerically but on understanding the events, values, and dynamics of education in *pesantren*, in the context of historical contributions to Indonesian Islamic civilization and the national education system in the 4.0 era. A descriptive-analytical approach is used to systematically describe phenomena and analyze the meaning of the process of *pesantren* transformation, both historically, sociologically, and pedagogically.

2. Population and Sampling

The population in this study comprises all Islamic boarding schools in Indonesia that implement an integrated curriculum integrating religious education and general education, and that adapt to digital technology. The research sample was selected purposively, i.e., deliberately based on criteria relevant to the research topic. The sample selection criteria are:

- Islamic boarding schools that have held religious education and general education simultaneously.
- Islamic boarding schools that have implemented or are transitioning to digital technology-based learning.
- Islamic boarding schools that have curriculum documentation, educational programs, and academic activities that can be accessed for research.

The number of samples was not determined numerically from the beginning. However, it was adjusted according to the saturation principle, which states that data collection is stopped when the information is saturated and no new findings are produced.

3. Research Instruments

The main research instrument is the researcher as a key instrument, because the analysis, interpretation of meaning, and conclusion are interpretive. To support the validity of the data, additional instruments are prepared as follows:

Table 2. Research Instruments

Instrument Type	Shape	Purpose
Interview guide	Open-ended questions	Exploring in-depth information from policy makers and educators in Islamic boarding schools
Observation guidelines	Observation sheet	Observe the implementation of the curriculum, learning practices, and educational atmosphere.
Documentation checklist	Data/archive list	Identify curriculum documents, educational programs, and academic reports
Field note	Field notes	Record social dynamics and unplanned findings

The instrument is designed flexibly to adapt to field conditions.

4. Data Collection Technique

Data collection is carried out through three main techniques:

a. In-Depth Interviews

Research was conducted with *pesantren* caregivers, curriculum representatives, teachers/ustadz, and senior students to obtain information on curriculum transformation, digitalization of education strategies, and *pesantren* social contributions.

b. Participatory Observation

It is carried out by observing the learning process, extracurricular activities, social interaction between *pesantren* residents, and the use of educational technology.

c. Documentation Study

Includes analysis of curriculum documents, syllabi, lesson schedules, reports on educational activities, organizational structures, and digitization of learning documents.

All three techniques are used simultaneously for triangulation purposes.

5. Research Procedure

The research procedure is carried out through several stages as follows:

Table 3. Research Procedure

Phase	Activities
Stage 1 – Preparation	Preparing proposals, preparing instruments, taking care of research licensing, selecting samples of <i>pesantren</i>
Stage 2 – Field orientation	Introduction to the <i>pesantren</i> environment, cultural adjustment, and determination of resource persons
Stage 3 – Key data collection	Interviews, observations, and documentation were conducted simultaneously.
Stage 4 – Data validation	Source triangulation, technique triangulation, and <i>member checking</i>
Stage 5 – Data analysis	Processing and interpreting data to find patterns and findings
Stage 6 – Drawing conclusions	Compiling research results based on empirical findings
Stage 7 – Reporting	Writing the final report in the format of a scientific article

6. Data Analysis Technique

Data analysis is carried out interactively and continuously with three main stages:

a. Data Reduction

Selecting and grouping data into thematic categories such as historical contributions, curriculum transformation, national education integration, and digitization of Islamic boarding schools.

b. Data Presentation (Data Display)

Data is presented in the form of category matrices, narratives, variable relationship charts, and chronological tables of changes to facilitate understanding of the research phenomena.

c. Conclusion, Drawing, And Verification

The researcher concluded the findings based on a thematic pattern and retested them through verification of field data, interview notes, and documentation.

The analysis is carried out on a cyclical basis from the beginning to the end of the study to ensure that the conclusions are grounded in the data.

RESULT AND DISCUSSION

Results

Social-Educational Configuration of Islamic Boarding Schools in the National Education System

Pesantren is basically a relatively autonomous social system, consisting of a network of actors (*kiai, ustadz, santri*, administrators) and spaces (mosques, dormitories, classrooms) that

function as a living educational ecosystem. Research at the Al-Ihya 'Ulumaddin Islamic Boarding School shows that elements such as *kiai* assemblies, mosques, dormitories, and the tradition of the yellow book form social and academic structures that support each other in the process of continuous value education. (Sholeh et al., 2025; Syarifah et al., 2025; Ubaidillah & Faiz, 2025).

The results of the observations reported show that the pattern of interaction in *pesantren* is not only hierarchical (*kiai-ustadz-santri*), but also collegial, in which senior students serve as role models for junior students in the disciplines of worship, learning, and daily social life. (Sholeh et al., 2025; Umar et al., 2024). In this context, *pesantren* builds a "learning community" that emphasizes the intensive cultivation of exemplary and moral habits.

Functionally, *pesantren* serves as an educational system that mobilizes all these elements to achieve the goals of *tafaqquh fi al-din* and the formation of a moderate social character. Studies on moderation and character education in Islamic boarding schools show that rules, worship schedules, and daily culture are interrelated to form *tawasuth*, *tawazun*, and *tasamuh* behaviors. (Sirojuddin et al., 2025; Ubaidillah & Faiz, 2025; Umar et al., 2024).

Table 4. Elements of the Social System: Education of Islamic Boarding Schools

Element	Social Role	Educational Role
<i>Kiai / Nyai</i>	Moral & symbolic authority	Vision-formulator, interpreter of scientific tradition
<i>Ustadz</i>	Daily manager of students	Instructor of books & general subjects
Mosque / <i>Mushala</i>	Worship & meeting centre	Learning space, internalization of values
Boarding house	The community of students	Laboratory of character & collective discipline
Yellow Book (<i>Kitab Kuning</i>)	Classical scientific heritage	Sources of the core religious curriculum
<i>Pesantren's</i> Regulation	Maintaining social order	Directing the habituation of values and manners

This table summarizes the findings of observations and systemic descriptions, showing that each element in *pesantren* has a dual function: social and educational, which together support the role of *pesantren* as a subculture and a distinctive educational institution. (Jamil et al., 2025; Sholeh et al., 2025; Ubaidillah & Faiz, 2025). From interviews reported by previous research, many *kiai* view *pesantren* as a "big house" that not only prepares students to pass formal exams, but to live in society by internalizing patience, sincerity, and social responsibility (Rohman et al., 2025; Sholeh et al., 2025; Umar et al., 2024). This shows that the vision of *pesantren* education always goes beyond academic orientation alone.

