Attractive : Innovative Education Journal
Vol. 8 No. 2, July 2026

Information Technology Integration in Kitab Kuning Instruction at Traditional Dayah in Aceh: Tengku Perceptions, Adaptive Strategies, and Implementation Challenges

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ARTICLE INFO
Article history:
Received
February 15, 2026
Revised
May 24, 2026
Accepted
June 17, 2026

ABSTRACT

The integration of information technology (IT) into traditional Islamic education has become a major challenge in Indonesia's pesantren reform discourse. Traditional dayah in Aceh, recognized as some of the oldest Islamic educational institutions in the archipelago, face a dual imperative: preserving classical scholarly traditions centered on kitab kuning while responding to rapid educational digitalization. This study aims to (1) examine tengku perceptions of IT integration in kitab kuning instruction, (2) analyze the adaptation strategies they employ, and (3) identify key implementation challenges. A qualitative multiple-case study was conducted at three traditional dayah in Aceh: Dayah Najmul Hidayah Al-Aziziyah Batee Iliek (Bireuen), Dayah Anwarul Munawwarah Kuta Krueng (Pidie Jaya), and Dayah Darussalam Lampoh Tuah (Pidie). Data were collected through semi-structured interviews with six tengku and participant observation, then analyzed using the Miles, Huberman, and Saldana interactive model through open, axial, and selective coding with source and technique triangulation. Findings reveal that tengku perceptions are adaptive-selective, guided by fiqhiyah considerations balancing mashlahah (benefit) and mafsadah (harm), rather than absolute acceptance or rejection of technology. IT practices include the use of Maktabah Syamilah, YouTube, Zoom, and TikTok/Facebook live-streaming for da'wah, while halaqah and sorogan remain central pedagogical methods. A digital literacy gap between senior and junior tengku has produced a technology delegation mechanism based on scholarly authority hierarchies, extending the Technology Acceptance Model (TAM). Major challenges include unstable infrastructure, limited digital literacy among senior tengku, and the absence of formal IT governance policies.

Keywords: Information Technology; Kitab Kuning; Traditional Dayah Aceh; Tengku Perceptions; Digital Literacy

Journal Homepage https://attractivejournal.com/index.php/aj/

Published by CV. Creative Tugu Pena

INTRODUCTION

Digital transformation increasingly influences educational institutions of all types, including traditional Islamic educational settings such as dayah in Aceh. In Indonesia, the accelerating pace of digitalization—sharpened by disruptions to face-to-face learning in recent years has brought questions of technology integration to institutions that had long maintained a degree of distance from digital platforms (Dhawan, 2020). The rapid diffusion of digital tools into educational contexts has intensified scholarly debates on pedagogical sovereignty, institutional identity, and the preservation of values-based learning traditions (Selwyn, 2017;

Burbules, 2016). For traditional dayahs, this pressure does not arrive as a neutral technical question but as a challenge that touches the core of their pedagogical identity.

Traditional dayahs in Aceh are among the oldest Islamic educational institutions in the archipelago, carrying the mission of tafaqquh fi al-din across generations (Rifqi & Dehham, 2024). (Izmi, 2023) notes that the dayah system centers on the transmission of classical Islamic texts (al-kutub al-mu'tabarah) through halaqah, sorogan, and bandongan methods practiced for centuries. Suresman et al., (2025) confirm that the shift from sorogan to digital learning models represents a major epistemological transition in pesantren pedagogy, challenging inherited assumptions about the necessity of physical co-presence in knowledge transmission. This tradition positions the teacher-student relationship (tengku-santri)—built on adab, direct transmission, and trust—as the very foundation of the educational process.

Digitalization thus presents dayahs with a real tension: government policy through the Ministry of Religious Affairs (2023) promotes pesantren modernization, while many tengku and communities are concerned that digital integration may threaten the integrity of sanad ilmu—the chain of scholarly transmission that legitimizes knowledge within the pesantren tradition. This tension manifests not in abstract debates but in the daily pedagogical decisions of the tengku.

From an Islamic normative perspective, considerations regarding technology as a wasilah (means) have been systematically formulated in fiqh principles. Allah SWT states in Surah Al-Mujadilah [58]: 11:

يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ

"*Allah elevates those of you who have believed and those who have been granted knowledge by several degrees. Allah is fully aware of what you do.* (Q.S. Al-Mujadilah [58]: 11)

This verse affirms that knowledge elevates its bearer regardless of the medium through which it is transmitted. The fiqh principle al-wasail laha hukm al-maqashid—the ruling on the means follows that of the intended end—provides the theological basis through which tengku evaluate technology: IT is acceptable when it strengthens the objectives of knowledge transmission and preserves adab, and questionable when it threatens them. This is not a technical calculus but a scholarly and moral one, requiring the judgment of the tengku within their institutional context.

