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Pesantren Sustainability in the Digital Era: Governance, Educational Innovation, and Social Transformation

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ABSTRACT

Pesantren (Islamic boarding schools) are among Indonesia's oldest educational institutions, yet digitalization is reshaping how they teach, govern, and engage with society. This article examines how pesantren can remain sustainable in the digital era by connecting three dimensions: governance, educational innovation, and social transformation. Using a qualitative literature-based design, it synthesizes peer-reviewed studies, scholarly books, and policy documents through reflexive thematic analysis. Four findings emerge. First, sustainability depends on hybrid governance in which kyai authority is complemented by formal digital policies, data systems, and learning mechanisms. Second, educational innovation endures when digital tools are embedded in, rather than substituted for, classical practices such as sorogan and bandongan. Third, digital media redistribute religious authority while creating new forms of social capital, economic opportunity, and risk. Fourth, unequal infrastructure and human capacity can widen disparities among pesantren. The article proposes the Selective Integration and Institutional Resilience (SIIR) framework and four propositions to guide future empirical research, institutional practice, and pesantren policy.

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1. INTRODUCTION

Pesantren are residential Islamic educational institutions in which students (*santri*) study classical Islamic texts under the guidance of a *kyai* and a team of teachers. They are widely regarded as one of the oldest and most distinctive educational traditions in Indonesia [1], [2]. Their institutional footprint remains substantial: the Ministry of Religious Affairs reported more than 42,000 registered *pesantren* in 2025 [3]. Beyond schooling, *pesantren* perform religious, social, and civic roles that the 2019 Law on *Pesantren* recognizes formally as the functions of education, *da'wah*, and community empowerment [4]. Scholars have long shown that *pesantren* combine continuity of tradition with a capacity for change, from the adoption of classroom systems and national curricula to engagement with civil society [5]–[7].

Institutional recognition has recently deepened. In 2026, a presidential regulation establishing a Directorate General of *Pesantren* within the Ministry of Religious Affairs was signed, and the first Director General had been inaugurated by September of that year [8], [9]. Officials have already emphasized planning that is based on function, output, and single-source data [9]. This development heightens the importance of sound governance, as *pesantren* are now expected to plan, report, and improve within a more clearly articulated national framework.

At the same time, digital technology is changing how knowledge is accessed, how institutions are managed, and how religious authority is negotiated. The shift to emergency remote teaching during the COVID-19 pandemic exposed many institutions to online delivery without the design and preparation that characterize deliberate online learning [10]. Research on digital transformation in organizations treats it as more than the installation of tools, because it involves strategic responses and organizational change [11], [12]. A growing body of *pesantren* research converges on this view. It demonstrates that technology adoption depends on leadership, infrastructure, and human

resource capacity rather than on devices alone, and that organizational readiness, leadership capacity, digital literacy, and resistance to change are recurring challenges [13]–[16].

Notwithstanding this growth, the literature remains fragmented. Studies tend to examine isolated aspects such as digital literacy, online learning, administrative systems, or technology acceptance, with limited integration into a comprehensive framework [13]. Systematic reviews have begun to map *pesantren* learning models and the idea of the digital *pesantren* [17], [18], but sustainability, understood as the long-term capacity of an institution to preserve its mission and legitimacy while adapting, is seldom theorized across governance, pedagogy, and social roles at once. Moreover, a large share of the available evidence comes from qualitative case studies of one or a few institutions [13], [19], [20], which constrains cross-case comparison.

This article adopts a broad understanding of sustainability. Following the general principle of meeting present needs without compromising the capacity of future generations [21], and the view that sustainable leadership in education means improvement that lasts, spreads, and does not damage people or surroundings [22], *pesantren* sustainability is defined here as an institution's ability to maintain its religious mission, educational quality, and social legitimacy over time while adapting to technological and policy change.

The study is guided by three research questions. **RQ1:** How do governance arrangements shape the capacity of *pesantren* to manage digital change? **RQ2:** How can digital innovation be integrated into *pesantren* education without eroding its pedagogical and spiritual foundations? **RQ3:** How is digitalization reconfiguring the social roles, religious authority, and community ties of *pesantren*? This article makes three contributions. It synthesizes recent Indonesian scholarship with foundational theory, bridges three dimensions that are usually studied in isolation, and proposes the Selective Integration and Institutional Resilience (SIIR) framework, together with propositions that can be tested in future empirical research.

