Transforming *kitab kuning* literacy in the digital era: Challenges and future prospects for Islamic education

Azwar Sani[1*] , Muhammad Kashif Majeed[2]

*Corresponding Author:
Azwar Sani, IAIN Takengon Aceh, Indonesia
✉ sanimutuah@gmail.com

About Authors:

[1] Azwar Sani, IAIN Takengon Aceh, Indonesia

[2] Muhammad Kashif Majeed, International Islamic University Malaysia

Abstract

Digital transformation has confronted Indonesian Islamic boarding school (*pesantren*) with the need to redefine traditional Islamic textbook literacy (*kitab kuning*), marking a critical point in contemporary Islamic education. Although previous studies have addressed institutional and curriculum modernisation, research mapping how these changes reconfigure *kitab kuning* literacy as a holistic epistemic practice remains limited. Through an integrative literature review, this article synthesises discourse on *pesantren* modernisation, digital pedagogy, and critical literacy. The findings reveal the transformation of *kitab kuning* literacy as a three-dimensional construct: (1) traditional literacy (preserving textual authority); (2) digital literacy (enabling access and hybrid learning); and (3) critical literacy (fostering evaluative reasoning in the post-truth era). The main challenge lies in the structural dilemma between expanding access and safeguarding ethical-epistemic integrity, alongside institutional responses ranging from cautious adoption to selective integration. The prospects of Islamic education depend on developing a supporting institutional ecosystem, including governance, dialogic pedagogy, and a selective institutional culture, capable of operationalising this trilogy of literacy sustainably. This article formulates strategic implications for curriculum redesign, teacher training, and digital governance that preserve the knowledge transmission (*sanad*) tradition while strengthening critical-digital competencies.

Keywords: *kitab kuning*; digital literacy; critical literacy; *pesantren*; Islamic education; digital challenges

Introduction

Digital transformation has changed the landscape of the production and circulation of religious knowledge, including within the Islamic boarding school (*pesantren*) ecosystem (Fajar et al., 2025). The shift in learning media from the dominance of printed books to digital access via gadgets has affected access efficiency and altered how *pesantren* students (*santri*) read, interpret, and discuss textual authority (Raya, 2025). In the context of the Industrial Revolution 4.0, changes in learning behaviour are leading to a shift from Islamic textbooks (*kitab kuning*) to sophisticated gadget media, and to a demand for

innovative pesantren learning to remain relevant without losing its traditional character (Ritonga et al., 2020).

However, for *pesantren* (especially *salaf*), media change is not only a technical issue, because *pesantren* sustain *kitab kuning* literacy through a distinctive structure of authority and learning ethics (Sofi et al., 2025). In many cases, *pesantren* leaders (*kyai*) are not only regarded as "text teachers" but also as interpreters, guides, and directors of how *santri* connect texts with social-cultural contexts, including sensitive issues (such as *jihad* and *hudud*), thereby fostering a more moderate understanding (Humaidi et al., 2024). At the same time, the tradition of reproducing textual authority also operates through mechanisms of collective *ijtihad*, such as *bahs al-masail*, in which the *kitab kuning* texts are transferred, discussed, and legitimised (Mustofa et al., 2024).

Nevertheless, the existing literature often remains fragmented, each focusing on specific dimensions such as authority, management, pedagogy, or digitalisation, without providing an integrative mapping of the layered nature of the transformation of *kitab kuning* literacy. These layers include: (1) traditional literacy that maintains the discipline of knowledge transmission (*sanad*) and the ethics of authority; (2) digital literacy that alters patterns of access, archiving, and knowledge production; and (3) critical literacy that enables contextual-ethical reading without falling into textual simplification or relativism. We can group this fragmentation into three research clusters that, to date, have not been conceptually or operationally connected, thus leaving an important gap in understanding the comprehensive transformation of *kitab kuning* literacy.

First, the managerial-institutional approach emphasises the governance of institutional transformation but tends not to connect it to epistemic consequences for traditional *kitab kuning* literacy. Mutamimah et al. (2024), for example, highlight the revitalisation of learning through planning, organising, implementing, and supervising functions. However, its focus is predominantly on institutional design and control. Hamdanah (2025) also demonstrates the adoption of digital technology for accountability and data oversight, but does not yet elaborate on how digital policies alter the depth of reading, mechanisms of authority, or verification standards within the *kitab kuning* tradition. Even Marzuki et al. (2025), which carefully describes the adoption of technology to preserve an ethical-traditional environment, still does not link it to a comprehensive literacy transformation framework.

Second, a pedagogical curriculum rich in exploration of teaching methods has not yet yielded an operational framework for critical digital literacy. For example, Zulmuqim et al. (2020) discuss curriculum aspects and learning methods as part of *pesantren* characteristics, but they do not develop "critical digital literacy" as an analytical category that researchers can test across cases. Meanwhile, Radino and Mubarok (2025) emphasise discussion as the basis for developing critical reasoning within dialogic pedagogy. However, it is still rarely placed within a transformative paradigm that explicitly

incorporates issues related to digital media and information disruption. On the other hand, Halimi et al. (2022) demonstrate changes in access and learning practices in the digitalisation of the *kitab kuning* and the use of applications or tools, but often stop at the level of "media adoption," without linking them to epistemic consequences and the pedagogical design of literacy.

Third, this interpretive-authority scholarship analyses the *kyais'* role and the mechanisms through which communities reproduce textual authority. However, it still often remains detached from digital dynamics and the challenges of the post-truth era. For example, Humaidi et al. (2024) show how interpretive guidance shapes *santri* moderation and prevents literalistic readings of the texts. Mustofa et al. (2024) also emphasise the reproduction of authority through dialogic-interpretative competence in Islamic jurisprudence (*fiqh*) reasoning, grounded in textual authority, in the discussion of issues. However, this study group is still rarely confronted with digital literacy problems, such as how textual, interpretive, and platform authority negotiate within the contemporary flow of information. In the normative realm, Nasution et al. (2024) affirm the ideological potential of *kitab kuning* to integrate moderative values from the classical treasury, but have yet to formulate a map of literacy transformation that simultaneously bridges tradition, the digital, and critique. Similarly, Asari and Abidin (2020) emphasise the centrality of *sanad* in *kitab kuning* as a means of shaping *ulama*, but this is insufficient to address the dynamics of contemporary digital literacy.