From an Islamic educational perspective, knowledge transmission is not merely a process of information transfer but also a moral and spiritual formation process. Al-Ghazali, in his Ihya' Ulum al-Din, emphasized that the educational relationship between teacher and student fundamentally involves adab and ethical cultivation that extends well beyond cognitive achievement. For Al-Ghazali, the teacher's role is not limited to conveying information but encompasses the shaping of character and spiritual disposition in the student (Kurniasari & Astuti, 2022). Al-Attas (1980), in his foundational work on the concept of Islamic education, similarly argues that the aim of education in Islam is to produce the good person (al-insan al-kamil) through the cultivation of adab the disciplined recognition and acknowledgment of proper relationships between knowledge, its sources, and its recipients (Muhammad Syaiful Islam, 2024). These classical frameworks remain essential reference points for understanding why digital pedagogy in Islamic contexts cannot be evaluated on purely instrumental grounds (Wan, 2019). Therefore, technology integration within traditional dayah contexts must be understood not only through the lens of technical efficiency but also through the educational values and moral dimensions that define Islamic pedagogy.

Previous studies on technology and pesantren education offer partial insights. Suhartini et al., (2025) found e-learning beneficial in modern pesantren settings, while Iranzo, (2025) observed that resistance in religious institutions generally reflects concern for the integrity of value transmission rather than outright rejection of technology. (Pan & Filippova, 2024) similarly noted that tradition-based institutions tend toward gradual, selective adoption. Abubakari et al., (2024) Further validate this framework, demonstrating that religious perspective on ICT significantly moderates acceptance behavior in Islamic educational settings. However, these studies do not address the specific context of traditional Acehnese dayah,

where knowledge transmission is deeply embedded within sanad, talaqqi, and adab-based pedagogical structures, nor do they examine how the scholarly authority of tengku shapes institutional responses to digital change. The digital literacy gap among religious teachers—and its implications for collective adaptation remains particularly underexplored.

Where Technology Acceptance Model (TAM) studies are referenced, they serve as a supporting analytical lens; however, the contextual dynamics of adab, otoritas keilmuan, and knowledge transmission within hierarchical religious institutions require interpretive frameworks rooted in Islamic educational tradition. Venkatesh et al., (2003)In their Unified Theory of Acceptance and Use of Technology (UTAUT), they recognize that social influence and facilitating conditions—both of which map onto the dayah's hierarchical authority structures—are critical determinants of adoption behavior. Tondeur et al., (2017) further demonstrate that teachers' pedagogical beliefs operate as a primary filter through which technological innovations are evaluated and selectively adopted.

Therefore, this study contributes in two ways. Empirically, it investigates the perceptions, adaptation strategies, and implementation challenges of information technology integration across three traditional dayahs in Aceh. Theoretically, it proposes scholarly authority hierarchy as a contextual mediating mechanism that transforms responses to technological barriers from individual non-adoption into collective delegation practices.

Based on the above discussion, this study focuses on three questions: first, how do tengku perceive the integration of information technology into the teaching of classical Islamic texts in traditional Acehnese dayahs? Second, what adaptation strategies have Tengku developed in response to the presence of IT, particularly given the constraints of digital literacy? Third, what are the main challenges in implementing IT in traditional Acehnese Islamic boarding schools? The objectives of this study are to describe these perceptions, analyze the adaptation strategies, and identify the challenges faced.

METHOD

1. Research Approach and Design

This study employs a qualitative approach using a multiple case study design. The choice of a qualitative approach is based on the nature of the research questions, which focus on gaining a deep understanding of the phenomenon of human perception within its natural context, rather than on statistical measurements of isolated variables (Creswell, 2013;Taylor & Healy, 2023). Yin (2018) affirms that multiple-case designs are particularly appropriate for theory-building research where the goal is to establish whether a proposed theoretical explanation holds across different institutional contexts. The multiple case study design was chosen because the research focuses on contemporary phenomena embedded in the real-life contexts of three different Islamic boarding schools, and because this design allows for logical replication across cases (Nair et al., 2023).

2. Location and Characteristics of the Research Sites

The research was conducted at three traditional Islamic boarding schools in Aceh from January to April 2026. The first dayah was Dayah Najmul Hidayah Al-Aziziyah Batee Iliek, located in Bireuen Regency, with a capacity of approximately 250 students. This dayah has a unique characteristic: the use of Zoom, TikTok Live, and Facebook by the dayah's leader (Waled) for religious study sessions attended by alumni, students from other dayahs, and the general public. Final-year students (aliyah or 7th-grade dayah students) are permitted to use Maktabah Syamilah, a digital dictionary, and books available only in digital format for the Lajnah Bahtsul Masail (LBM) munadharah at designated times, while students at other levels continue with conventional learning. The teachers actively use IT to strengthen scholarly arguments during religious study sessions.

The second dayah is Dayah Anwarul Munawwarah Kuta Krueng, located in Pidie Jaya Regency, with a capacity of approximately 400 students. This dayah strictly adheres to conventional teaching methods throughout the entire educational process; no digital platforms

are integrated into the formal learning process. However, the teachers use IT independently for study and to reinforce scholarly references outside of class hours.

The third dayah is Dayah Darussalam Lampoh Tuah, located in Pidie Regency, with a capacity of around 250 students. This dayah implements an IT access policy that is limited to administrators (the student organization section) and the tengku teachers, for the purpose of reviewing explanations and commentaries on religious texts. This dayah also has a senior tengku who consistently holds a study session on classical Islamic texts via a live TikTok broadcast every morning after the Subuh prayer, which is followed by hundreds of viewers from all over Aceh.

