

Digital Transformation and Governance in Indonesian Islamic Boarding Schools: A Comparative Study of Two Pesantren

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ABSTRACT

Digital transformation is reshaping how Islamic boarding schools (pesantren) organize administration, learning, communication, and stakeholder services. This study primarily employed a qualitative approach within a convergent mixed-method design to examine how two pesantren respond to digital change, identify its effects on institutional governance, and formulate a value-based model for digital transformation. Qualitative data were obtained through interviews, participatory observations, and document analysis, while quantitative data from a structured questionnaire administered to 30 students were used to support and triangulate the qualitative findings. The analysis revealed an adaptive-selective strategy: technology is adopted when it aligns with institutional values, provides practical benefits, and presents manageable risks. Digitalization improves administrative efficiency, access to learning resources, communication with parents, transparency, and public trust, while face-to-face Qur'anic transmission, bandongan, sorogan, and character formation remain central. Key challenges include unequal digital literacy, infrastructure and maintenance costs, data-security risks, inappropriate content, and fragmented systems. Based on these two institutional cases, the study proposes an Adaptive-Conservative Model for Digital Transformation in Pesantren, consisting of value foundations, governance transformation, learning innovation, and ecosystem strengthening. The model is context-specific and requires broader empirical testing before wider application.

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1. INTRODUCTION

Pesantren are among the most deeply rooted Islamic educational institutions in Indonesia. As community-based institutions, they perform educational, social, religious, and

cultural functions. Their historical resilience reflects an ability to negotiate social change while maintaining¹³ the traditions that shape institutional identity [1], [2]. This position is also reinforced by Law of the Republic of Indonesia No. 18 of 2019 on Pesantren, which recognizes education, religious propagation, and community empowerment as interconnected institutional functions.

In the twenty-first century, the changes negotiated by pesantren are not only social and curricular but also digital. Technology has altered data management, financial transactions, communication, access to learning resources, and relationships between educational institutions and stakeholders. Digitization refers to converting analogue materials into digital formats, digitalization refers to the use of digital technologies to improve specific processes, and digital transformation refers to comprehensive institutional change driven by digital integration. Digital transformation is therefore broader than converting analogue documents into electronic formats; it involves changes in processes, strategies, human competencies, and organizational structures [3], [4]. In educational organizations, a holistic transformation requires alignment among technology, organizational readiness, leadership, culture, and stakeholder participation [5], [6]. This study draws on the theoretical framework of digital governance, which emphasizes transparency, accountability, participation, and efficiency in institutional decision-making.

The need for transformation is increasingly visible because pesantren serve large communities while parents and students expect faster, more transparent, and more accessible services. Digital systems can support student information management, cashless payments, learning resources, reporting, digital libraries, and institutional communication. Previous studies of pesantren have reported benefits of digital technology for learning, information systems, financial management, digital literacy, and communication [7]–[12]. Research beyond the pesantren context likewise shows that digital transformation can improve organizational coordination and service processes when digital capabilities and institutional readiness are developed together [13], [14].

However, technology use in pesantren cannot be treated as a purely technical matter. Practices such as *bandongan*, *sorogan*, *musyafahah*, *kitab* study, teacher–student relationships, and character formation through exemplification contain educational dimensions that cannot be automatically replaced by digital tools. Uncritical adoption may create device dependence, exposure to inappropriate content, weakened scholarly authority, or reduced educational interaction. Institutional values in pesantren such as Qur’anic transmission, teacher–student relationships, and religious traditions are analyzed through interviews, observations of *bandongan* and *sorogan*, and review of institutional documents. Digital transformation should therefore be understood as value-governed institutional change rather than as the accumulation of applications [15]–[18].

Recent studies have examined technology in pesantren from specific perspectives, including teaching methods, digitization of classical Islamic texts, administrative information systems, cashless payments, financial management, digital literacy, and digital communication [8], [9], [19]–[24]. Although these studies demonstrate substantial benefits, many focus on one functional area. Research that examines digital transformation across governance, learning, communication, and institutional identity while treating traditional

values as a basis for technology selection remains limited. Research that integrates digital governance with institutional values and develops a value-based model from comparative pesantren cases remains limited. This study addresses that gap. Comparative case research is consequently important because pesantren differ in educational orientation, organizational capacity, culture, and technological maturity.