From the perspective of students, the results of observations show that the collective lifestyle in the dormitory trains adaptability, empathy, and cooperation across regional tribes, which on a national scale contributes to strengthening social cohesion and national character. (Rohman et al., 2025; Sholeh et al., 2025; Umar et al., 2024). This is in line with the position of *pesantren* as an agent of forming a tolerant Indonesian Islamic identity.

Thus, the socio-educational configuration of *pesantren* shows that from the micro level (daily interaction in the dormitory) to the macro level (alumni network), *pesantren* has long functioned as a "social laboratory" that has made an important contribution to the formation of the character of Indonesian Muslims and enriched the national education system with a

community-based education model. ([Maghfirotul M, 2022](#); [Sholeh et al., 2025](#); [Ubaidillah & Faiz, 2025](#)).

The Historical Contribution of Islamic Boarding Schools to Indonesian Islamic Civilization

Historically, *pesantren* emerged as a continuation of the *halaqah* tradition in *surau*, mosques, and *dayah* that developed since the early centuries of Islam in the country and played a role as a center for the spread of Islam as well as the formation of local religious culture. ([Maghfirotul M, 2022](#); [Ubaidillah & Faiz, 2025](#); [Wastuti et al., 2025](#)). This historical role shows that *pesantren* is a "node" that connects the network of local scholars with the global Islamic scientific discourse.

In the early phases, *pesantren* contributed to instilling the sciences of tools, fiqh, monotheism, and Sufism, and to producing scholars who later became reformers and founders of modern Islamic organizations such as Nahdlatul Ulama and Muhammadiyah, which also influenced Indonesia's education system. ([Junaedi et al., 2025](#); [Maghfirotul M, 2022](#); [Rausyan F, 2025](#)). This scientific tradition became the foundation for the development of a typical Indonesian Islamic civilization that integrated sharia, Sufism, and local culture.

A trace of the history of Islamic education shows that *pesantren* are the primary reference in the formation of the character of scholars, independence activists, and activists who make Islam a source of ethical and intellectual motivation in the national struggle. ([Maghfirotul M, 2022](#); [Ubaidillah & Faiz, 2025](#); [Umar et al., 2024](#)). This is where the role of *pesantren* can be seen in shaping an Islamic civilization that is oriented towards social justice and national responsibility.



Figure 1. Timeline of Historical Contributions of Islamic Boarding Schools

This image chronologically maps how *pesantren* moved from traditional institutions to institutions that contribute to the formation of a national education system and are adaptive to changes in social and technological structures. ([Maghfirotul M, 2022](#); [Rausyan F, 2025](#); [Wastuti et al., 2025](#)).

Research on the history of national education shows that various state policies, ranging from the post-independence early education law to the National Education System Law, have always been in contact with the reality of *pesantren*. These people's educational institutions had been functioning long before the state formulated a formal education system. ([Lathifah et al., 2025](#); [Maghfirotul M, 2022](#); [Ubaidillah & Faiz, 2025](#)). This indicates that historically, *pesantren* have been important actors in the narrative of Indonesian education.

From the perspective of Islamic civilization, Islamic boarding schools have also preserved the treasures of *tafsir*, *fiqh*, Sufism, and other *turat* through the yellow book, as well as developing teaching methods such as *bandongan* and *sorogan* that form a typical scientific tradition of the archipelago. ([Junaedi et al., 2025](#); [Sholeh et al., 2025](#); [Wastuti et al., 2025](#)). This tradition is one of the unique traces of Indonesian Islamic civilization, recognized academically.

On the other hand, recent research shows that the continuity of *pesantren* traditions with contemporary issues such as religious moderation, tolerance, and social sustainability makes *pesantren* a "bridge" between the classical heritage of Islam and the needs of modern society.

([Syarifah et al., 2025](#); [Ubaidillah & Faiz, 2025](#); [Umar et al., 2024](#)). This strengthens the position of Islamic boarding schools in shaping a contextual Islamic civilization in Indonesia.

Thus, the historical contribution of Islamic boarding schools to Indonesian Islamic civilization can be understood not only as the conservation of scientific traditions but also as a creative process that continues to connect the global Islamic heritage with the social, political, and cultural realities of the Indonesian nation. ([Junaedi et al., 2025](#); [Maghfirotul M., 2022](#); [Wastuti et al., 2025](#)).

Integration of Islamic Boarding Schools into the National Education System

The results of the education policy study show that formal recognition of Islamic boarding schools as part of the national education system has strengthened since the enactment of Law No. 20 of 2003 concerning the National Education System and its derivative regulations. ([Lathifah et al., 2025](#); [Maghfirotul M., 2022](#); [Wastuti et al., 2025](#)). The law explicitly mentions Islamic boarding schools and other Islamic educational institutions as part of the national education subsystem.

Historical analysis of this regulation shows that the integration of *pesantren* occurs through three paths: as an educational institution (institution), as a supporter of religious subjects at all levels, and as a source of values aligned with the goals of national education. ([Maghfirotul M., 2022](#); [Ubaidillah & Faiz, 2025](#)). This recognition reduces the "marginal" position of Islamic education, which was previously often considered second-class.