Thus, we need a framework that diagnoses fragmentation in the literature and offers an integrative model that simultaneously explains pedagogical transformation, shifts in epistemic authority, and governance implications. This article proposes two research questions. First, how can the *kitab kuning* literacy transformation framework be formulated integratively by linking traditional literacy, digital literacy, and critical literacy within a single conceptual architecture? Second, what are the most defining challenges and prospects in operationalising this transformation, both at the pedagogical level, in terms of epistemic authority, and institutional governance? This article attempts to synthesise traditional, digital, and critical literacy to shift the discussion from partial descriptions towards an integrative model that simultaneously explains the pedagogical transformation of *kitab kuning* learning, the negotiation of epistemic authority within the digital ecosystem, and the governance implications for the sustainability of *kitab kuning* literacy in the digital era.

Literature Review

Kitab kuning literacy in the *pesantren* tradition is a skill in textual decoding, a complex epistemic and social practice that connects texts, scholarly authority, and learning habitus within a religious ecosystem (Muchlish Huda & Muslih, 2024). *Kitab kuning* serves as an intellectual infrastructure for the training of ulama and the formation of scholarly authority (Asari & Abidin, 2020), as well as a medium for transmitting

knowledge that has shaped the Islamic knowledge landscape in Southeast Asia (Abdul Malik & Abdul Hamid, 2022; Burhanudin, 2022). In recent developments, *kitab kuning* literacy can be known as an ethical-social device in strengthening religious moderation through curating and teaching *Ma'had al-Jami'ah* materials at State Islamic Higher Education Institutions (Nasution et al., 2024), because literacy, according to Alfathon (2025), is a process of knowing that is mediated by space, collections, and community interactions based on an approach that emphasises its collective and contextual nature.

Therefore, it is important to understand the categorisation of *kitab kuning* literacy to clarify the operational aspects and variations in its implementation at *pesantren*. At least three categories exist within *kitab kuning* literacy. First, traditional literacy includes mastery of *kitab kuning* genres, learning etiquette, *sanad* discipline, and the interpretation of the teacher's authority. In this category, the *kyai* serves as an interpretive guide, ensuring that *kitab kuning* are well understood in their context, thereby fostering a moderate and relevant religious attitude (Humaidi et al., 2024). Second, digital literacy refers to the competence to access, manage, evaluate, and utilise classical references through digital media, whether as repositories, search tools, or interactive learning channels (Halimi et al., 2022).

Third, critical literacy refers to the capacity to reason, test validity, and evaluate religious claims in a dialogic and argumentative manner, among other things, and is cultivated through discussion forums such as *bahts al-masail* that foster critical consciousness (Radino & Mubarok, 2025). In practice, the configuration of these three literacies varies across institutional contexts. In *pesantren*-based higher education institutions, for example, efforts are made to balance the authority of *kitab kuning* with the demands of modern academic methodology (Arif et al., 2025). Meanwhile, in specific traditional *pesantren* environments, the adoption of digital devices is carried out very selectively and cautiously to maintain a unique ethical environment and disciplined learning atmosphere (Marzuki et al., 2025).

In understanding the impact of digitalisation, a shift from a tool-centric approach to one that views it as an ecological learning change is necessary. Here, according to Collins and Halverson (2018), the concept of digital learning ecology can be utilised to analyse how the relationships between actors (*kyai*, *ustaz*, and *santri*), artefacts (printed books, applications, and platforms), rules (discipline and usage restrictions), and spaces (classrooms, dormitories, and online spaces) collectively shape how religious knowledge is produced, accessed, and verified. Within this framework, the challenges of the digital era are often interpreted as threats to *kitab kuning's* existence, driven by a shift in *santri* preferences toward instant reference sources on devices (Ritonga et al., 2020).

However, the digital ecology also opens up opportunities for the reactualisation of Islamic heritage, enabling students to become initiators of digitising *kitab kuning* through various platform innovations (Mustofa et al., 2023). Therefore, building a healthy digital

ecology requires strong institutional governance, including planning, organising, implementing, and supervising, so that technological transformation does not erode the core of traditional learning in *kitab kuning* (Mutamimah et al., 2024). Consequently, development here can be carried out by redesigning relationships within the learning ecology to achieve educational goals that remain faithful to tradition while adaptable to change.

As a tangible manifestation of the redesign, strategic-adaptive steps within the *pesantren* learning ecology can be mapped into several forms. First, digitalisation of sources, which involves converting traditional texts into digital formats through scanning, compilation into applications (such as *Maktabah Syamilah*), or packaging as e-books to broaden access (Farhan & Pahlevi, 2024). Second, the platformisation of learning, which entails using video channels (YouTube), social media, or online classes to teach traditional texts, thereby altering the rhythm, participation patterns, and even the construction of teaching authority. Third, institutional hybridisation, which involves integrating digital devices and spaces into the formal *pesantren* learning design, is typically supported by institutional strategies such as teacher training, standardisation of digital materials, and mechanisms for evaluating blended learning (Fakhri et al., 2025).

Fourth, digital governance, which involves the utilisation of technology to enhance accountability, data-based supervision, and modernisation of administration, without abandoning spiritual-local values (Hamdanah et al., 2025). Fifth, selective-guarded integration, which refers to the cautious and limited adoption of technology, as seen in some *pesantren* that only provide Wi-Fi access in certain areas to maintain an ethical environment and traditional learning discipline (Marzuki et al., 2025). From this mapping, it appears that *pesantren's* responses to digitalisation are multidimensional and heavily influenced by culture, leadership, and politics of institutional authority. However, behind these various strategies, changes in learning conditions/environment and media integration also create new challenges for religious authority and the quality of Islamic discourse, thus highlighting the urgency of critical literacy.

In the context of this complex digital information, critical literacy becomes an epistemic necessity. We can understand this concept as the capacity that enables readers of *kitab kuning* to navigate information disruptions and contest religious claims responsibly (Kholili et al., 2024). An abundance of information characterises the "post-truth" situation, weakened verification mechanisms, blurred hierarchies of authority, and the widespread use of emotional narratives or simplified texts for political or identity legitimacy. Traditionally, religious authority in *pesantren* is stabilised by the central role of *kyai* as interpretative guides who prevent literal reading of texts without considering social and ethical contexts (Al-Ghifari et al., 2024). However, authority is also dynamically reproduced through practices of *ijtihad* and deliberative forums such as *bahts al-masail*, where *santri* engage in managing references, constructing arguments, and gaining

legitimacy (Mustofa et al., 2024). Outside the *pesantren*, many scholars use *kitab kuning* to legitimise contemporary social issues, demonstrating how textual authority can be mobilised for particular interests (Isra et al., 2025). Therefore, we should view critical literacy in this context as a combination of hermeneutic competence (understanding texts within their context), verification capacity (assessing sources and claims), and ethical authority (accountability in interpretation).