3. Profile of Research Informants

Informants were selected using purposive sampling based on criteria of relevance and the information they possessed. This approach aligns with Lincoln & Guba's (1985) criterion of information richness, which prioritizes depth and relevance over representativeness in qualitative inquiry (Palinkas et al., 2015). Informants were assigned codes to protect their confidentiality in accordance with research ethics. Data collection continued until thematic saturation was achieved, indicated by the absence of substantially new categories emerging from subsequent interviews. Saturation was reached after the sixth interview, where recurrent patterns related to technology perceptions, adaptation mechanisms, and implementation barriers repeatedly appeared across cases.

Code	Position	Dayah Affiliation	Teaching Tenure	Age
T1	Senior Tengku	Dayah Najmul Hidayah Al-Aziziyah Batee Iliek	8 years	29
T2	Junior Tengku	Dayah Najmul Hidayah Al-Aziziyah Batee Iliek	5 years	22
T3	Senior Tengku	Dayah Anwarul Munawwarah Kuta Krueng	7 years	27
T4	Senior Tengku	Dayah Anwarul Munawwarah Kuta Krueng	7 years	30
T5	Senior Tengku	Dayah Darussalam Lampoh Tuah	10 years	33
T6	Junior Tengku	Dayah Darussalam Lampoh Tuah	5 years	32

Table 1. *Research Participant Profiles*

4. Data Collection Methods

Data collection was conducted using two complementary methods. First, semi-structured interviews lasting between 30 and 50 minutes per session. The question guide was developed based on the constructs of perceived usefulness and perceived ease of use in Davis's (1989) Technology Acceptance Model (TAM), as well as on the categorization of adopters in Rogers's (2003) diffusion theory. The interview protocol additionally drew on Mishra & Koehler, (2006) TPACK framework to examine how Tengku conceptualize the intersection of pedagogical, content, and technological knowledge in their teaching practice. All interviews were recorded with the informants' written consent and subsequently transcribed verbatim. Second, participant observation was conducted during the learning process at each dayah.

5. Data Analysis and Validity

Data analysis was conducted using the interactive model proposed by Miles, Huberman, and Saldana (2014) through three interlocking stages. The first stage is data condensation: the selection, focusing, simplification, and transformation of raw data from

interview transcripts and field notes. The second stage is data display in the form of organized thematic narratives. The third stage is conclusion drawing and verification based on empirical evidence that is consistent across cases.

The coding process was conducted in stages: open coding to identify initial concepts, axial coding to discover causal relationships between categories, and selective coding to construct interpretive propositions. Data validity is ensured through: (1) source triangulation comparing statements among the three dayahs; (2) methodological triangulation matching interview data with observation results; and (3) member checking—returning a summary of findings to the informants for verification before the final interpretation is formulated. Creswell, (2013) identify member checking and triangulation as the most critical validity strategies in qualitative multiple-case research, particularly in studies involving institutional perceptions and normative frameworks.

RESULT

1. Tengku's Perceptions of IT Integration: An Adaptive-Selective Approach Based on Mashlahah

The kitab kuning classical Islamic literature in Arabic or Arabic-Malay, printed without vowel marks constitutes the core pedagogical foundation of traditional dayah education in Aceh (Taylor & Healy, 2023). As Meriza et al., (2022) note, it is not merely a pedagogical text but a symbol of authentic Islamic scholarship connected through an unbroken chain of transmission (sanad). This tradition demands direct teacher-student interaction and the cultivation of adab as preconditions for the legitimate reception of knowledge principles that are epistemologically distinct from technology-based learning models prioritizing independent access to information (Aflah et al., 2025).

Against this backdrop, data analysis from the three dayahs reveals that the tengku's perceptions of IT integration in the teaching of classical Islamic texts are adaptive and selective in nature, rather than dichotomous—a choice between full acceptance and total rejection—as is commonly assumed in discussions about traditional educational institutions. Each tengku evaluates IT based on contextual mashlahah-mafsadah considerations: the extent of the benefits IT brings to the process of transmitting the Kitab Kuning, and the extent of the risk of harm to both the *adab talaqqi* and the accompanying concentration and akhlak of the santri. This pattern aligns with the proposition by Jiang (2026) and Willison et al., (2023) that value-transmission-based educational institutions tend to adopt innovations selectively based on value compatibility. Abubakari & zakaria, (2023) provide empirical support for this selectivity from a quantitative perspective, showing that perceived Islamic education compatibility significantly predicts technology acceptance among Islamic educators a finding that translates qualitatively into the tengku's mashlahah reasoning framework documented in the present study.

At Dayah Najmul Hidayah Al-Aziziyah Batee Iliek, the most accommodating attitude toward IT was identified. A number of Tengku accepted the presence of technology under certain conditions that did not undermine the essence of talaqqi. They view the use of LCD projectors to display book texts, access to Maktabah Syamilah as an additional reference, and digital Arabic dictionaries as tools that actually enhance the effectiveness of learning. T1 stated:

> "*Anything that serves as a means to seek and disseminate beneficial knowledge is permitted, as long as it does not cause greater harm. The scholars of the past used the media available in their time. We use the media available in our time. What we safeguard is not the form of the medium, but the truth of the knowledge conveyed, the authenticity of its chain of transmission, and the proper etiquette in receiving it.*"(T1, Tengku Senior, Dayah Najmul Hidayah Al-Aziziyah Batee Iliek).