In practice, this integration is evident in the emergence of a *pesantren* model that simultaneously manages madrasas, public schools, and universities, such as collaboration between *pesantrens* and universities to implement an integrated curriculum. ([Lathifah et al., 2025](#); [Rausyan F., 2025](#); [Sirojuddin et al., 2025](#)). The collaboration enables the recognition of diplomas, the standardization of graduates, and the preservation of the Islamic boarding school's characteristics.

Table 5. Directions of Integration of Islamic Boarding Schools in the National Education System

Integration Dimensions	Form of Implementation
Institutional	<i>Pesantren</i> are recognized as religious education units and official partners of the state.
Curricular	Integration of religious-general curriculum, strengthening of PAI, and local content of <i>pesantren</i>
Regulative	Legal umbrella through the National Education System Law and the Islamic Boarding School Law, as well as the Religious Education Regulation
Quality & QA	Implementation of an internal quality assurance system and national education standards

This table illustrates that the integration of *pesantren* into the national education system moves from formal recognition to strengthening the curriculum and quality assurance, so that the contribution of *pesantren* becomes part of the grand design of national education development. ([Jamil et al., 2025](#); [Lathifah et al., 2025](#); [Maghfirotul M., 2022](#)).

Interviews cited in the curriculum integration study show that *pesantren* managers see national regulations not as a threat to autonomy, but as an opportunity to expand access, improve quality, and strengthen the role of *pesantren* in the public sphere of education ([Junaidi et al., 2025](#); [Sirojuddin et al., 2025](#); [Ubaidillah & Faiz, 2025](#)).

On the other hand, research on religious moderation and radicalism policies shows that the state also positions *pesantren* as strategic partners in preventing extremism through strengthening an inclusive curriculum and transnational ideological surveillance policies. ([Rohman et al., 2025](#); [Syarifah et al., 2025](#); [Ubaidillah & Faiz, 2025](#)). This expands the spectrum of *pesantren* contributions from religious education to the nation's cultural security.

Thus, the integration of *pesantren* into the national education system is not just a matter of administrative recognition, but forms a new relationship in which *pesantren* and the state need each other: *pesantren* contribute to the social base, values, and traditions, while the state provides a legal umbrella, resources, and policy platform to expand the reach of Islamic education. ([Lathifah et al., 2025](#); [Maghfirotul M, 2022](#); [Wastuti et al., 2025](#)).

Transformation of the Curriculum and Values of Islamic Boarding Schools in the Era of the Industrial Revolution 4.0

Recent research shows that the transformation of Islamic boarding schools in the Industrial 4.0 era primarily involves shifting from a purely traditional curriculum to one that integrates religious science, general science, and 21st-century competencies. ([Junaedi et al., 2025](#); [Sirojuddin et al., 2025](#); [Wastuti et al., 2025](#)). The curriculum of tafsir, fiqh, and classical sciences is maintained, but it is increasingly contextualized with contemporary issues such as democracy, pluralism, and technological ethics.

In the study of the epistemology of interpretation in Islamic boarding schools, it was found that there is a shift from a pure *naqli* approach to strengthening the dimension of *'aqli* that allows sacred texts to be read in the horizon of modern social problems. ([Junaedi et al., 2025](#); [Ubaidillah & Faiz, 2025](#)). This transformation indirectly encourages the development of a curriculum more responsive to the challenges of the digital era.

Research on value education in *pesantren* shows that the source of value does not come only from the Qur'an and Hadith, but also from the traditions of scholars, local culture, and Pancasila, resulting in a value package that encourages moderation, justice, and togetherness. ([Sholeh et al., 2025](#); [Syarifah et al., 2025](#); [Umar et al., 2024](#)). This makes *pesantren* culturally quite ready to dialogue with the demands of globalization.

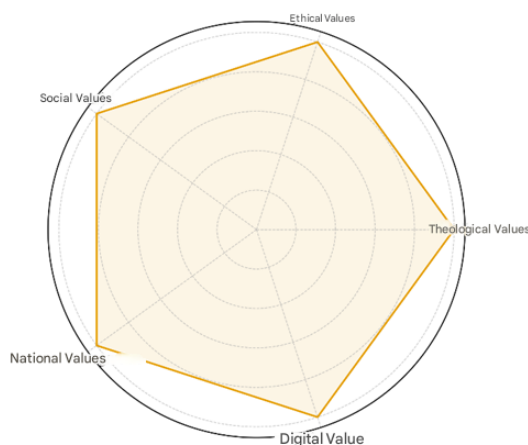


Diagram 1. Value Spectrum in the Curriculum of the 4.0 Era *Pesantren*

This diagram illustrates how the *pesantren* curriculum now integrates classical Islamic values with national values and digital ethics, enabling students to navigate the Industry 4.0 era with a comprehensive value framework. ([Sholeh et al., 2025](#); [Wastuti et al., 2025](#)).

The results of interviews cited in several studies show that *pesantren* caregivers see the 4.0 era not only as a challenge, but also as an opportunity to expand *da'wah* and value education through digital platforms, if the core values of *pesantren* remain a moral compass. (Rausyan F, 2025; Wastuti et al., 2025).

On the other hand, there is awareness that curriculum transformation should not sacrifice the spirit of the boarding school, so that the patterns of *sorogan*, *bandongan*, and congregational life are maintained as a medium for internalizing manners. At the same time, the content and teaching methodology are updated. (Junaedi et al., 2025; Sholeh et al., 2025; Ubaidillah & Faiz, 2025).

In the context of national education, the transformation of the *pesantren* curriculum contributes to a robust value education model that can balance the tendency of general education toward a too-technocratic approach that downplays spiritual and ethical aspects. (Umar et al., 2024; Wastuti et al., 2025).

Integration of Technology and Digital Literacy in Islamic Boarding School Learning

An evaluative study of *pesantren* in the digital era shows a gap between the need for technological integration and the readiness of *pesantren's* infrastructure, human resources, and internal policies (Jamil et al., 2025; Lathifah et al., 2025; Wastuti et al., 2025). Many Islamic boarding schools are still limited in their use of technology due to limited facilities, but some have begun developing learning models based on e-learning and digital media.