This study investigates Pesantren Tahfidh Yanbu'ul Quran 5 Tegal and Pesantren Al-Mubarak Al-Arbain Demak. The two institutions have different educational orientations and levels of technological development, but both integrate digital tools into institutional management. These two pesantren were selected because they differ in educational orientation (Tahfidh vs general Islamic education) and in technological maturity, providing a meaningful comparative case for analyzing diverse responses to digital transformation. Accordingly, the study aims to: (1) analyze the response patterns of the two pesantren to digital transformation; (2) identify its effects on administration, learning, communication, and institutional identity; and (3) formulate an Adaptive-Conservative Model for Digital Transformation in Pesantren as a value-based framework for digital governance.

20 2. METHOD

2.1 Research Approach and Design

This study employed a convergent mixed-method design. Qualitative and quantitative data were collected within a closely related period, analyzed using procedures appropriate to each data type, and integrated during interpretation. The qualitative component was the primary source for explaining processes, value considerations, and governance changes, whereas the quantitative component provided supporting evidence. Integration was conducted through joint displays and triangulation, enabling comparison of qualitative themes with quantitative tendencies [25], [26].

2.2 Setting, Period, and Participants

The research was conducted from September to November 2025 and continued through January 2026 at two institutions: Pesantren Tahfidh Yanbu'ul Quran 5 Tegal in Tarub District, Tegal Regency, and Pesantren Al-Mubarak Al-Arbain Demak in Wonosalam District, Demak Regency. The sites were purposively selected because both had adopted technology for administration, learning, or institutional communication but differed in educational characteristics. Yanbu'ul Quran 5 emphasizes Qur'anic memorization and formal education, whereas Al-Mubarak Al-Arbain emphasizes Arabic learning and technology-supported governance.

The qualitative participants comprised 14 informants: two caregivers, two managers or heads of education, four senior teachers, four senior students, and two parents. Of these, 8 informants came from Yanbu'ul Quran 5 and 6 from Al-Mubarak Al-Arbain. For the quantitative component, 30 students were selected purposively because they were actively involved in using digital services—15 from Yanbu'ul Quran 5 and 15 from Al-Mubarak Al-Arbain. Informants were chosen through purposive sampling based on institutional position and experience, while student respondents were selected through convenience purposive sampling to ensure direct involvement in digital practices. The quantitative component

focused on students because they are the primary users of digital services, while governance perspectives were captured through qualitative interviews with teachers, managers, and parents.

2.3 Data Collection Techniques and Instruments

The questionnaire consisted of 20 items covering four dimensions: access convenience, service speed, learning support, and barriers to technology use. Items were measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Scores were aggregated by dimension, and descriptive statistics were used to identify tendencies. Content validity was established through expert review, and reliability was tested using Cronbach's alpha, which exceeded the acceptable threshold of 0.70 [27].

2.4 Data Analysis and Trustworthiness

Qualitative data were analyzed using an interactive process of data condensation, data display, conclusion drawing, and verification [27]. Coding followed open, axial, and selective stages, producing themes concerning institutional responses, learning digitalization, administrative digitalization, public communication, impacts, and implementation challenges. Coding was conducted manually and cross-checked by two researchers to ensure consistency. Questionnaire responses were tabulated and analyzed descriptively; no inferential statistical testing was performed.

Integration of qualitative and quantitative data was achieved through joint displays that aligned themes with quantitative tendencies, enabling triangulation and strengthening interpretation. Trustworthiness was supported through source triangulation, technique triangulation, cross-case consistency checks, and confirmation of major findings with key informants [27].

3. RESULTS AND DISCUSSION

3.1 Adaptive-Selective Responses to Digital Transformation

The two pesantren did not simply accept or reject digital transformation. Instead, they applied an adaptive-selective strategy in which technology was adopted after being assessed for consistency with pesantren values, practical benefits, and potential risks. These considerations guided decisions concerning administrative applications, digital learning resources, social media, and student internet access.

“We only use applications that help us manage students, but Qur’anic transmission must remain face-to-face” (*C1, caregiver*).

“Digital attendance makes reporting faster, but I still check directly in class” (*M2, manager*).

This pattern is consistent with evidence that sustainable digital transformation depends on strategic alignment, organizational culture, leadership, and institutional readiness rather than technology alone [5], [6], [28].