Based on the above challenges, we can break down critical literacy into four interrelated competence areas. First, critical hermeneutics, which is the ability to connect *kitab kuning* to socio-historical contexts and the higher purposes of Islamic law (*maqasid al-shariah*), thereby avoiding literalism and producing a substantive, moderate understanding (Humaidi et al., 2024; Nasution et al., 2024). Second, critical-dialogic, which is the ability to construct and test arguments through structured discussion or deliberation, as reflected in the pedagogical dialogue of *pesantren* that trains critical reasoning and openness (Radino & Mubarok, 2025). Third, critical-verificative, which is the ability to assess the validity of reference sources and claims of information, including distinguishing between the authority of the original text, the authority of interpreters (*kyai* or *ulama*), and the authority of digital platforms that distribute content (Ichwan et al., 2024; Raya, 2025).

Fourth, critical-ethical-social, which is the ability to critically reflect on how *kyai/ulama* or *santri* use *kitab kuning* (or misused) in public discourse to legitimise certain practices or interests, so that reading is not only about asking "what is the meaning of the text?" but also "for what purpose and with what social consequences is this text used?" (Isra et al., 2025). These four aspects indicate that critical literacy is a set of competencies that maintain the quality and depth of religious discourse in an increasingly complex public space. However, the development of these competencies depends on the strength and adaptation of the interpretative ecosystem in which the literacy is practised.

To understand how the transformation of *kitab kuning* literacy occurs, analysis must be elevated to the level of the interpretive ecosystem. This concept views the production of meaning from the *kitab kuning* as the result of a dynamic network between texts, institutions, actors, and knowledge infrastructure. Historically, the writing traditions in Arabic and Javanese have shaped configurations of authority and scholarly networks in Southeast Asia (Abdul Malik & Abdul Hamid, 2022; Burhanudin, 2022). At the micro level, this ecosystem is supported by institutions such as *pesantren*, *halaqah*, and *ma'had*, with their pedagogical practices and charismatic leadership (Halim, 2022).

In Indonesia, the institutional character of *pesantren*, as reflected in its typology, curriculum, and system, determines the position and function of *kitab kuning*, both as the core of the *salaf* tradition and as a component within an integrative curriculum (Zulmuqim et al., 2020). Within this ecosystem, textual authority is dynamic and reproduced through collective *ijtihad* practices (Mustofa et al., 2024), while physical

infrastructure, such as *pesantren* libraries, serves as nodes in the knowing process that mediate interactions between communities and knowledge collections (Alfathon, 2025). Essentially, any change in *kitab kuning* literacy is a change within the broader interpretive ecosystem.

This interpretative ecosystem can be analysed through several key components that serve as leverage points for transformation. First, the infrastructure of texts and knowledge, which includes collections of books (print/digital), manuscripts, and repositories that serve as the basis for access and reference (Halimi et al., 2022). Second, pedagogical routines and methods, such as the *sorogan* system and the forum of *bahts al-masail*, shape students' mindsets, learning ethics, and interpretative skills (Radino & Mubarok, 2025). Third, the architecture of scholarly authority involves the role of *kyai* as the guardians of interpretative direction and the mechanism through which students reproduce authority via argumentation skills (Humaidi et al., 2024). Fourth, institutional governance and leadership, including modernisation policies, training programmes, evaluation systems, and leadership visions that guide change (Mutamimah et al., 2024).

Fifth, technology regulation, which refers to institutional policies in adopting and restricting the use of digital technology, ranging from open integration to highly selective adoption (Marzuki et al., 2025). Sixth, institutional typologies, recognising that the needs and approaches to literacy transformation will differ between traditional *pesantren*, modern *pesantren*, and *pesantren*-based universities (*ma'had 'aly*) (Arif et al., 2025; Zulmuqim et al., 2020). Mapping these components concludes that the ongoing transformation of *kitab kuning* literacy requires a holistic approach that deliberately redesigns the interpretative ecosystem. Only by strengthening all these components, from digital infrastructure and critical pedagogy to adaptive governance, *pesantren* can preserve the authenticity of their traditions whilst equipping *santri* with the digital and critical literacy skills needed to face contemporary challenges.

Method

This study employs an integrative literature review design as its methodological approach. We chose this method because it has descriptive-analytical, synthesising-critical, and constructive objectives. It aims to analyse, critique, and synthesise various strands of thought within fragmented literature, and then to develop them into a coherent, integrative conceptual framework for transforming traditional Islamic manuscripts. The integrative review research design integrates perspectives from diverse studies (empirical, theoretical, and historical) to develop a new theoretical understanding. This method allows researchers to systematically identify gaps, tensions, and convergences within the literature while proposing a synthesis that can fill these discursive gaps (Whittemore & Knafl, 2005).

We collected the data for this study through systematic and extensive literature searches. Primary data sources included scientific journal articles, monograph books, book chapters, and relevant conference proceedings. Searches were carried out across various academic databases using a combination of strategic keywords in both Indonesian and English. The publication time frame focused on the last 10-15 years (2010-2025) to capture contemporary dynamics. However, we included foundational texts published outside this range if we deemed them essential to the discourse. The inclusion criteria applied in this article were: (1) publications that directly discuss at least one of the three main research streams (institutional/curriculum modernisation, digitalisation and authority, or critical literacy in the digital era); (2) academic and peer-reviewed in nature; and (3) making a significant contribution, whether empirically, theoretically, or methodologically. The selection process involved screening titles and abstracts, followed by full-text reviews to ensure relevance and quality.

Analytical procedures constitute the core of this study's methodology, gradually designed to achieve conceptual synthesis across three interconnected phases. First, we conduct strand identification and sorting by analysing the entire selected literature to identify the main arguments, findings, and perspectives. Based on this analysis, we categorise the literature into three related yet distinct analytical strands within the discourse: (1) institutional and curriculum modernisation of *pesantren*, focusing on reforms in governance, leadership, and curriculum as responses to modernity; (2) digitalisation, pedagogy, and the shift of religious authority, combining studies on technology adoption, digital learning ecology, and their implications for *kyai* authority and knowledge construction; and (3) critical literacy discourse in the digital and post-truth era, comprising theoretical and empirical discussions on literacy challenges, information verification, and interpretative ethics within the context of information overload and fluidity.

Second, critical analysis and relationship mapping delve into each flow to understand its internal logic, contributions, and limitations. This analysis focuses on the points of convergence, tensions, and gaps among the three flows, thereby revealing why fragmentation occurs and how they actually complement each other in explaining the complex transformation of literacy. Third, conceptual synthesis integrates findings from the critical analysis phase to construct answers to the research questions. The synthesis here is a creative integration that produces a conceptual model of the integration of traditional, digital, and critical literacy in the development of *kitab kuning* literacy in the digital era. This integrative framework simultaneously explains the continuity of tradition, the transformation of the medium, and the demands for critical capacity, while also providing a roadmap for policy development and educational practice. With this transparent and systematic procedure, the study offers a robust methodological and theoretical contribution to understanding the complex transformations within *pesantren*.