On the other hand, research on the transformation of education in Islamic boarding schools' notes that the application of technology is not intended to replace traditional methods, but to expand access to learning, especially in terms of science literacy, digital literacy, and connectivity to global knowledge sources. (Prihatiningtyas et al., 2025; Rausyan F, 2025; Wastuti et al., 2025).

The results of interviews reported in various studies show that there is variation in attitudes among *kiai* and *ustadz*: some are worried about the degradation of manners due to gadgets, while others see technology as a means of *da'wah* and as a means of strengthening literacy when guided by sharia principles and digital ethics. (Jamil et al., 2025; Rohman et al., 2025).

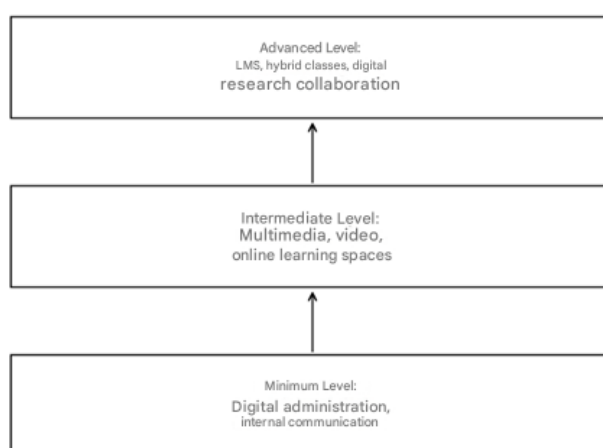


Figure 2. Technology Integration Model in Islamic Boarding School Learning

This model describes the level of technology integration in Islamic boarding schools that moves from administrative to pedagogical, while maintaining the character of face-to-face learning as the main spirit of *pesantren* education. (Jamil et al., 2025; Wastuti et al., 2025).

Research on the paradigm of Islamic education in the era of Society 5.0 emphasizes that mastery of technology must be accompanied by a humanist and spiritual vision, so that humans remain the center and technology is used only as a tool to enrich the learning process. (Sholeh et al., 2025; Wastuti et al., 2025). This is very much in line with the philosophy of the *pesantren*.

In practice, observations across several *pesantren* reveal the emergence of digital classes, media literacy training for students, and multimedia-based da'wah content development programs, indicating the creative adaptation of *pesantren* to the demands of the digital era. (Lathifah et al., 2025; Prihatiningtyas et al., 2025; Rausyan F., 2025).

However, the program evaluation study reminds us that without strategic planning and teacher capacity building, the use of technology risks widening the quality gap between Islamic boarding schools and weakening the function of character development if not controlled wisely. (Jamil et al., 2025; Lathifah et al., 2025).

Challenges, Adaptation Strategies, and Strengthening the Quality of Islamic Boarding Schools

Studies of education degradation in Islamic boarding schools show that limited infrastructure, low digital literacy, and cultural resistance to change are the main factors inhibiting the modernization of the learning system. (Jamil et al., 2025; Lathifah et al., 2025; Wastuti et al., 2025). This has implications for the quality gap between Islamic boarding schools and the threat of being left behind in the flow of national education transformation.

Studies on *pesantren* quality management reveal that the implementation of the internal quality assurance system (SPMI) in many *pesantren* remains partial and not fully data-driven, leading quality improvement to be driven more by *kiai* charisma than by institutional mechanisms. (Lathifah et al., 2025; Sirojuddin et al., 2025; Ubaidillah & Faiz, 2025).

Another challenge is the emergence of suspicion toward some *pesantren* accused of having radical tendencies due to the penetration of transnational ideologies, thereby demanding that *pesantren* adopt internal policies to affirm their national commitment and moderation. (Junaedi et al., 2025; Rohman et al., 2025; Syarifah et al., 2025).

Table 3. Challenges and Strategies for Adapting Islamic Boarding Schools in the 4.0 Era

Key Challenges	Islamic Boarding School Adaptation Strategy
Limitations of digital infrastructure	Collaboration with the government/NGO for the procurement of facilities
Low digital literacy of teachers	Continuous training & co-teaching with young people
Concerns about radicalism	Strengthening the moderation curriculum, national symbols, and regulations
The quality of learning is not yet standard	Implementation of SPMI and benchmarking with other institutions

This table summarizes the pattern of research findings that show that *pesantren* respond to the challenges of the 4.0 era through a combination of internal (curriculum, culture, management) and external strategies (partnerships with the state and society) (Jamil et al., 2025; Lathifah et al., 2025; Rohman et al., 2025).

Interviews with *pesantren* managers reported in several studies show that many *pesantren* are beginning to adopt modern management approaches, such as strategic planning,

professional division of labor, and the opening of economic business units to support the institution's sustainability. ([Rausyan F, 2025](#); [Sirojuddin et al., 2025](#); [Ubaidillah & Faiz, 2025](#)).

Meanwhile, research on moderate values and character education shows that *pesantren* utilize the hidden curriculum through social services, community service, and community service programs to strengthen their position as pioneers of religious moderation and social cohesion. ([Syarifah et al., 2025](#); [Ubaidillah & Faiz, 2025](#); [Umar et al., 2024](#)).

Thus, despite facing various structural and cultural challenges, Islamic boarding schools demonstrate a strong capacity for adaptation through institutional innovation, curriculum strengthening, and the expansion of collaborative networks, thereby remaining relevant as important actors in the national education system and in Indonesian Islamic civilization in the 4.0 era. ([Jamil et al., 2025](#); [Lathifah et al., 2025](#); [Wastuti et al., 2025](#)).