T1's statement reflects the deeply internalized principle of al-wasail laha hukm al-maqashid: the ruling on the means follows that of the end. Rather than asking whether a technology is intrinsically good or bad, the tengku's evaluative framework asks whether it serves the maqashid of knowledge transmission and preserves the integrity of the teacher-

student relationship. T2, a young religious teacher serving as the coordinator for Waled's online study sessions, explains the practical dimensions of its application:

> "*Seventh-grade students active in the LBM need access to books that are not available in print at the dayah library. Maktabah Syamilah provides access to thousands of classical Islamic texts on a single device. The quality of munadharah in the LBM improved significantly after we provided this access. However, access remains restricted: it is only for specific academic purposes, at designated times, and not for other purposes.*"(T2, Tengku Muda, Dayah Najmul Hidayah Al-Aziziyah Batee Iliek).

A different pattern was observed at Dayah Anwarul Munawwarah Kuta Krueng, specifically a conservative-functional approach that strictly separates the tengku's private quarters from the collective learning spaces for students. T3 explains:

> *"Here, we do not use digital platforms to teach the students. Lessons still follow the traditional method – reading, translation, and commentary. However, for personal use in searching for book references, I use digital devices. There are many books not physically available here, but they can be accessed via the internet.*"(T3, Senior Tengku, Dayah Anwarul Munawwarah Kuta Krueng).

This situation aligns with the findings of Rizal et al., (2024) that teaching authorities at Salafi institutions tend to adopt IT for personal reference purposes, rather than as a medium for direct instruction to students. T4 reinforces this with an argument regarding quality control:

> "*I'm afraid that if students have cell phones, they won't be opening religious texts. So it's safer if we're the ones using IT, not the students. We are the ones who filter the knowledge.*" (T4, Senior Tengku, Dayah Anwarul Munawwarah Kuta Krueng).

T4's statement reflects the gatekeeping dimension in Rogers' diffusion theory (2003): opinion leaders filter innovations before disseminating them to the community. Harnadi et al., (2021) identifies this gatekeeping role as structurally reinforced in post-pandemic pesantren environments, where senior ulama actively manage the flow of digital content to protect students from misinformation and moral hazards associated with unrestricted internet access. At Dayah Darussalam Lampoh Tuah, a selective-graduated pattern was observed differentiating IT access based on students' maturity levels:

> *"We're not anti-technology. This is the modern age. But if all students were free to use devices, they would spend all their time on unproductive things. So we impose gradual restrictions: senior teachers and students may use them for review and to assist with teaching. Junior students focus on traditional learning first.*"(T5, Senior Teacher, Dayah Darussalam Lampoh Tuah).

What is particularly interesting is that T5—who is the strictest in limiting students' access to IT—is also the most active in utilizing technology for da'wah. Every morning after the Fajr prayer, T5 holds a live TikTok session on classical Islamic texts, attended by hundreds of viewers from all over Aceh. T5 cites the hadith of the Prophet (peace be upon him):

بَلِّغُوا عَنِّي وَلَوْ آيَةً

"Convey from me even if it is only one verse." (Narrated by Al-Bukhari)

T5 uses this evidence to legitimize his digital da'wah:

> "*Whereas in the past we could only teach dozens of students at the dayah, now with TikTok Live we can reach hundreds, even thousands of people every day. That is not a violation of tradition – it is an expansion of tradition. The Prophet commanded us to convey the message, without limiting the medium of delivery.*"(T5, Senior Tengku, Darussalam Lampoh Tuah Islamic Boarding School)

Cross-case analysis suggests that perceptions toward IT integration are shaped primarily by beliefs concerning the educational objectives of technology use rather than by age alone. This finding is consistent with Tondeur et al., (2017) who demonstrate through systematic review that pedagogical beliefs, rather than demographic factors, are the primary determinants of teachers' technology integration decisions. It also resonates with the TPACK framework Mishra & Koehler, (2006), which posits that effective technology integration requires the convergence of technological, pedagogical, and content knowledge, a convergence

that Tengku achieves through their scholarly authority rather than through formal digital training. Tengku, who perceived technology as supportive of the maqashid of knowledge transmission, demonstrated more accommodative attitudes toward digital innovation. Institutional endorsement from dayah leadership also played an important legitimizing role.

2. The Digital Literacy Gap: Delegation Mechanisms Based on Scholarly Authority

The most original finding of this study—and the one least frequently addressed in the literature on the digitization of pesantren—is the reality of a significant digital literacy gap between older and younger generations of tengku, along with the adaptive responses it generates. This gap is not merely a difference in technical competence; it is a social phenomenon with profound implications for the transmission of knowledge, the maintenance of scholarly authority (otoritas keilmuan), and the preservation of the adab of the teacher-student relationship within the pesantren ecosystem. Uerz et al., (2018) identify this gap as a systemic challenge in teacher education globally, noting that digital competence development requires sustained, context-specific professional development rather than one-off training interventions a finding with direct implications for the design of digitalization programs targeting senior tengku.

Where individual-level technology adoption models would predict withdrawal or non-adoption in the face of technical difficulty, the dayah context produces a distinctly different response—one shaped by the hierarchy of scholarly authority that organizes all aspects of institutional life.