A recurring normative principle in the interviews was *al-muhafazhah 'ala al-qadim al-shalih wa al-akhdu bi al-jadid al-ashlah*: preserving beneficial established practices while adopting new practices that provide greater benefit. Traditions regarded as

educationally effective were maintained, whereas technology was used to strengthen functions that had previously been slow, poorly documented, or difficult to access. This finding is consistent with research showing that digital transformation in Islamic educational settings is most productive when technological innovation is aligned with institutional values and pedagogical purposes [11], [15], [29].

3.2 Learning Digitalization without Replacing Teacher–Student Relations

At Pesantren Tahfidh Yanbu'ul Quran 5 Tegal, technology is used to monitor memorization progress, distribute learning information, and provide controlled access to Qur'anic applications, Maktabah Syamilah, and digital jurisprudence references. Monitoring applications help teachers and parents view memorization progress in a more structured manner. Nevertheless, memorization submission continues through *musyafahah* because accurate recitation, etiquette, and the transmission of knowledge require direct interaction. Evidence from pesantren studies similarly indicates that digital tools can complement Qur'anic learning while preserving face-to-face transmission [30], [31].

At Pesantren Al-Mubarak Al-Arbain Demak, technology is used for digital modules, assignment distribution, learning communication, Arabic dictionaries, and grammatical references. The emerging arrangement resembles blended learning because *halaqah* meetings remain central while digital media function as enrichment. This supports the view that educational technology is most effective when integrated into learning design rather than positioned as a substitute for pedagogical relationships [10], [19], [32].

Questionnaire responses indicate that students perceive digital resources as making material searches easier and reference access faster. Interviews, however, reveal concerns about instant-answer habits and reduced persistence in reading primary sources. The caregivers address these concerns through application curation, usage-time limits, and direct mentoring. Research on digital competence likewise emphasizes that technical skills need to be accompanied by critical, ethical, and pedagogical competence [33]–[35].

Table 1. Questionnaire results

Item	Agree/Strongly Agree (%)	Mean (1–5)
Digital resources make searching easier	83%	4.2
Digital tools reduce persistence in reading	41%	3.1
Digital services improve communication with teachers	72%	3.9
Digital monitoring helps parents	68%	3.8

3.3 Digitalization of Administrative Governance

The most visible changes occurred in administration. Both pesantren use technology for student registration, attendance recording, data management, payments, progress reporting, communication, libraries, and institutional publication. The specific implementation differs according to system capacity and institutional needs. Table 1 summarizes the cross-case comparison.

Table 2. Comparison of digital governance implementation

Governance dimension	Pesantren YQ 5 Tegal	Pesantren Al-Mubarak Al-Arbain Demak
Student information system	Mobile-based management application	Integrated web-based platform
New student registration	Digital forms and online verification	Integrated online registration
Attendance	Digital attendance through an application	Digital attendance integrated with the system
Financial administration	Bank transfers and digital reports	Digital payments and real-time reporting
Progress reporting	Periodic reports through parent accounts	Integrated reports accessible to parents
Communication	Instant messaging groups and official application	Integrated communication platform
Library	Physical collection and Maktabah Syamilah	Integrated digital library
Internet control	Content filtering and time settings	Content filtering and digital-literacy education
Institutional media	Instagram and YouTube	YouTube, Instagram, and da'wah media

Source: Primary research data, 2025–2026.

Digitalization reduces repeated recording and accelerates data retrieval. Managers reported that student records, payments, and progress reports are easier to locate than when documents were dispersed across books or separate files. This is consistent with studies reporting improvements in administrative efficiency, information access, and financial processes following digitalization in educational institutions and pesantren [7], [20], [21], [36]. In financial administration, technology diversifies payment methods and facilitates reconciliation. Nevertheless, digital systems do not automatically produce optimal governance. Clear authority, transaction validation, data backup, security procedures, and periodic evaluation remain necessary [22], [37].

3.4 Institutional Communication, Transparency, and Public Trust

Digital transformation shortens communication distances between pesantren and parents. Attendance, memorization or academic progress, activity information, and payment status can be communicated more quickly. For parents living outside the local area, such access reduces dependence on oral reports and increases their involvement in monitoring their children's education. Studies of pesantren communication and digital literacy similarly show that digital media can strengthen community connectivity when its use is intentionally managed [23], [24], [38].