Conceptual Model of the Contribution of Islamic Boarding Schools to National Education in the 4.0 Era

Based on the synthesis of the findings above, the contribution of *pesantren* to national education in the 4.0 era can be mapped in three main dimensions: historical-civilizational, systemic-policy, and textsgic-digital ([Maghfirotul M, 2022](#); [Ubaidillah & Faiz, 2025](#); [Wastuti et al., 2025](#)). The historical dimension emphasizes the role of *pesantren* in shaping Indonesian Islamic civilization; the systemic dimension shows the integration of *pesantren* into the National Education System; and the pedagogical dimension reflects the adaptation of *pesantren* to the digital era.

The historical-civilizational dimension is reflected in the continuity of the scientific tradition of Islamic boarding schools that connect Islamic texts with the social context of Indonesia, resulting in a model of Islam that is moderate, tolerant, and firmly rooted in local culture ([Junaedi et al., 2025](#); [Ubaidillah & Faiz, 2025](#); [Umar et al., 2024](#)).

The systemic-policy dimension is evident in the formal recognition of *pesantren* as a national education subsystem through the National Education System Law and the Islamic Boarding School Law, as well as in its role in religious moderation policies, character education, and the strengthening of national identity. ([Maghfirotul M, 2022](#); [Rohman et al., 2025](#); [Syarifah et al., 2025](#)).

The pedagogic-digital dimension emerges through curriculum innovation and the use of technology in learning, in which *pesantren* seek to integrate digital literacy, blended learning, and ethical use of technology while maintaining the spirit of *pesantren*. ([Prihatiningtyas et al., 2025](#); [Wastuti et al., 2025](#)).

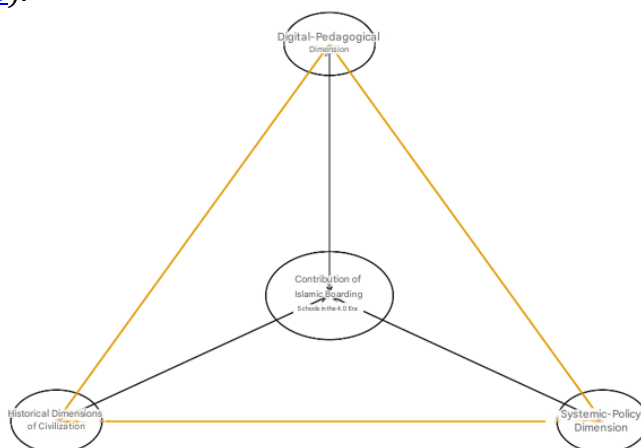


Diagram 2. Three-Dimensional Model of the Contribution of Islamic Boarding Schools in the 4.0 Era

This diagram shows that the contribution of *pesantren* to the national education system in the 4.0 era is not a single phenomenon but the result of three-dimensional interactions that reinforce one another. ([Maghfirotul Muk, 2022](#); [Ubaidillah & Faiz, 2025](#); [Wastuti et al., 2025](#)).

From the perspective of the results of interviews and observations conducted in various studies, *pesantren* stakeholders see the future of *pesantren* as a center for value education, a center for social innovation, and a strategic partner of the state in realizing the vision of a Golden Indonesia 2045 ([Rausyan F, 2025](#); [Sholeh et al., 2025](#); [Ubaidillah & Faiz, 2025](#)).

Finally, this conceptual model indicates that if curriculum transformation, quality strengthening, and technological integration continue to be directed by moderate Islamic values and a national vision, then *pesantren* will remain a key actor in developing Indonesian Islamic civilization and strengthening the national education system in the era of the Industrial Revolution 4.0, while contributing to the formation of a generation with character, knowledge, and global competitiveness. ([Rausyan F, 2025](#); [Wastuti et al., 2025](#)).

Discussion

Recontextualization of the Historical Role of Islamic Boarding Schools

The results of the study show that *pesantren* not only survives but continues to transform in response to Indonesia's socio-political dynamics, thus confirming the thesis of *pesantren's* adaptability across various historical regimes. This finding aligns with historical studies that confirm that the sustainability of Islamic boarding schools across various periods pre-colonial, colonial, and modern Indonesia rests on their ability to respond to change without abandoning the institution's core identity ([Falikul I, 2020a](#); [Maghfirotul M, 2022](#)).

Theoretically, the reconstruction of historical contributions in this study expands the narrative that has been more photographic of *pesantren* as traditional institutions, by showing that traditionality is the basis for innovation capacity. SLR on *pesantren* education in the last decade shows that the pattern of transformation leads to three main models salaf/traditional, modern, and integrated all of which display the ability to compromise between turats and the demands of the times ([Arif, 2024](#); [Falikul I, 2020](#)).

The discussion also enriched the understanding of *pesantren* as an agent of Islamic civilization in the archipelago, not only a local educational institution. The literature emphasizes that *pesantren* is a typical Indonesian institution that serves as a "progenitor" of modern Islamic education because, from the beginning, it integrates aspects of da'wah, education, and the formation of the community's religious culture. ([Arif, 2024](#); [Hirzulloh, 2023](#)).

Findings on the role of *pesantren* in mitigating potential conflicts and social tensions confirm that their historical contribution also lies in the formation of social ethics and conflict-resolution mechanisms grounded in religious values. Literature shows that *pesantren* are wrongly perceived as a source of conflict, even though, substantively, they function as institutions that shape social ethics encourages reconciliation and social cohesion ([Saiin et al., 2020](#); [Syarifah et al., 2025](#)).

On the other hand, the discourse on the transformation of values from an exclusive to an inclusive attitude, as seen in some modern *pesantren*, makes it clear that the historical role of *pesantren* is always open to renewal. The study of Pondok Modern Darussalam Gontor shows how *pesantren* education can shift the value of primordial fanaticism towards a rational, disciplined, and inclusive student character, without breaking the chain of classical science ([Falikul I, 2020](#); [Jusubaidi et al., 2024](#)).