T4's candour points to the dimension of the digital literacy gap that carries the most weight in the dayah context: a tengku who has spent decades mastering and transmitting classical Islamic texts finds himself needing assistance with a task that junior colleagues handle with ease. What matters in this setting, however, is not technical competence per se, but how the gap is responded to—and it is here that the logic of scholarly authority (otoritas keilmuan) shapes the institutional response (Kafid & Rohmatika, 2020) . T4 explains:

> *"To be honest, I want to make use of technology, but I'm not very skilled at it yet. Once I tried using a projector to display text from a religious text, and the students actually laughed because the Arabic script didn't display correctly on the screen. That incident made me afraid to try again. What we need is serious, context-specific training—not just being told to use it without being taught how."*(T4, Senior Tengku, Dayah Anwarul Munawwarah Kuta Krueng)

There is an irony of significant academic importance in T4's situation: a scholar who has spent nearly two decades guiding dozens of students in understanding the "yellow books" texts that are linguistically and conceptually highly complex—needs assistance with a task considered trivial by a generation raised in a digital environment. Sorrentino (2018), and Evans, (2017) explain this irony through the concept of digital natives versus digital immigrants: those who grew up before the digital era bring different cognitive patterns to their interaction with technology, Prensky (2001) original formulation of this dichotomy has been critiqued for oversimplification (Selwyn, 2017), but in the dayah context, the generational divide in technology familiarity is empirically observable—not as a fixed cognitive trait but as a product of differential socialization into digital environments. Pelgrum, (2001) identified teacher competence as the most critical obstacle to ICT integration across educational systems worldwide—a structural barrier that remains as relevant in traditional dayah contexts as in mainstream education.

The response to these limitations did not result in a rejection of IT, but rather gave rise to a collective adaptation mechanism that developed organically in all three dayahs: the delegation of technology based on scholarly authority. T6 describes this mechanism:

> "*I can read Arabic-language classical texts without vowel marks fluently. But if asked to create a digital presentation, I wouldn't know where to start. Those two competencies exist in different worlds for me. I'm not ashamed to admit it because no one has ever taught me how to do it."*(T6, Young Tengku, Darussalam Lampoh Tuah Islamic Boarding School)

T6's statement contains an important theoretical proposition: within the dayah ecosystem, digital literacy and scholarly authority are two distinct categories of competence that do not exist on the same hierarchical ladder. Deficiencies in the technical domain do not undermine authority in the scholarly domain. This organically developed mechanism of delegation indirectly confirms this proposition, while simultaneously fostering a form of intergenerational collaboration that holds its own pedagogical value ((Patton et al., 2025). This delegation pattern constitutes what Spillane, (2010) terms distributed leadership in action: leadership functions, including the management of knowledge resources, are distributed across individuals according to their specific competencies rather than concentrated in a single authority figure. While Spillane's framework was developed in mainstream school contexts, the dayah data suggest that distributed technical leadership can emerge organically in hierarchically organized institutions when institutional values create space for competence-specific role differentiation.

These findings suggest that the relationship between technological barriers and institutional responses cannot be adequately understood through individual-level adoption frameworks alone. In the dayah context, technical difficulty does not lead to withdrawal from technology but rather generates a collective, authority-structured response: the delegation of technical tasks to younger tengku while substantive scholarly and pedagogical authority remains with the senior teachers.

3. Patterns of Information Technology Implementation and Adaptation Strategies

The patterns of IT implementation at the three Islamic boarding schools are diverse, yet they share a consistent common thread: IT is used as a tool (aid), not as a replacement for traditional teaching methods. This aligns with the compatibility characteristic in Rogers' (2003) Diffusion of Innovations Theory, which posits that innovations spread more readily when perceived as consistent with existing values and practices (Yu, 2022; Kohles et al., 2013). Basori et al., (2023) identifies this compatibility criterion as especially salient in salaf pesantren environments, where innovation proposals that can be framed in terms of traditional scholarly practice encounter significantly lower institutional resistance than those that appear to displace established methods. In the dayah context, innovations endorsed by the dayah leader (Waled or Abi) diffuse vertically through the authority hierarchy rather than horizontally through peer networks—making institutional leadership a decisive accelerating factor.

Platform / IT Tool	Dayah Najmul Hidayah Al-Aziziyah	Dayah Anwarul Munawwarah	Dayah Darussalam Lampoh Tuah	Primary Users
Digital Kitab PDF	Senior students & tengku	Tengku only (personal)	Tengku & senior students	Mixed
WhatsApp Group	Coordination + material sharing	Tengku coordination only	Coordination + materials	Tengku
YouTube	Tengku reference	Personal self-study	Text & commentary review	Tengku
Maktabah Syamilah	Class 7 (LBM sessions only)	Personal self-study	Not used	Limited
Zoom/Google Meet	Leader's open pengajian	Not used	Not used	Media team
TikTok/ Facebook	Ramadan	Not used	Daily morning	Senior tengku

Platform / IT Tool	Dayah Najmul Hidayah Al-Aziziyah	Dayah Anwarul Munawwarah	Dayah Darussalam Lampoh Tuah	Primary Users
Live	special sessions		sessions (T5)	
LCD Projector	Occasional discussions	Not available	Not used	Tengku

Table 2. Matrix of IT Implementation in Three Traditional Aceh Islamic Boarding Schools

At Dayah Najmul Hidayah Al-Aziziyah, the most structured implementation of IT is seen in Waled's religious lectures via Zoom and live streaming on social media. T2 explains the rationale:

> *"Our Waled uses Zoom and live social media at the request of alumni and students from other Islamic boarding schools who cannot attend in person. This way, the book study sessions can be followed by the general public whenever and wherever they are."*(T2, Tengku Muda, Dayah Najmul Hidayah Al-Aziziyah Batee Iliek).