2. THEORETICAL BASIS

2.1. Sustainability as institutional resilience

Sustainability in education is often discussed in environmental terms, but its core logic is temporal: an institution is sustainable when it can carry its purposes into the future without exhausting the human, moral, and material resources on which it depends [21], [22]. Applied to *pesantren*, this logic raises two linked questions: what must be preserved, and what may change? Institutional theory suggests that organizations survive by earning legitimacy from their environments, and that coercive, mimetic, and normative pressures push them toward similar structures [23]. For *pesantren*, such pressures now include state recognition and funding rules, public expectations of digital competence, and the example of other institutions. Research on educational change adds that reforms rarely fail for lack of ideas; they fail when the capacity, time, and support needed for implementation are missing [24].

Sustainability is therefore treated here as institutional resilience, that is, the combination of a stable identity anchor and an adaptive capacity built through governance, learning, and relationships. Collaborative governance, defined as arrangements in which public agencies and non-state stakeholders deliberate together in consensus-oriented decision making [25], offers a useful lens for the relationships among *pesantren*, the state, universities, communities, and technology providers.

2.2. Technology acceptance and pedagogical integration

The effective use of digital tools depends on more than their availability. The technology acceptance model explains use through perceived usefulness and ease of use [26], and the unified theory of acceptance adds social influence and facilitating conditions such as infrastructure and support [27]. Diffusion research shows that innovations spread through communication channels and social systems, with early adopters and peer demonstration playing important roles [28]. At the level of teaching, the TPACK framework holds that effective technology integration arises from the interaction of technological, pedagogical, and content knowledge rather than from technical skill alone [29]. Blended learning, which combines face-to-face and computer-mediated instruction [30], and the Community of Inquiry model, which distinguishes social, cognitive, and teaching presence [31], provide design vocabularies that can be adapted to *pesantren*. Educator competence can be described through frameworks such as DigCompEdu [32]. Finally, the digital divide literature cautions that unequal access to devices is only the first layer of inequality; differences in skills, patterns of use, and social support follow [33], [34].

2.3. Religious authority, social capital, and digital media

Studies of new media in Muslim societies show that digital communication widens the public sphere and multiplies the voices that can speak about religion, which complicates the position of traditional authorities [35]. Research on cyber-Islamic environments likewise describes how websites, social media, and search engines reshape the ways in which religious knowledge is produced, validated, and consumed [36], [37]. For *pesantren*, whose authority has rested on personal transmission, scholarly lineage, and exemplary conduct [1], [2], these changes are both a challenge and an opportunity. Social capital theory helps explain what *pesantren* can mobilize in response. Bourdieu treats social capital as resources linked to durable networks of relationships [38], while Putnam distinguishes bonding ties within groups from bridging ties across groups [39]. A case study of Buntet *pesantren*, for example, examined how the social capital of *santri* helps them face the effects of globalization [20].

3. METHODS

3.1. Research design

This study uses a qualitative, literature-based design. Library research of this kind treats texts as the primary data and aims at interpretation and conceptual development rather than statistical generalization [40]. The design follows the logic of a narrative or integrative review, which is appropriate when a topic is conceptually broad, studied across disciplines, and in need of synthesis and theory building rather than a count of effects [41]. Reporting is guided by the transparency principles of the PRISMA 2020 statement, namely explicit questions, stated eligibility criteria, and a documented process, although the study does not claim to be an exhaustive systematic review [42].

3.2. Sources and selection criteria

Sources were identified through keyword searches in open-access scholarly indexes and journal websites, supplemented by backward citation tracking from recent studies. Search terms combined *pesantren* or Islamic boarding school with digital transformation, technology adoption, digital literacy, *kyai* leadership, governance, blended learning, religious authority, social capital, and community empowerment, in English and Indonesian. Sources were retained when they (i) concerned *pesantren* or closely related Islamic educational institutions, or provided a foundational theory directly relevant to the three dimensions; (ii) were peer-reviewed articles, scholarly books or chapters, official regulations, or reputable news reports of policy developments; and (iii) were available in English or Indonesian. Sources presenting opinion without a described method or supporting evidence were excluded. Priority was given to studies published between 2023 and 2026 for empirical evidence on digitalization, and to foundational works for theory and historical context. Policy developments reported up to September 2026 were drawn from official regulations and news reports.

3.3. Analytical procedure and trustworthiness

Each source was read closely and coded using a combined inductive and deductive approach. Following the six phases of reflexive thematic analysis, namely familiarization, coding, generating initial themes, reviewing themes, defining themes, and writing up [43], codes were organized under three sensitizing dimensions derived from the research questions: governance, educational innovation, and social transformation. Table 1 summarizes the analytical framework. Themes were then compared across sources to identify convergence, tension, and gaps, and propositions were derived from the resulting patterns.