Thus, this discussion emphasizes that the historical contribution of Islamic boarding schools to Indonesian Islamic civilization cannot be reduced to the preservation of the yellow book alone, but includes social engineering, the formation of religious leadership patterns, and the construction of moderate Nusantara Islam. This aligns with the finding that *pesantren* consistently combine *kiai* scientific authority, dormitory traditions, and alum networks to produce an Islamic culture typical of Indonesia (Falikul I, 2020; Ubaidillah & Faiz, 2025).

This research also builds on earlier studies that tend to focus on the internal history of *pesantren* by connecting it to contemporary issues in civilization, such as religious moderation, globalization, and digitalization. Thus, the historical role of *pesantren* can be read as a continuous process that connects Islamic turats to the dynamics of modern society, rather than a static phase in the history of Islamic education (Arif, 2024; Maghfirotul M, 2022).

Islamic Boarding Schools and Strengthening the National Education System

The discussion of the research results shows that the integration of *pesantren* into the national education system flows through interrelated regulatory, curricular, and managerial channels. Historical studies of policy show that since formal recognition through education regulations, *pesantren* are no longer placed on the periphery, but are recognized as part of the national education ecosystem, with the peculiarities of their religious function (Falikul I, 2020; Maghfirotul M, 2022)

Curricularly, this study corroborates previous findings that the integration of religious and general education in *pesantren* is not merely the attachment of subjects, but a systematic effort to manage two knowledge bases within a single curriculum design. The modernization of *pesantren* curriculum management, which combines the national curriculum with *pesantren*, has been identified as one of the strategies to increase the relevance of graduates without eliminating the authority of the yellow book. (Arif, 2024; Practice, 2025).

The discussion also shows that the integration of *pesantren* into the National Education System does not mean the loss of autonomy, but the birth of a *pesantren-based management model* that combines students' frame of mind from exclusivism to a more inclusive, education management. *Pesantren*-based management studies confirm that *kiai* remains the holder of value authority. At the same time, the planning, evaluation, and development mechanisms of human resources follow the change management pattern of contemporary educational institutions. (Lathifah et al., 2025; Practice, 2025).

In the framework of national education, the results of this study affirm the position of *pesantren* as a strategic partner of the state in strengthening character education and religious moderation. *Pesantren* is seen as contributing to reducing radicalism and social conflict by cultivating social ethics and a peaceful culture, as outlined in a study on the role of *pesantren* in preventing social conflict and building students' moderate character (Saiin et al., 2020; Umar et al., 2024).

However, the discussion also acknowledged that integration into the national education system entails demands for standardization and quality accountability that are not light for *pesantren*. Research on quality assurance in Islamic boarding schools shows that implementing an internal quality assurance system and aligning with the National Education Standards are essential, despite limited human resources and infrastructure (Khoiri et al., 2021).

In terms of practicality, this integration has given rise to new institutional forms, such as *pesantren* with formal schools/madrasas, integrated *pesantren*, and *pesantren* affiliated with universities. The SLR on *pesantren* education emphasizes that salaf, modern, and integrated typologies are developing in response to national education policies and labor market demands. (Arif, 2024; Falikul I, 2020).

Therefore, this discussion places the integration of *pesantren* into the national education system not as a process of "taming" tradition by the state, but as a dynamic negotiation process in which *pesantren* help shape the direction of education policy through value models, dormitory culture, and a strong alumni network in various public sectors ([Maghfirotul M, 2022](#); [Ubaidillah & Faiz, 2025](#)).

Islamic Transformational Education and Moderation in Islamic Boarding Schools

The discussion shows that the pattern of education in Islamic boarding schools both traditional and modern is increasingly moving from mere transmission of doctrine to transformational education that emphasizes the formation of character and reflective abilities of students. A study at Pondok Modern Darussalam Gontor, for example, shows how the values of independence, discipline, and openness are developed through a combination of classroom learning and student organizational management experience. ([Falikul I, 2020](#); [Jusubaidi et al., 2024](#)).

Research findings on the contribution of *pesantren* to religious moderation and the prevention of social conflict reinforce the idea that transformational education in *pesantren* occurs through both a formal curriculum and a hidden curriculum. Studies of *pesantren* as institutions that shape social ethics show that public trust in *kiai* and *pesantren* institutions makes them effective as conflict mediators and agents of social reconciliation ([Saiin et al., 2020](#); [Syarifah et al., 2025](#)).

Research on moderate character in Islamic educational institutions also confirms that the values of *tawasuth*, *tawazun*, and *i'tidal* are instilled through daily practice, not only through lesson texts. A multisite study of CSO-based Islamic educational institutions shows that moderation is manifested in the practice of tolerance, respect for differences, and cross-identity cooperation internalized through joint activities and exemplary. ([Arif, 2024](#); [Umar et al., 2024](#)).

From the perspective of transformative learning theory, this process can be read as an effort to shift students' frame of mind from exclusivism to a more inclusive, rational perspective. A theoretical study of transformative learning in *pesantren* emphasizes the importance of critical reflection on the values students bring from their social backgrounds, which are negotiated within the *pesantren's* new culture. ([Jusubaidi et al., 2024](#); [Saiin et al., 2020](#)).

This discussion also shows that religious moderation in *pesantren* is not only a state agenda but also inherent to the *pesantren's* culture as an institution that combines classical scientific traditions with local culture. SLR on *pesantren* education notes that the moderate character of students is formed through daily encounters between students from various regions, tribes, and cultural backgrounds in one dormitory environment ([Arif, 2024](#); [Falikul I, 2020](#)).

However, transformational education in Islamic boarding schools still faces risks if it is not balanced with critical literacy regarding transnational religious discourse that enters through digital spaces. Studies on Islamic boarding schools and transnational ideologies remind us that some Islamic boarding schools may be exposed to exclusive religious narratives, so strengthening moderation must be safeguarded through internal policies and the development of critical curricula ([Lundeto & Talibo, 2021](#); [Rohman et al., 2025](#)).