This pattern reflects the principle that innovations accepted by dayah leadership spread vertically through the authority hierarchy—not horizontally through peer networks. Waled's virtual presence via digital platforms does not replace his authority; rather, it extends his reach for da'wah and scholarship. Mohd. et al., (2024) notes that senior dayah leaders in Aceh who embrace digital da'wah platforms are perceived not as abandoning tradition but as exercising prophetic mandate—a framing that substantially reduces institutional resistance to their digital practices. This is particularly significant given Kementerian Agama RI's (2023) policy push for pesantren digitalization, which has faced resistance in contexts where leadership legitimacy for digital adoption has not been established (Zulkarnain, 2023). T1 adds:

> *"Senior students active in the LBM can now consult thousands of classical texts on a single device. The quality of legal reasoning in munadharah sessions has improved measurably since this access was provided."*(T1, Senior Tengku, Dayah Najmul Hidayah Al-Aziziyah Batee Iliek).

At Dayah Anwarul Munawwarah, the use of IT is personal and not institutionally structured. T3 describes his usage pattern:

> *"If there is an expression in a book whose meaning or the context of the scholar's interpretation I am unsure of, I search for it on YouTube. Many scholars explain the mu'tabarah texts in great detail and depth. That is very helpful for preparing my lessons."*(T3, Senior Tengku, Dayah Anwarul Munawwarah Kuta Krueng).

This practice illustrates how IT serves the tengku's scholarly function—deepening access to the classical textual tradition—even when it has not yet been formally integrated into the learning environment. The benefit is real and recognized, but its application remains within the boundaries of the tengku's personal scholarly practice rather than the collective learning space of the dayah.

The adaptation strategies identified in the three Islamic boarding schools show similar patterns, which can be summarized in the motto of Nahdlatul Ulama scholars:

المحُاَفَظَةُ عَلَى القَدِيْمِ الصَالِحِ وَالأَخْذُ بِالجَدِيْدِ الأَصْلَحِ

"Preserving what is good from the past and adopting what is better from the present."

Operationally, this strategy is manifested in four principles: (1) maintaining halaqah and sorogan as the core pedagogical foundation of learning; (2) positioning IT as a supplement, not a substitute; (3) gradually limiting access to IT based on the students' level of maturity; and (4) utilizing IT to expand da'wah to the wider community. Alam, (2025) characterizes this type of adaptive strategy as "pedagogical sovereignty," the institution's capacity to selectively appropriate external tools without ceding control over its core educational philosophy.

4. Challenges in Implementing IT in Traditional Islamic Boarding Schools

Although there is an adaptive acceptance of IT, its implementation in the three boarding schools faces multidimensional challenges. Data analysis identifies four main clusters of challenges. These clusters correspond broadly to the barrier categories identified by Kundu, (2018) In their systematic review of ICT adoption barriers in rural schools: infrastructure inadequacy, digital competence gaps, cultural-normative resistance, and governance deficits.

Challenge Cluster	Description	Sites Affected	Severity
Digital Infrastructure	Unstable rural internet connectivity; limited hardware; unscheduled power outages	All three dayah	High
Digital Literacy of Human Resources	Some senior religious leaders are not yet able to operate digital devices; a generational skills gap.	Dayah Anwarul Munawwarah & Darussalam Lampoh Tuah	Moderate–High
Cultural Resistance	Concerns about distortions in the transmission of scholarly lineage; issues regarding the etiquette of knowledge transmission; narratives portraying technology as a "distraction from scholarship."	All three dayah (varying degrees)	Moderate
Internal Regulations	There is no formal policy on the use of IT; access limits depend on the individual discretion of religious leaders; potential for inconsistency.	Dayah Darussalam Lampoh Tuah	Moderate

Table 3. *Matrix of IT Implementation Challenges in Traditional Islamic Boarding Schools in Aceh*

Infrastructure challenges are the most tangible obstacle faced by the three Islamic boarding schools. Limited internet connectivity in rural Aceh makes the use of streaming platforms inconsistent. T1 illustrates this with a specific example:

> "*Once, Waled's religious lecture via Zoom was interrupted midway through the session because the signal suddenly dropped. The students had already gathered, the projector screen was on, but the internet connection went dead. We eventually continued using traditional notes. This infrastructure instability remains the primary obstacle we have not yet been able to resolve on our own.*" (T1, Senior Tengku, Dayah Najmul Hidayah Al-Aziziyah Batee Iliek).