Results and Discussion

Reconfiguring the Pedagogy of *Kitab Kuning*: from Authoritative Transmission to Dialogic-Critical Literacy

At *pesantren*, *kitab kuning* has undergone a pedagogical transformation and reconfiguration from an authoritative, one-way transmission of knowledge (*sanad*) to a more dialogical and critical form (Muchlish Huda & Muslih, 2024). This shift does not mean abandoning the tradition and distinctive character of *pesantren*, but instead adding layers of pedagogical practice that strengthen students' reasoning capacity, argument testing, and epistemic responsibility in responding to changes in the development of knowledge (Achmadin et al., 2024). In this context, *pesantren*, in its various settings, tend to move from the logic of "transferring text authority" towards the logic of "building interpretative competence through structured dialogue", without neglecting the foundation of *kitab kuning* or classical texts (*kutub al-turats*) and the discipline of knowledge based on *sanad*, which are its distinctive features (Asari & Abidin, 2020).

The tradition of *sanad* in the *pesantren* remains an irreplaceable foundation. On this axis, *kitab kuning* serves as the core curriculum. In contrast, the *kyai* or *ustaz* serves as an interpretive guide, a guardian of learning manners, and a guarantor of the connection between the text and the ethics of religious praxis (Mujahid, 2021). *Kyai*, as the central interpretive guide, uses the *kitab kuning* as the primary medium to form a moderate religious understanding (Humaidi et al., 2024). This pattern aligns with the broader picture that *pesantren* rely on a learning habitus that connects texts, scientific authority, and reading disciplines. Therefore, the literacy of *kitab kuning* has exceeded the level of reading and has reached the level of forming a way of reasoning and of behaving towards authority.

Based on this traditional foundation, more explicit and structured dialogic practices have emerged. Discussion forums, for example, are not considered supplementary activities but pedagogical spaces that mobilise argumentation, critical questioning, and the negotiation of textual meaning in a reflective manner. Therefore, the study of *kutub al-turats* shifts from an "acceptance" pattern towards a "formulation and testing of reasons" approach (Abza et al., 2024). Here, critical does not equate to scepticism towards tradition but refers to the capacity for reason-giving, which means the ability to formulate arguments, explain justifications, and assess the strength of reasoning within the bounds of scholarly decorum in *pesantren* (Radino & Mubarok, 2025). This practice clarifies that literacy is a process of knowing that is inherently collective (Asari & Abidin, 2020).

Formal deliberative mechanisms such as *bahts al-masail* strengthen this dialogic-critical dimension. Through *bahts al-masail*, *santri* are not only considered recipients of authority, but can act as active agents in transferring, linking, and legitimising arguments through references to classical texts, both explicitly (*qawli*) and implicitly (*ilhaqi*). This deliberative forum emphasises an important shift; literacy in *kitab kuning* no longer

results in "textual compliance" but also trains dialogic-argumentative competence that remains bound to the discipline of the texts and the ethics of authority (Ali & Halim, 2023). Therefore, authority is not transmitted, but also shaped and verified through argumentative practices that can be tested within the learning community at the pesantren (Mustofa et al., 2024).

Furthermore, the reconfiguration of pedagogy becomes clear within the higher education based on *pesantren*. Learning in *pesantren*-based higher education is designed in a more systematic cycle and employs a syntax that encourages active student engagement (Siswati et al., 2023). Models such as contextual literacy learning mark the strengthening of a dialogic-critical dimension, in which texts remain central but learning outcomes require the ability to explain contexts, construct arguments, and demonstrate relevance (Zakaria et al., 2025). At this point, the pedagogy of *kitab kuning* needs to go beyond mere content mastery. It should also aim to develop competence-based literacy compatible with the modern academic environment (Arif et al., 2025).

Interpretively, there has been a shift in *pesantren* from a "pedagogy based on *sanad*" to a "layered literacy-based pedagogy". The *sanad* continues to maintain the continuity of tradition and the discipline of reading, but is now supported by a dialogic-critical framework that allows texts to be more contextual, ethical, and resistant to simplification in the contemporary public sphere (Humaidi et al., 2024). This reconfiguration of pedagogy is a prerequisite for analysing the issues of access versus ethics in digital practices, as well as the needs for governance and the capacity of educators as institutional leverage in broader literacy transformation (Nasution et al., 2024).

Digital Practices at *Pesantren*: Negotiation between Access, Ethics, and Authority

The digitalisation of learning *kitab kuning* has given rise to a complex structural dilemma. On one hand, technology functions as an access accelerator that broadens the availability of texts, speeds up searches, and extends the reach of learning. On the other hand, it raises ethical-epistemic challenges concerning learning etiquette, interpretative authority, and the quality of knowledge verification. Therefore, we can understand that digital practices in *pesantren* are a continuous negotiation strategy between the imperative of open access and the commitment to maintaining ethical integrity within the learning tradition (Halimi et al., 2022; Mutamimah et al., 2024; Ritonga et al., 2020).

In the dimension of access, digitalisation functions as a core for literacy. The trend of using applications, digital repositories, and online sources enables students to access *kutub al-turats* or *kitab kuning* more quickly and broadly (Nasri et al., 2025). These take various forms, ranging from the digitalisation of *kitab kuning* in PDF format and packaging within specialised applications such as *Maktabah Syamilah* to the provision of interactive reference search platforms (Farhan & Pahlevi, 2024). Within the framework of modernisation, this digital access is part of an institutional revitalisation agenda aimed

at maintaining the relevance of *pesantren* amidst the dynamics of contemporary knowledge (Suwendi et al., 2024). Therefore, the transformation occurring is not only about the availability of texts but also involves a change in learning habitus, from repetitive reading patterns in slow, structured rhythms to quick, concise, and selective search patterns characteristic of the digital era.

However, expanding access carries several serious risks to the depth and disciplinary integrity of epistemic practices. The main risk lies in a shift in students' preferences towards instant references based on digital devices, which can lead to faster but shallower learning patterns, especially when digital practices replace, rather than complement, traditional gradual reading and in-depth interpretation. According to Ritonga et al. (2020) and Mutamimah et al. (2024), this risk of quick, superficial learning takes on a concrete institutional dimension because, without proper governance, digitalisation has the potential to erode rather than enrich the core interpretative work involved in the study of *kitab kuning*. The critical issue is not whether digitalisation occurs, but how we practice it, whether we position technology as a tool to deepen understanding, or allow it to become a shortcut that reduces complexity and epistemic responsibility.