Thus, the discussion places transformational education in *pesantren* as a dialectical field between traditions, the demands of moderation, and the penetration of new discourses, where the success of character education depends heavily on the capacity of *kiai* and teachers to manage religious authority in a rapidly changing social context ([Jusubaidi et al., 2024](#); [Ubaidillah & Faiz, 2025](#)).

Curriculum, Digital Literacy, and Learning in the 4.0 Era

The discussion of research results on curriculum transformation shows that *pesantren* are now adopting a more integrative curriculum design, incorporating general knowledge, 21st-century skills, and digital literacy alongside classical religious sciences. SLR *pesantren* education emphasizes that an integrated model that combines the national curriculum and *pesantren* is increasingly dominant, especially in *pesantren* that want to increase the competitiveness of graduates ([Arif, 2024](#); [Jamil et al., 2025](#)).

In the context of the era of disruption, this discussion confirms that Islamic boarding schools are revitalizing the education system through the use of digital technology as a medium for learning, information management, and the expansion of da'wah. Studies on "digital *pesantren*" show that technology allows *pesantren* to expand the reach of education, but demands system restructuring and strengthening teacher capacity so that it does not simply move traditional methods to digital platforms. ([Lundeto & Talibo, 2021](#); [Nikmatullah et al., 2023](#)).

The discussion also underlined that the use of technology in Islamic boarding schools must be seen in the context of values, not solely in terms of efficiency. Studies of Islamic boarding schools in the era of disruption emphasize that technology should be oriented to strengthen the functions of *tarbiyah*, *ta'lim*, and *ta'dib*, rather than replace them, so that students become digitally literate and retain character ([Jamil et al., 2025](#); [Nikmatullah et al., 2023](#)).

The results of the study, which placed technology integration into three levels minimal, intermediate, and advanced are consistent with previous findings that technology adoption in Islamic boarding schools occurs gradually and is strongly influenced by *kiai* leadership, infrastructure availability, and institutional culture. A literature review shows that some Islamic boarding schools are still at the stage of using technology for administrative and communication purposes. In contrast, others have developed a learning management system and offer hybrid classes ([Lundeto & Talibo, 2021](#); [Prihatiningtyas et al., 2025](#)).

In the discourse of Islamic education, the integration of digital literacy in Islamic boarding schools is also seen as important for equipping students with the ability to filter information and combat religiously motivated misinformation on social media. Research on Generation Z and digital media shows that students in this age group have a high level of social media use, making *pesantren* a critical and ethical space for digital literacy education ([Nikmatullah et al., 2023](#)).

At the same time, this discussion acknowledges the concerns of some *pesantren* circles about the negative impact of gadgets on students' manners and concentration. The literature on educational challenges in Islamic boarding schools emphasizes the need for strict internal regulation of the use of digital devices, alongside learning designs that integrate technology into the educational process rather than treating it as a distraction. ([Khoiri & Aryati, 2021](#); [Lundeto & Talibo, 2021](#)).

Thus, the integration of curriculum and digital literacy in *pesantren*, as discussed in this study, strengthens the view that *pesantren* can be a model of Islamic education that combines depth of knowledge, strength of character, and digital skills, if the transformation is managed within the framework of Islamic values and *pesantren* identity. ([Arif, 2024](#); [Nikmatullah et al., 2023](#)).

Global-Multicultural Challenges and Society 5.0

The discussion of research results on global multicultural challenges shows that *pesantren* face a paradox between maintaining traditional identity and preparing students to compete globally. An analysis of *pesantren* education problems highlights that globalization and the

penetration of Western culture can give rise to symptoms of "counter-morality" if not addressed through curriculum innovation and character strengthening. ([Hirzulloh, 2023](#); [Khoiri & Aryati, 2021](#)).

The concept of Society 5.0, which emphasizes a refocus on humans amid technological dominance, opens up space for Islamic boarding schools to take a strategic position as institutions for character formation, spirituality, and students' social intelligence. The study of the relevance of traditional Islamic boarding schools in the Society 5.0 era emphasizes that Islamic boarding schools possess cultural and spiritual capital that can serve as a counterweight to technological currents, provided they modernize their systems and expand science literacy without relinquishing their identity. ([Falikul I, 2020](#); [Hirzulloh, 2023](#)).

The discussion also showed that multicultural challenges are closely related to the issue of intolerance and social polarization, which is often blamed on some Islamic boarding schools. Studies of *pesantren* and social conflict show that when *pesantren* fulfill their role in public education and maintain public trust, they act as a buffer for social harmony and conflict prevention, not a source. ([Arif, 2024](#); [Saiin et al., 2020](#)).

Within that framework, this study's results show that encounters among students from diverse regions and social backgrounds in *pesantren* have the potential to serve as a laboratory for constructive multiculturalism. SLR on *pesantren* education notes that the internal plurality of *pesantren* – in terms of students' origins and religious organizations' preferences – produces a habitus of tolerance when managed through a curriculum and a dialogical culture ([Arif, 2024](#); [Umar et al., 2024](#)).

However, the discussion also noticed the existence of a small number of Islamic boarding schools that were exposed to exclusive religious discourse, both through transnational networks and digital channels. Policy studies on *pesantren* and transnational ideologies highlight the importance of internal policies that affirm national commitment and supervise teaching materials, so that *pesantren* do not become fertile ground for radicalism. ([Lundeto & Talibo, 2021](#); [Rohman et al., 2025](#)).

In Society 5.0, this discussion positions *pesantren* as actors who not only react to change but also offer a holistic educational paradigm that integrates spiritual, intellectual, social, and technological dimensions. A literature review confirms that *pesantren* can become centers for the development of appropriate technology and for health and environmental education for the community if they expand their traditional mandate ([Hirzulloh, 2023](#); [Khoiri & Aryati, 2021](#)).

Thus, global multicultural challenges and Society 5.0 offer opportunities for Islamic boarding schools to reassert themselves as Islamic educational institutions that are locally rooted yet globally oriented, provided they creatively combine tradition and innovation within the framework of Islamic values and Pancasila. ([Arif, 2024](#); [Falikul Isbah, 2020](#)).