Digital literacy challenges primarily arise among tengku over the age of 35. T4 acknowledged this, highlighting psychological barriers alongside technical ones:

> "*I'm not yet accustomed to using a laptop. If there's a PDF file of a religious text that needs to be opened, I ask a younger tengku to open it for me. I'm more comfortable with printed books. It's not that I don't want to learn, but it does require time and contextual training—not crash courses that don't align with our learning style.*"(T4, Senior Tengku, Dayah Anwarul Munawwarah Kuta Krueng).

T6 adds a psychosocial dimension to this gap:

> "*Senior Tengku who have been teaching for over a decade are typically more cautious about new technology. They worry about making mistakes or being laughed at by their students for not being able to operate devices properly. This sense of hesitation must not be ignored. Training approaches must take their dignity and psychological well-being into account.*"(T6, Young Tengku, Dayah Darussalam Lampoh Tuah).

Cultural resistance is present in the discourse of all three dayahs, though not as a dominant challenge. T3 articulates its normative boundaries with precision:

"What we uphold is not a rejection of technology, but rather the etiquette of talaqqi—listening to the teacher with full attention and presence of heart. If a student holds a device during a lesson but remains attentive and undistracted, that is not a problem normatively. But in reality, it is very difficult to control, and that is why we are cautious." (T3, Senior Tengku, Dayah Anwarul Munawwarah Kuta Krueng).

T3's perspective aligns with the fiqh principle of dar'u al-mafasid muqaddam 'ala jalb al-mashalih: preventing harm takes precedence over seeking benefit when the two are in a delicate balance. The final challenge—the absence of systematic internal regulations—was identified by T5 as the obstacle most likely to be addressed institutionally:

"There should be a unified regulation at the dayah level specifying who is permitted to use what, when, and for what purpose. Currently, it still depends on the discretion of each tengku, resulting in inconsistent outcomes. Students can become confused when one tengku permits something while another prohibits the same thing." (T5, Senior Tengku, Dayah Darussalam Lampoh Tuah).

Overall, these challenges demonstrate that IT integration in dayahs is a complex process of negotiation between traditional norms, human resource capacity, and infrastructure realities. The most feasible implementation model in the context of traditional Acehnese dayahs is a gradual integration model that positions the tengku as a dignified gatekeeper. Sholeh, (2023) argue that open and distance learning frameworks that respect institutional autonomy and embed technology within existing authority structures achieve higher adoption rates in Islamic higher education contexts—a principle that extends logically to dayah settings. Songyu et al., (2025) emphasizes that the culture of teaching and learning is the primary determinant of technology integration success, with tool availability being a secondary factor.

5. Model of IT Integration Dynamics in Traditional Acehnese Islamic Boarding Schools

Based on the findings of the four sub-studies above, this research formulates an integrative dynamics model that illustrates the relationships among elements in the process of IT integration in traditional Acehnese Islamic boarding schools. This model positions the Tengku's Perception (adaptive-selective, mashlahah-based) as the primary determinant, which then generates an IT Implementation Pattern (selective-supplementary) through the mediating mechanisms of Scholarly Authority and Technological Delegation. This implementation pattern, in turn, develops an Adaptation Strategy (graduative-participatory), all of which face Multidimensional Challenges (infrastructure, literacy, cultural, regulatory).

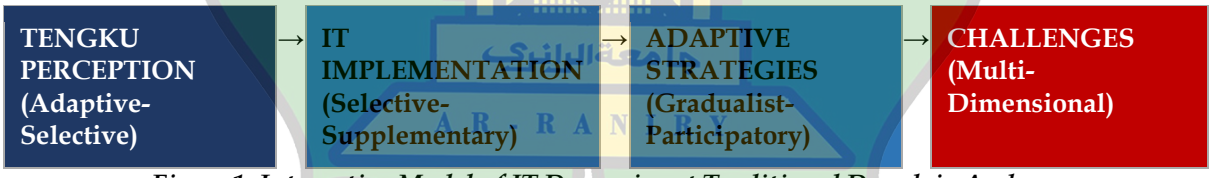

Figure 1. Integrative Model of IT Dynamics at Traditional Dayah in Aceh

This model illustrates how traditional Acehnese dayahs negotiate technology integration based on institutional values and pedagogical considerations rooted in adab and otoritas keilmuan, rather than as a passive response to external digitalization pressures.

DISCUSSION

This study offers three interconnected contributions to the literature on technology integration in traditional Islamic education, organized around the study's core novelty: scholarly authority hierarchy as a contextual mediating mechanism that shapes institutional responses to digitalization. The adaptive-selective perception pattern documented here challenges a persistent assumption in technology adoption research—that traditional religious institutions respond to digital change through binary acceptance or resistance. All six tengku in this study demonstrated nuanced, case-by-case evaluation rooted in mashlahah-mafsadah reasoning. This finding extends earlier work by Izquierdo-Iranzo, (2025) and Pan & Filippova, (2024) by

specifying the evaluative framework through which Islamic educational institutions exercise selective adoption. It also complements Abubakari et al., (2024) quantitative demonstration that perceived compatibility with Islamic education values is the strongest predictor of digital technology adoption intent among Islamic educators. The determinant is not age, educational level, or even prior digital exposure, but conviction about whether a given tool serves the maqashid of knowledge transmission without threatening adab and sanad. This has direct implications for how IT introduction programs should be designed: framing tools in relation to scholarly objectives, not technical affordances, is more likely to secure tengku acceptance. This recommendation is consistent with Müller & Steiner, (2018) policy-oriented findings on digital governance in Southeast Asian Islamic institutions.