This dilemma becomes complex when it intersects with the information landscape in the post-truth era. A weakening of verification mechanisms accompanies the abundance of information in this era, the blurring of authority hierarchies, and the widespread use of text simplification to legitimise specific interests (Ichwan et al., 2024). For example, the processes of *fiqh* reasoning and the legitimacy of arguments depend on referencing procedures, deliberation structures, and argumentative discipline, elements that the unverified use of digital sources can easily disrupt (Mustofa et al., 2024). Therefore, the ethical problem in digital practice extends beyond device usage ethics; it is an epistemic ethical issue. The question here is how to ensure that abundant access still results in responsible reading, critically weighed authority, and scientifically accountable claims.

In response to this multidimensional dilemma, at least three negotiation strategies emerge within various *pesantren* contexts. First, curating authority and supporting interpretative guidance. Traditionally, *kyai* serve as guides and interpreters who prevent literal readings of texts and steer understanding towards a contextual and moderate interpretation (Anam et al., 2024). In the digital era, this curatorial function becomes even more vital. The strategy is not to restrict access, but to ensure that educational aims and objectives, alongside justifiable standards of scholarly authority, guide open access (Nasution et al., 2024).

Second, a clearly defined function-based hybrid. Here, technology serves specific functions such as enabling access, tracing sources, and compiling references. Meanwhile, the core processes of understanding, testing arguments, and validating meaning remain anchored in dialogic-communal practices. Discussion spaces, such as *bahts al-masail*, are important arenas for training critical reasoning and responsible argumentation (Radino

& Mubarok, 2025). The legitimacy of an argument, as demonstrated by Mustofa et al. (2024), is not only about finding digital texts. However, it must involve the ability to link references, organise reasons, and withstand testing through collective deliberation. Essentially, technology acts as a supporting tool. At the same time, dialogue, a long-standing tradition within *pesantren*, continues to build epistemic authority (Halim, 2022).

Third, it involves contextual regulation through limited access. An example of this is the cautious adoption of technology, where digital access (such as Wi-Fi) is available only in specific spaces and at specific times (libraries or computer laboratories) for particular academic purposes (Marzuki et al., 2025). This pattern indicates that the design of selective access operationalises digital ethics, determining when, where, for what purpose, and with whose guidance people may use technology. Such regulation is a protective strategy to maintain disciplined learning and traditional ethical environments, while still allowing utilisation in digital spaces.

Table 1.

Negotiation Strategies for Digital Practices: Mechanisms, Benefits, and Potential Risks

Strategy	Mechanism and Epistemic Safeguard	Potential Risk	Example of Practice
Curating authority and interpretive guidance	*Kyai* or *ustaz* curate digital sources and frame their use through recognised scholarly authority and *adab*, preventing decontextualised or literal readings.	Over-curation may narrow exposure to wider scholarly debates and reduce learner autonomy.	▪ Approved repositories and kyai-selected digital reading packs; ▪ Guided sessions that authorise which digital references are acceptable.
Functional hybrid (dialogic-critical)	Technology supports access and source-tracing, while meaning-making and argument validity are tested through deliberative-dialogic forums (*bahts al-masail*).	If deliberative spaces weaken, digital retrieval becomes an untested shortcut and undermines verification.	▪ Digital source-tracing followed by *bahts al-masail* validation; ▪ Structured argument testing of claims with referenced proofs.
Contextual regulation through limited access	Digital access is bounded by space, time, and purpose, operationalising digital ethics as selective, supervised use that protects learning rhythms.	▪ Digital competencies may develop slowly; ▪ Rigid policies can create access gaps and informal workarounds.	▪ Library or lab-only Wi-Fi; ▪ Device-free dormitory or study zones.

Note. This table synthesises the three negotiation strategies in the digital practices at *pesantren*. *Adab* refers to normative learning etiquette in *pesantren* contexts, while *bahts al-masail* denotes a deliberative forum for collective testing and validation of arguments. Examples are illustrative.

Institutional Infrastructure for Sustainable Digital Transformation

Digital transformation in learning *kitab kuning* succeeds when *pesantren* provide adequate technological tools and build institutional capacity to direct, support, and supervise digital practices so they align with pedagogical goals and *pesantren* ethical traditions (Warisno et al., 2025). In other words, besides having advanced technological facilities, sustainable digital practices require three pillars of robust institutional infrastructure: governance that provides direction, training that builds the capacity of educators, and evaluation that ensures quality, so that technology functions as a literacy enhancer rather than a source of disruption to authority and depth of learning (Das, 2024). Therefore, digitalisation is a planned institutional process that requires design, integrated implementation, and ongoing organisational learning.

The first pillar, governance, functions as a framework that directs. Strengthening digital practices is part of revitalising the study of *kitab kuning* through traditional managerial functions, such as planning, organising, implementing, and supervising (Mutamimah et al., 2024). This managerial logic is important because it provides an institutional framework for negotiating access and the ethical dilemmas faced by *pesantren* (Hasan, 2025). In the planning stage, *pesantren* sets priorities by defining what technology will support (text access, reference enrichment, or learning platforms), for whom, and under which spatial and temporal constraints (Saputro & Arif, 2025). In the organising stage, the focus is on the division of roles and responsibilities; who curates digital materials, who is responsible for training, and who supervises access practices. Thus, governance serves as a mechanism for aligning technology, pedagogical goals, and institutional culture.

Visionary leadership is a critical component in this governance. According to Hamdanah et al. (Hamdanah et al., 2025), digital transformation is successful when led by figures who can translate technology into a coherent institutional agenda. Such leadership can utilise technology to enhance data-based accountability and oversight in institutional management, including in work procedures, documentation, and quality control. Although its focus is administrative, the implications are highly relevant for learning. Without leadership that sets direction, digitalisation tends to be sporadic, following device trends rather than clear pedagogical and ethical standards. Leadership, in this sense, functions as a policy anchor that ensures the adoption of technology remains compatible with the *pesantren's* spiritual and local values (Sofi et al., 2025).

The second pillar is the development of teacher capacity through targeted and holistic training. The adoption of technology in the teaching of *kitab kuning* will not result in modern literacy if teachers can only use devices technically but lack adequate pedagogical-digital competence (Ritonga et al., 2025). This competence includes the ability to select and curate digital sources, relate references to learning objectives, and manage discussions so that technology deepens understanding of texts. The effectiveness of learning depends

on systematic instructional design and teachers' ability to facilitate active student engagement (Arif et al., 2025). Therefore, ideal training should include technical application workshops as well as integrative pedagogical training that teaches how to combine digital access with dialogic practices, and how to teach reference verification and citation ethics within the tradition of *kitab kuning* (Radino & Mubarok, 2025).