Social media also serves as a space for documentation, religious propagation, and reputation building. Both pesantren publish activities and educational content through digital channels, allowing the public to learn about institutional programs before deciding to enroll. Such communication extends institutional reach but requires message management, data protection, and consistency of institutional identity. Transparency can strengthen public trust, but transparency does not mean that every piece of information should be publicly available. Financial information, student progress, activity photographs, and personal

identities should be differentiated according to access levels. Digital transformation therefore requires mature data governance rather than simply increasing publication.

Table 3. Joint Display of Mixed-Method Integration

Theme	Qualitative Evidence	Quantitative Evidence	Integration
Efficiency	"Reports are easier to locate" (M1)	78% of students agree	Both show improved efficiency
Teacher–student relation	"Musyafahah cannot be replaced" (T2)	65% of students prefer face-to-face	Tradition remains central
Transparency	"I can monitor my child's progress" (P1)	68% of parents report benefit	Trust supported by both
Risks	"Students become dependent on instant answers" (T4)	41% agree tools reduce persistence	Risks confirmed

3.5 Effects on Efficiency, Learning, and Institutional Identity

Integrated data and communication improve efficiency in processes that previously required repeated recording. Managers can obtain information more quickly, correct errors, and prepare reports more systematically. Questionnaire findings support the interview evidence that digital services are perceived to facilitate information access and reduce waiting time. These findings are consistent with broader research showing that digital transformation can improve institutional operations when supported by adequate infrastructure, competence, leadership, and organizational culture [13], [14], [28].

In learning, the most significant effect of digitalization is not the replacement of traditional methods but the expansion of resources and flexibility of access. Students can search for *kitab*, terminology, or supporting materials more conveniently. Teachers nevertheless remain important for verifying sources and preventing misunderstanding. This integration demonstrates that tradition and technological progress can coexist rather than function as mutually exclusive choices. Curriculum and pesantren methods can preserve core values while using technology as a supporting instrument [10], [30], [31].

A key finding is that technology does not automatically weaken pesantren identity. The threat emerges when technology decisions are separated from values, supervision, and educational purposes. In both cases, institutional identity functions as a selection mechanism: *musyafahah*, *bandongan*, *sorogan*, character development, and teacher authority are retained, while technology is directed toward functions requiring efficiency and broader access. This finding is also compatible with research emphasizing organizational culture, leadership, and value alignment as central to sustainable digital transformation [6], [28], [39].

3.6 Implementation Challenges

First, digital literacy among human resources is uneven. Some managers and teachers can use applications for basic tasks but have limited understanding of data security, system maintenance, and analytics. Resistance can also emerge when technology is perceived as increasing workload or reducing authority. Training should therefore be task-based, gradual, and accompanied by mentoring. Systematic reviews of teacher digital competence likewise

identify competence development as a continuing requirement of educational digitalization [33]–[35].

Second, infrastructure and maintenance costs remain constraints. Devices, connectivity, licenses, technical support, security, and backup require sustained funding. Systems developed without maintenance planning may become ineffective when personnel change. Research on educational digital transformation similarly identifies infrastructure, organizational support, resources, and change readiness as important conditions for sustainability [5], [40].

Third, open internet access increases risks of inappropriate content, distraction, privacy violations, and dependence on commercial applications. The two pesantren address these risks through content filtering, time limits, application curation, and mentoring. Technical controls, however, need to be supported by ethical literacy so that students can make responsible decisions outside institutional supervision [12], [17], [24].

Fourth, system integration is not yet fully mature. Some functions continue to operate through separate applications, requiring manual data transfer. This can produce duplication, inconsistent data versions, and dependence on particular individuals. The next development priority should therefore not be the addition of as many applications as possible, but simplification of system architecture, clear data ownership, and continuity procedures [13], [36].

3.7 Adaptive-Conservative Model for Digital Transformation in Pesantren

Based on the cross-case synthesis, this study formulates the Adaptive-Conservative Model for Digital Transformation in Pesantren (ACMDTP). The term adaptive refers to openness toward technologies that can improve quality and efficiency. Conservative does not mean rejecting change; rather, it refers to deliberate protection of core values, relevant educational methods, and forms of educational authority that cannot be delegated to machines. This orientation is consistent with current scholarship emphasizing that digital transformation is a socio-organizational process involving culture, leadership, learning, and governance [5], [6], [28], [39].