Islamic Boarding School Management, Quality Assurance, and Independence

The discussion of the research results on management and quality shows that the success of Islamic boarding schools in adapting to the 4.0 era is closely correlated with management's capacity to combine charismatic leadership with modern governance principles. Studies on *pesantren*-based management confirm that this model focuses on Islamic leadership, integrative curriculum management, and the collective participation of the *pesantren* community ([Practice, 2025](#); [Sayyid & Rahmatullah, 2024](#)).

From a quality assurance perspective, this discussion shows that implementing the internal quality assurance system (SPMI) in Islamic boarding schools continues to face various limitations, particularly in human resources, documentation culture, and access to technology. A study on quality assurance in Islamic boarding schools found that many institutions are in

the early stages of implementation but are committed to meeting national education quality standards ([Lathifah et al., 2025](#); [Practice, 2025](#)).

The results of the research on structural challenges such as limited infrastructure, digital literacy, and resistance to change reflect the findings of the study of the problems of *pesantren* education in the global multicultural era. The research emphasizes that *pesantren* need to innovate their systems and explore their full potential to avoid being left behind and eroded by the tide of globalization ([Jamil et al., 2025](#); [Khoiri & Aryati, 2021](#)).

On the other hand, the discussion shows that the economic independence of Islamic boarding schools is an important factor in supporting management and quality transformation. The literature indicates that many Islamic boarding schools are developing business units and strategic partnerships with governments and the private sector to strengthen their financial base and support educational programs ([Falikul I, 2020](#); [Practice, 2025](#)).

Regarding change strategies, the study of change management in educational institutions emphasizes the need for visionary leadership, collective participation, and value instilling as the basis for sustainable transformation. In the context of *pesantren*, this means that *kiai* and managers must articulate a vision of change aligned with *pesantren* values while remaining responsive to external demands. ([Practice, 2025](#)).

This discussion also shows that *pesantren*-based management has the potential to serve as an alternative model for the development of other Islamic educational institutions, integrating spirituality, local culture, and professionalism. SLR *pesantren* education emphasizes that the uniqueness of the *pesantren* subculture can actually be a source of competitive advantage if managed strategically ([Arif, 2024](#); [Falikul I, 2020](#)).

Thus, the discussion of placing *pesantren* management and quality assurance is not just an administrative demand, but part of an institutional transformation that determines the extent to which *pesantren* can continue to contribute to the quality of Islamic education and national development in the era of disruption. ([Lathifah et al., 2025](#); [Practice, 2025](#)).

Implications of the Three-Dimensional Model of the Contribution of Islamic Boarding Schools to the 4.0 Era

The resulting three-dimensional model historical-civilizational, systemic-policy, and pedagogic-digital allows a more complete reading of the position of *pesantren* in contemporary Indonesian Islamic education. From a historical-civilizational perspective, the discussion emphasized that *pesantren* is not only an educational institution but also a node in the archipelago's Islamic cultural production, continuing to contribute to the formation of the nation's religious identity ([Arif, 2024](#); [Falikul I, 2020](#)).

From the systemic-policy dimension, this model shows that state policy towards *pesantren* is not only a matter of legality but also of recognizing *pesantren*'s contribution to the development of the nation's character and social stability. The study of *pesantren* in the context of education policies and social conflict prevention corroborates that *pesantren* are important partners of the state in anticipating radicalism and religion-based conflicts ([Rohman et al., 2025](#); [Saiin et al., 2020](#)).

The pedagogic-digital dimension emphasizes that *pesantren* have ample space to innovate by utilizing technology to expand *da'wah* and value education. Studies on digital *pesantren* and learning strategies in the era of the Industrial Revolution 4.0 show that technology can be integrated creatively without losing the distinctive character of *pesantren* learning ([Lundeto & Talibo, 2021](#); [Nikmatullah et al., 2023](#)).

Theoretically, this model enriches the study of *pesantren* education, which previously tended to be separated into history, curriculum, and digital issues, by offering an integrative

framework for reading continuity and change. SLR on *pesantren* education during 2014–2024 shows that the literature is often thematic and fragmentary, providing a foothold for more comprehensive follow-up studies ([Arif, 2024](#); [Jusubaidi et al., 2024](#)).

From a policy perspective, this three-dimensional model implies the need for synergy between strengthening *pesantren* traditions, regulatory and managerial support from the state, and technological and infrastructure facilitation. The study of *pesantren*-based management and curriculum modernization emphasizes that transformation will be sustainable only if strategic partnerships among *pesantren*, the government, and the community support it. ([Lathifah et al., 2025](#); [Practice, 2025](#)).

In developing Islamic education theory, this model shows that *pesantren* can serve as a basis for an integrative educational paradigm that combines the functions of *tarbiyah*, *ta'lim*, and *ta'dib* with critical mastery of science and technology. This is in line with the discourse of Islamization of science that encourages the integration of Islamic values in educational management and practice. ([Hirzulloh, 2023](#); [Practice, 2025](#)).

Finally, this discussion emphasizes that if these three dimensions are managed synergistically, *pesantren* have the potential to become a reference model for Islamic education at the regional and global levels, especially in responding to the challenges of the Industrial Revolution 4.0 and Society 5.0 with a paradigm that is rooted in tradition, quality-oriented, and open to innovation. ([Falikul I., 2020](#); [Nikmatullah et al., 2023](#)).

CONCLUSION

Pesantren have a highly significant historical contribution to Indonesian Islamic civilization as well as to the strengthening of the National Education System, and the results of this study confirm that this contribution is in fact reinforced in the digital 4.0 era. At the systemic-policy level, the study shows that *pesantren* are now legally recognized as a subsystem of national education through education and *pesantren* regulations, and play a strategic role in policies of religious moderation, character education, and the strengthening of national identity.

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