The third pillar is evaluation as a mechanism for quality assurance and feedback. Without a systematic evaluation, *pesantren* lack the instrument to assess whether digitalisation truly enhances literacy or broadens the risks of superficial understanding and authority drift. In the context of digital information ecology, which is vulnerable to post-truth phenomena, evaluation should not be limited to cognitive learning outcomes. However, it must also encompass epistemic processes that include depth of reading, quality of argumentation, and the ability to verify claims (Ichwan et al., 2024). This approach is important because the legitimacy of arguments is not only determined by the speed of text discovery, but also by the quality of argument testing and disciplinary referencing (Mustofa et al., 2024). In other words, evaluation plays a role as a guardian of epistemic standards in a digitalised learning environment.

These three pillars function in an integrated manner, forming an interconnected, mutually reinforcing ecosystem of leverage. Good governance would be ineffective without educators' capacity to implement policies in *pesantren*. Contrarily, reliable educator capacity requires a clear policy framework and an evaluation system that provides constructive feedback for continuous improvement. In turn, evaluation gains meaning and impact when institutions use the results to refine policies and training materials. This dynamic cycle enables institutions, especially *pesantren*, to continuously adapt to digital transformation as needs and challenges evolve.

The Spectrum of Digital Adoption: Between the Logic of Protection and Controlled Integration

The response of *pesantren* to digitalisation follows a spectrum of strategies, ranging from cautious adoption to selective integration. Cautious adoption refers to the acceptance of technology that is strictly limited to maintain discipline, manners, and the stability of traditional authority. Meanwhile, selective integration refers to the use of technology that is more structured and functional for specific learning purposes, yet remains under strict institutional control. We can analyse this spectrum through four interrelated dimensions: (1) technology control (strict or moderate), (2) purpose of use (instrumental or pedagogically integrated), (3) institutional capacity (limited or developing), and (4) authority-maintenance strategies (protective or curative). These variations show that digitalisation in the *kitab kuning* ecosystem involves a contextual negotiation between the benefits of access and ethical-epistemic risks, shaped by institutional culture, leadership configurations, and authority politics (Hamdanah et al., 2025; Mutamimah et al., 2024).

On the cautious adoption spectrum, technology restrictions are pedagogical and ethical strategies grounded in a logic of protection. Here, technology is accepted very cautiously and within strict boundaries. Controlled technology adoption, such as Wi-Fi access that is only available in certain areas (such as in the library, *Ma'had Aly* academic room, or specific zones), while other spaces (such as *santri* study rooms and dormitories) are protected from technological penetration deemed potentially disruptive to learning discipline and traditional culture (Marzuki et al., 2025). *Pesantren* impose these restrictions because *kitab kuning* literacy depends on deep-reading rhythms and a controlled ethic of learning; without regulation, open digital access can erode the depth and focus of traditional *kitab kuning* literacy (Ritonga et al., 2020). Thus, cautious adoption is a form of defensive risk management (risk avoidance), where technology is permitted only to a minimal extent, deemed not to disturb the core of the tradition. This strategy tends to preserve the dimension of traditional literacy (through protection of discipline and learning habitus). However, these restrictions can also limit the development of digital and even critical literacy by deliberately restricting access to broader sources and discourses.

Nevertheless, even within the context of cautious adoption, technology is not absent; it is instrumental and localised. Its use is limited to specific administrative needs, referral access at certain levels, or supporting urgent learning functions. We can interpret these patterns as selective, controlled hybridisation; institutions design strict access controls that regulate when, where, and for what purposes they allow technology. These dilemmas between access and ethics require transparent governance. *Pesantren* addresses them by establishing clear boundaries that safeguard the core of tradition from external disturbances (Suwendi et al., 2024).

In the spectrum of selective integration, *pesantren* moves towards a logic of controlled integration, prioritising adaptive risk management. Here, technology begins to be systematically integrated into the study of *kitab kuning*, though not entirely, and always within a clear pedagogical framework (Arif et al., 2025). The modernisation of institutional approaches emphasises that digitalisation of learning needs to be carefully managed through planning, organisation, implementation, and supervision to align with educational objectives (Mutamimah et al., 2024). Selective integration means choosing technology based on specific pedagogical functions. *Pesantren* uses digital applications or repositories to expand references, employs platforms to reinforce selected materials, and opens digital channels to broaden its reach (Muslim, 2024). Meanwhile, the process of meaning maturation and knowledge validation continues to rely on deliberative practices and guidance from scholarly authority (Humaidi et al., 2024). This strategy actively seeks to balance the three dimensions of literacy by leveraging digital literacy to enrich access, relying on traditional literacy as the foundation of authority, and promoting critical literacy through structured dialogue.

The fundamental difference between these two ends of the spectrum lies in their orientation towards risk and institutional capacity. While cautious adoption prioritises risk avoidance through strict restrictions, selective integration shifts towards risk management through structured governance. Both recognise digital epistemic risks but respond to them with different institutional logics; one with a protective, defensive approach, and the other with an adaptive, measured approach. Leadership structures and managerial capacity shape this variation. Visionary leadership capable of developing clear policies and linking technology with institutional agendas, such as accountability, data-driven oversight, and administrative modernisation that respects local values, will tend to encourage institutions to move from "permitting technology" to "integrating technology in a targeted manner" (Hamdanah et al., 2025).

This variation of strategies is also a response to the challenges of the post-truth era and the contestation of authority in the digital space. In a fluid information environment, technology as an access provider often carries the risk of blurring authority hierarchies and simplifying texts to legitimise specific identities (Ichwan et al., 2024). Institutions that opt for selective integration tend to emphasise curating authority and strengthening dialogic practices to ensure that digital access continues to produce responsible understanding (Nasution et al., 2024). Conversely, institutions that adopt a cautious approach see restrictions as a protective strategy to maintain decorum, learning rhythm, and argumentative discipline so as not to be overwhelmed by the flow of instant information (Ritonga et al., 2020).

Placing the Literacy Trilogy within the Institutional Context

The literacy trilogy (traditional, digital, and critical) is an institutional achievement. *Pesantren* produce these competencies through an ecosystem of support that simultaneously sustains inherited learning practices, governs digital access ethically, and cultivates critical reasoning through structured pedagogy. We can capture this interconnection through a conceptual framework that maps how the three literacies interact and how specific institutional layers enable (or undermine) their integration. From this perspective, transformation becomes meaningful only when institutions pair technological provision and scriptural instruction with socio-epistemic conditions that let the three literacies function as a coherent whole (Hamdanah et al., 2025; Mutamimah et al., 2024).