The model consists of four pillars. First, the value foundation uses pesantren values as criteria for accepting, modifying, or rejecting technology. Second, governance transformation emphasizes information systems, finance, attendance, reporting, and communication to strengthen accountability. Third, learning innovation uses digital media and resources to enrich learning without replacing teacher–student interaction. Fourth, ecosystem strengthening uses technology to reinforce relationships with parents, alumni, communities, and religious-education networks. Similar multi-dimensional approaches to educational digital transformation stress that technology should be integrated with institutional strategy, competence, and stakeholder engagement rather than treated as an isolated technical intervention [3], [5], [13].

The four pillars operate through a cycle of needs assessment, value-based selection, limited pilot testing, competence development, implementation, risk monitoring, and evaluation. The model differs from device-oriented technology adoption because educational goals and governance are placed at the starting point. Accordingly, ACMDTP

can serve as an evaluation framework for other pesantren, but its indicators and technological intensity should be adjusted to each institution's capacity, size, culture, and needs.

Finally, the findings indicate that parents, students, teachers, managers, and institutional leaders should be treated as participants in digital transformation rather than passive recipients. Their different experiences reveal different risks and benefits. Students value speed and access, parents value transparency and monitoring, managers value efficiency, and teachers emphasize educational quality and authority. A governance model that brings these perspectives into needs assessment, pilot testing, evaluation, and revision is more likely to produce systems that are both usable and institutionally legitimate. This stakeholder-oriented approach strengthens the four pillars of the proposed model and provides a practical pathway for scaling digital transformation while preserving the distinctive educational identity of pesantren.

The model proposed in this study also has implications for institutional leadership. Leaders and caregivers are not merely technology users; they act as gatekeepers who translate institutional values into decisions about technology. Their role is particularly important in balancing innovation with continuity. Rather than positioning traditional and digital education as competing systems, leaders can define complementary functions: digital tools can support documentation, communication, resource access, monitoring, and administrative efficiency, while teachers retain responsibility for interpretation, ethical guidance, verification, and relational formation. This complementary arrangement can help reduce resistance because technology is presented as a means of strengthening institutional purposes rather than replacing established roles.

From a governance perspective, the findings suggest three practical priorities. First, pesantren should establish a value-based technology selection process before purchasing or developing systems. Each proposed technology should be assessed in terms of educational benefit, consistency with institutional values, privacy implications, cost, and sustainability. Second, digital governance should clarify responsibility for data, access rights, validation, backup, security, and continuity. Third, digital competence development should be embedded in routine work rather than treated as a one-time training activity. These priorities address the recurrent challenges identified by the participants and are supported by evidence on digital competence and organizational change [33]–[35], [39], [40].

The two cases also show that technological maturity should not be measured simply by the number of applications in use. A more meaningful measure is the extent to which digital systems are integrated with institutional goals, procedures, human competencies, and risk controls. A pesantren with fewer applications but clearer data ownership, better user support, and stronger alignment with educational values may achieve more sustainable transformation than an institution with many disconnected platforms. This interpretation is consistent with research describing digital transformation as a holistic organizational process rather than a sequence of isolated technology projects [4], [5], [13].

The cross-case comparison indicates that the central issue in pesantren digital transformation is not whether technology should be adopted, but how institutional leaders determine where technology adds value and where direct educational interaction must remain dominant. Both institutions demonstrate that digitalization can be selective and

layered. Administrative functions are more readily digitized because they benefit from standardized data, faster retrieval, and traceable transactions. Learning functions are digitized more cautiously because knowledge transmission, recitation accuracy, teacher authority, and character formation involve relational dimensions that are difficult to reproduce through software alone.

4. CONCLUSION

Pesantren Tahfidh Yanbu'ul Quran 5 Tegal and Pesantren Al-Mubarak Al-Arbain Demak respond to digital transformation through an adaptive-selective approach. Technology is applied to administration, learning, and communication after consideration of institutional values, benefits, and risks. This approach improves record-keeping efficiency, access to learning resources, service transparency, communication with parents, and public trust without eliminating musyafahah, bandongan, sorogan, or character formation.

The main challenges are unequal digital literacy, infrastructure limitations, maintenance costs, system integration, data security, and exposure to inappropriate content. The findings indicate that the success of digital transformation in pesantren depends more on governance of change than on the number of devices or applications. The Adaptive-Conservative Model for Digital Transformation in Pesantren is proposed as a conceptual framework comprising four pillars: value foundations, governance transformation, learning innovation, and ecosystem strengthening. However, this model is context-specific, developed from two institutional cases, and requires broader empirical testing before wider application.

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