The delegation mechanism is the study's most original finding. Unlike what TAM and similar frameworks assume—that technology adoption is an individual decision—what emerged across all three dayahs was a collective response. Senior tengku who lack digital skills simply delegate technical tasks to junior colleagues, while retaining full scholarly authority. This means that a digital literacy gap does not prevent institutional engagement with technology; instead, it produces a division of labor rooted in the dayah's existing hierarchy. Senior tengku contribute content authority; junior tengku provide technical support. Neither replaces the other (Scherer, 2025; Venkatesh et al., 2003).

What makes this possible is the structure of the dayah's hierarchy itself. Unlike most organizations where seniority and technical competence are expected to go together, the dayah's hierarchy is based entirely on mastery of classical Islamic scholarship. Digital skills are simply not part of that hierarchy. So when a senior tengku needs help opening a PDF, there is no status cost in asking a junior colleague. Patton et al., (2025) describe something similar in their framework of conditional authority delegation, and Spillane, (2010) distributed leadership model offers a parallel: in the dayah, technical and scholarly functions are distributed across people according to what each actually does well.

A related pattern worth noting is how technology adoption spreads within each dayah. Rather than moving horizontally through peer networks—as Rogers' (2003) Diffusion of Innovations model would predict—adoption in the dayah tends to move vertically, downward from the Waled or Abi. When a dayah leader uses Zoom for religious study sessions or broadcasts on TikTok Live, other tengku and students take that as a signal that such tools are permissible. Leadership endorsement here is not just a social lubricant; it is a structural requirement. Basori et al., (2023) and Mohd. et al., (2024) both document this pattern in Acehnese and wider Indonesian pesantren settings. The practical implication is clear: IT programs targeting dayah that focus on individual teachers while bypassing institutional leadership are unlikely to gain traction.

The digital literacy gap also has implications for training design. Government programs for pesantren digitalization have tended to focus on providing hardware and internet access, without paying enough attention to how senior tengku actually experience learning to use new tools. The data here suggest that embarrassment—fear of being seen as incompetent by students—is a more significant barrier than motivation. T4's account of the projector incident is telling: a single public failure was enough to stop him trying again. Effective training for senior tengku needs to be small-scale, contextually grounded, and attentive to participants' dignity—not generic crash courses delivered in large groups (Evans, 2017; Uerz et al., 2018).

Finally, the consistent positioning of IT as a supplement rather than a substitute across all three sites reflecting the maxim *al-muhafazatu 'ala al-qadim al-salih wa al-akhzu bi al-jadid al-aslah* suggests that traditional dayahs are not simply resisting digitalization, but selectively engaging with it on their own terms. This distinction matters: the dayah is not an institution left behind by change, but one that deliberately chooses how and when to incorporate new tools into the teaching of classical knowledge. Alam, (2025) both characterize this positioning as epistemologically coherent within the salaf tradition, noting that the category of wasilah creates principled space for technological adoption without requiring institutions to abandon their foundational pedagogical commitments.

CONCLUSION

This study draws three main conclusions. First, tengku perceptions of IT integration are adaptive-selective, consistently evaluated through a mashlahah-mafsadah framework rather than as a binary choice between acceptance and rejection. The primary determinant is not age but conviction regarding the maqashid of technology use in knowledge transmission, reinforced by the legitimacy granted by dayah leadership. Second, the digital literacy gap between senior and junior tengku is a social phenomenon that organically generates a technology delegation mechanism based on scholarly authority: technical tasks are assigned to younger colleagues while substantive pedagogical authority remains with the senior tengku. Within this mechanism, deficiency in technical competence does not diminish authority in the scholarly domain—a dynamic that reflects the enduring logic of otoritas keilmuan in dayah institutions. Third, IT functions across all three dayahs as a supplement, not a substitute, for halaqah, sorogan, and direct talaqqi. Implementation challenges unstable infrastructure, the digital literacy gap, and the absence of formal IT governance require responses that respect the pedagogical autonomy of the tengku.

Grounded in the frameworks of Al-Ghazali and Al-Attas, these findings affirm that technology integration in Islamic education should be understood not as a replacement of traditional pedagogical values but as a contextually negotiated effort to preserve adab, sanad, and the integrity of knowledge transmission in changing times. The delegation mechanism that emerged across all three dayahs is itself an expression of Islamic educational ethics: a collective institutional wisdom that maintains the relational bond of teacher and student as the irreplaceable core of learning. The study contributes to understanding how scholarly authority hierarchy shapes institutional responses to technological change in traditional Islamic educational settings—an insight relevant to both practitioners and future researchers in the field. Practically, findings point to the need for contextually designed digital literacy programs for tengku, gradual and facilitative digitization policies from the Ministry of Religious Affairs and Aceh Dayah Education Office, and formal recognition of tengku digital da'wah as a form of strategic educational outreach. Limitations include the study's scope of three dayahs and six informants, reliance on tengku perspectives without student voices, and a cross-sectional design that does not capture long-term adaptation trajectories—all directions warranting future research.

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