Traditional literacy functions as the normative and epistemic foundation of *kitab kuning* learning, maintaining *sanad* continuity, deep-reading rhythms, and the teacher–text authority that anchors interpretation. *Kyai's* interpretive guidance operates as an ethical safeguard, preventing literalist misreadings and shaping moderate, contextual understanding within *pesantren* decorum (Humaidi et al., 2024). In this configuration, *kitab kuning* functions as an educational infrastructure that reproduces scholarly authority through disciplined textual engagement (Asari & Abidin, 2020). However,

when traditional literacy stands alone without adaptive mechanisms, it risks becoming defensive and less responsive to contemporary epistemic disruptions, especially those generated by instant information flows and authority contestation in digital space (Ritonga et al., 2020).

Digital literacy expands access through repositories, applications, and learning platforms, thereby reshaping how students search for, retrieve, and share references. The digitalisation of *kitab kuning* can enrich learning by widening textual availability and enabling rapid cross-referencing across sources (Halimi et al., 2022). However, digital abundance may produce superficial reading, weaken verification practices, and trigger authority drift when platform visibility or viral content displaces recognised scholarly mediation (Ichwan et al., 2024). The problem is institutional; it typically emerges when governance and cultural norms fail to provide clear standards for selection, curation, and responsible use.

Critical literacy completes the trilogy as the capacity to reason, test, and justify claims under post-truth conditions. Structured discussion serves as the primary mechanism for cultivating reason-giving, counter-argumentation, and disciplined judgment (Radino & Mubarok, 2025). The practice of *bahts al-masail* illustrates how *pesantren* can institutionalise collective verification; interpretive communities test arguments publicly and grant legitimacy to claims that are supported by careful referencing and robust reasoning (Mustofa et al., 2024). However, critical literacy also becomes dysfunctional when it is detached from institutionalised dialogic spaces and governance, devolving into reactive scepticism or relativism without epistemic responsibility, especially where deliberative rules, authority mediation, and verification norms remain unclear.

To prevent these dysfunctions and make the trilogy operate as an integrated system, *pesantren* require interconnected enabling layers. First, governance, management, and teacher capacity provide the institutional architecture that aligns technology, pedagogy, and evaluation through planning, organising, implementation, and supervision, so that digital adoption is not sporadic or personality-driven (Mutamimah et al., 2024). Visionary leadership further stabilises digital transformation by embedding accountability and data-informed oversight within institutional routines (Hamdanah et al., 2025). Second, dialogic pedagogy functions as the core connector that activates all three literacies: it preserves manners and authority (traditional), channels digital access into meaningful reference work (digital), and subjects claims to disciplined argument testing (critical) (Ritonga et al., 2020). Third, institutional culture operates as a value regime that determines adoption intensity, restriction design, and policy legitimacy; overly restrictive cultures can stall digital literacy development, while permissive cultures without ethical boundaries can normalise uncontrolled access and weaken epistemic discipline (Marzuki et al., 2025).

This model clarifies a cause-and-effect relationship: the literacy trilogy is the intended outcome, while governance, dialogic pedagogy, and institutional culture are the enabling conditions that determine its quality. When these layers function well, *pesantren* tend to produce deep reading and adaptive continuity (traditional literacy), broad yet curated and productive access (digital literacy), and responsible argumentative verification (critical literacy). Conversely, when one or more layers weaken, the system may regress into a defensive tradition, shallow instant access that shifts authority, or reactive criticism lacking verification discipline (Radino & Mubarok, 2025). Therefore, strengthening *kitab kuning* literacy is ecosystem design: pedagogical change requires supportive governance, digitalisation requires selective cultural regulation, and critical reasoning requires institutionalised dialogic spaces. *Pesantren* can operationalise these enablers by integrating curriculum and assessment, building educator capacity, and pursuing modernisation strategies that preserve *sanad* while cultivating digital and critical competencies (Nasution et al., 2024).

Figure 1.

The Literacy Trilogy and Enabling Institutional Layers in Kitab Kuning Transformation
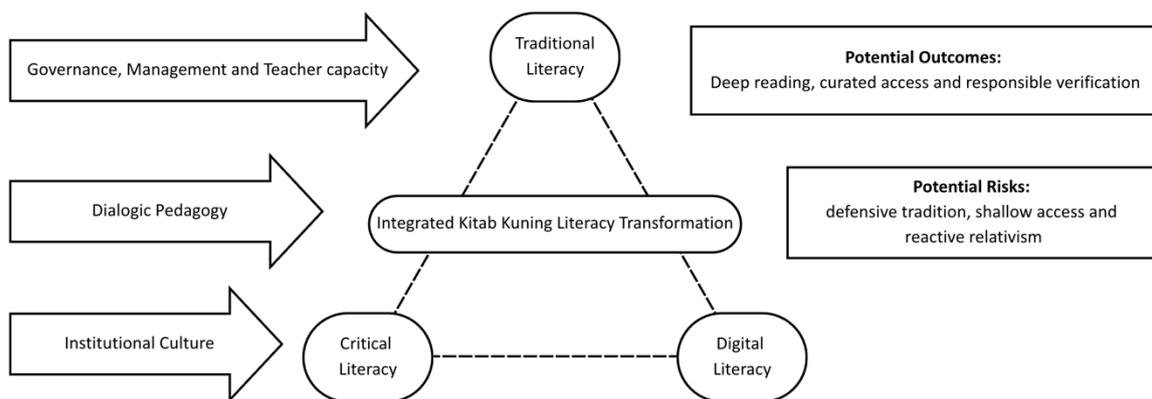
Note. The figure models the literacy trilogy (traditional, digital, critical) as an institutional outcome enabled by governance, management, and teacher capacity, as well as by dialogic pedagogy and institutional culture. Dashed links indicate mutual reinforcement among the three literacies, producing either outcomes (deep reading, curated access and responsible verification) or risks (defensive tradition, shallow access and reactive relativism) depending on the strength of these enabling layers.

The Future of *Kitab Kuning* Literacy in the Digital Era

Strengthening the literacy of *kitab kuning* is not a matter of "adding tools" or "opening access," but policy design and practice that activate traditional, digital, and critical literacy within the institutional context. If policies only promote digitalisation without curation, dialogic pedagogy, and evaluation, then what tends to emerge is superficial instant access, blurred hierarchies of authority, and weakened verification disciplines within the post-truth information ecosystem (Ritonga et al., 2020).

Conversely, when institutions design policies as ecosystem interventions, digitalisation broadens the range of references while preserving manners, depth of reading, and epistemic responsibility (Humaidi et al., 2024). Therefore, *pesantren* can build the future of *kitab kuning* literacy through three integrated intervention domains: curriculum and assessment redesign, teacher training and digital governance, and modernisation strategies that preserve *sanad* tradition (Achmadin et al., 2024).

First, in the domain of curriculum and assessment, there is a need to shift the traditional *kitab kuning* curriculum's orientation from "content mastery" towards "mastery of traditional, digital, and critical literacy" that can be measured and tested. In this regard, the repositioning of *kitab kuning* in *pesantren*-based higher education indicates that learning from it demands the ability to connect texts to contexts, formulate arguments, and explain their normative relevance (Budiman et al., 2025). Here, curriculum design should include explicit learning outcomes for all three literacies. Traditional literacy encompasses manners, reference discipline, and text structure; digital literacy includes access, sourcing, and curating sources; and critical literacy involves verifying claims, argumentation, and ethical contextualisation. Without explicit outcomes and indicators, *kitab kuning* literacy is likely to serve as a form of media adoption that does not alter the quality of reasoning (Halimi et al., 2022).

Furthermore, redesigning assessments is key to ensuring that the curriculum does not remain a declaration. Therefore, within the *pesantren* tradition, interpretive communities test arguments, and they grant legitimacy to those who can manage references effectively (Mustofa et al., 2024). Appropriate assessments should not only focus on comprehension tests but also on tasks that evaluate critical thinking, such as case study analysis that links texts to social contexts or argument mapping that outlines premises, supporting reasons, and counterarguments. Here, dialogic pedagogy that fosters reason-giving should serve as the basis for evaluating the process, as it trains an accountable argumentative capacity (Radino & Mubarok, 2025). However, this curriculum and assessment redesign will only be effective if supported by transformative teacher training. Without enhancing teachers' capacities, the new curriculum risks becoming a document, rather than a practical change in the classroom.

Second, in teacher training and digital governance, educators' competence is a determining factor in whether technology enhances or weakens literacy. Healthy digital transformation requires governance that guides, and teacher capacity that can integrate digital access with interpretative guidance and facilitate critical dialogue (Mutamimah et al., 2024). Therefore, training for teachers/*ustaz* should shift from application-focused training to pedagogical-digital integrative training, which includes: (1) curating digital sources of classical Islamic texts, (2) designing hybrid learning (when to use digital tools and when to engage in deliberation), (3) techniques for facilitating discussions and evaluating arguments, and (4) verifiable literacy in facing viral content and text

simplification (Radino & Mubarok, 2025). The cause-and-effect relationship is clear because, without teacher capacity, digital policies tend to become mere administrative formalities that do not address the epistemic quality of learning.

Digital governance requires mechanisms that ensure digital practices run stably through feedback cycles. In management, it is important to plan, organise, implement, and supervise to revitalise the study of *kitab kuning*, including setting goals for technology use and overseeing implementation (Ja'far, 2025). In practice, institutions can operationalise governance by setting recognised platform or repository standards, updating materials, conducting periodic evaluations based on literacy indicators, and running feedback mechanisms, such as evaluation meetings among educators, *pesantren* administrators, and student representatives, to correct policies (Nurkhin et al., 2024). Without institutionalised feedback cycles, digitalisation tends to be sporadic, reliant on individual preferences, and challenging to measure.

Third, at the policy level, development strategies need to be formulated as "development that does not sever *sanad* tradition", meaning an approach that maintains the discipline of *sanad* while also enhancing critical digital competencies. Restrictions imposed by *pesantren* on digitalisation are not resistance, but an ethical design to protect the *pesantren*-style learning environment (Marzuki et al., 2025). Nonetheless, digital access can open opportunities to reinvigorate *kitab kuning* when used functionally (Halimi et al., 2022). Therefore, effective policies should be selective in their integration, allowing technological tools for specific pedagogical functions while closing off spaces for distraction and disruption of authority. For example, a *pesantren* might implement a policy requiring the *Maktabah Syamilah* application for quick-reference searches in the intensive class (*takhassus*), and prohibiting its use during *sorogan* sessions dedicated to in-depth reading and reflection on *kitab kuning*. Selective integration becomes more stable when institutions align technology policies with institutional culture and support them through consistent leadership and management mechanisms (Hamdanah et al., 2025).

The further implications of this policy strategy include making *kitab kuning* literacy a priority in Islamic education to foster epistemic resilience in the post-truth era. The post-truth era weakens verification and encourages people to simplify texts to legitimise specific identities. In this context, *pesantren* (traditional, modern or hybrid) and *pesantren*-based higher education hold a strategic position as an ecosystem capable of building "tradition-based verification" by maintaining the authority of texts and teachers, while also training the capacity for argumentation and claim evaluation in the digital space (Budiman et al., 2025). If *pesantren* fails to institutionalise this agenda in policies and curricula, they will struggle to sustain *kitab kuning's* potential as a source of public ethics and moderation amid fast-paced, fluid competition in digital narratives (Nasution

et al., 2024). Therefore, *pesantren* must serve as guardians of tradition and producers of epistemic resilience for Indonesian society in the digital age.

Conclusion

The essence of transforming *kitab kuning* literacy in the digital era lies in adopting technology, profoundly reconfiguring pedagogy, and restructuring the learning ecosystem that supports it. Furthermore, there is a shift from authoritative transmission pedagogy towards dialogic-critical literacy, which then faces dilemmas of access and ethics in digital practice. We can only develop relevant and sustainable literacy by integrating traditional, digital, and critical literacies and supporting them with an adequate institutional ecosystem. This ecosystem includes governance that directs, dialogic pedagogy that shapes critical reasoning, and an institutional culture that selects and contextualises technology. Without these three elements, digitalisation risks dysfunctions such as superficial access, blurred scientific authority, and a weakened depth of reading in the post-truth information landscape.

The scholarly contribution of this article lies in three aspects. First, it offers an integrative conceptual framework that combines traditional, digital, and critical literacy, with three layers of institutional enablers (governance, dialogic pedagogy, and institutional culture) within a coherent ecosystem model. Second, from a methodological perspective, the article demonstrates the usefulness of an integrative literature review for conducting a critical synthesis of fragmented discourses and for generating testable theoretical propositions. Third, the article provides practical contributions in the form of a policy roadmap across three intervention domains, starting from curriculum and assessment redesign, strengthening educator capacity and digital governance, to selective modernisation strategies that preserve tradition while enhancing digital-critical competencies.

However, this study has its limitations. As a literature synthesis review, the findings and models produced are still conceptual and need to be tested through empirical research across various types of *pesantren*, including traditional, modern, and *pesantren*-based higher education institutions, in different regions. Demographic aspects, such as gender differences, *santri* age groups, and variations in socio-cultural backgrounds, have not been specifically analysed, even though these factors can significantly influence patterns of technology adoption, device access, and forms of participation in dialogic pedagogy. Therefore, further research is necessary through multi-site studies (for example, ethnographies of classes and deliberative forums) complemented by broader-scale surveys, as well as mixed methods approaches to assess the effectiveness of curriculum interventions, training, and digital governance. This step will provide a more comprehensive, inclusive, and practical policy foundation.

Statement of Interest

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