Table 1. Analytical framework used to synthesize the literature

Dimension	Analytical focus	Key concepts	Guiding literature
Governance	How authority, policy, data, and partnerships enable or constrain digital change	Hybrid authority; digital governance units; accountability; collaborative governance	[13], [23], [25], [44]
Educational innovation	How digital tools are integrated into classical pedagogy and supported by capacity	Selective integration; TPACK; blended learning; technology acceptance; digital divide	[26], [27], [29], [30]
Social transformation	How digitalization changes religious authority, community ties, and public roles	Religious authority; social capital; *da'wah*; empowerment	[35], [37]–[39]

Trustworthiness was supported through credibility, dependability, and confirmability strategies [45]. These included triangulating across source types (empirical studies, theory, and policy documents), keeping an audit trail of coding decisions, and distinguishing explicitly between findings reported in the sources and interpretations made by the author. The main limitations are that no primary data were collected, that selection was purposive rather than exhaustive, and that published case studies may over-represent successful or well-resourced institutions.

4. RESULTS AND DISCUSSION

The synthesis produced three interrelated themes that correspond to the research questions. First, governance is shifting from charismatic to hybrid authority. Second, educational innovation is most credible when it takes the form of selective integration rather than substitution. Third, digitalization is transforming the social roles of *pesantren* by changing religious authority, social capital, and exposure to risk. A cross-cutting condition, unequal capacity, shapes all three. The themes are discussed in turn and then integrated in the SIIR framework (Figure 1).

4.1. Governance: from charismatic to hybrid authority

4.1.1. *Kyai* leadership and institutional continuity

Classic studies portray the *kyai* as founder, teacher, and moral exemplar whose personal authority holds the institution together [1]. This concentration of legitimacy has been a major source of continuity, and it remains important in the digital era. Recent studies describe *kyai* who combine visionary, transformational, or value-based leadership with managerial and pedagogical innovation, including in institutions known for preserving classical traditions [46]–[49], and comparative research has examined how moral leadership is developed in *pesantren* [50].

In a multi-site study of six *pesantren* in Jambi, successful digital transformation was attributed less to the extent of technology adoption than to leaders' ability to align innovation with governance, discipline, and Islamic identity [13]. This is consistent with research on school leadership, which finds that leaders exert influence mainly by setting direction, developing people, and redesigning organizations [44].

This concentration of authority also entails a continuity risk. When digital policy rests on the personal disposition of one leader, it can stall if the leader is hesitant and can be reversed after a leadership transition. Frameworks of sustainable leadership stress that lasting improvement must be distributed and embedded so that it can outlive individual leaders [22]. This vulnerability is an inference from the leadership literature rather than a finding measured in the *pesantren* studies reviewed here, and it deserves empirical testing. The implication is that *kyai* authority is best understood as the foundation of legitimacy on which formal structures are built, not as a substitute for them.

4.1.2. Formal digital governance, data, and accountability

Evidence from several studies indicates that *pesantren* that manage digitalization well do so through explicit structures. In the Jambi study, institutions established dedicated edutech teams to supervise devices and provide technical assistance, built their own connectivity infrastructure, scheduled digital learning through computer laboratories while restricting personal smartphones, and digitalized assessment and reporting [13]. Studies of administrative and financial digitalization similarly emphasize the formulation, implementation, and evaluation of systems rather than the mere acquisition of software [15], [51]. Research on quality assurance in *pesantren* stresses modernization and adaptability alongside integration into the national education system [52]. Taken together, these studies indicate that sustainability is reinforced when digital use is governed by written rules, assigned responsibilities, and routines for review.

External governance is also changing quickly. Law No. 18 of 2019 gave *pesantren* formal recognition and defined their functions of education, *da'wah*, and community empowerment [4]. The establishment of a Directorate General of *Pesantren* in 2026 [8], [9] brings opportunities such as clearer budgets and policy attention, as well as obligations such as reporting and standards. Institutional theory warns that such coercive pressures can generate compliance-driven digitalization, in which systems are adopted to satisfy external expectations without changing internal practice [23]. *Pesantren* leaders in Jambi did report that mandated computer-based assessments acted as a catalyst for investment in digital infrastructure [13]. The governance challenge is therefore to translate external requirements into internal learning.

Organizational research indicates that digital transformation capabilities foster organizational commitment when they are supported by digital leadership and a continuous learning environment [53], and an application of the learning-organization model to *pesantren* likewise frames institutional improvement as collective learning [54]. Because few *pesantren* can build connectivity, content, and training alone, collaborative arrangements with government agencies, universities, communities, and technology providers are important [25]. Such arrangements should be designed so that partners support, rather than dictate, the educational philosophy of the *pesantren*. Finally, digitalization generates data about students, finances, and teaching that must be protected; the reviewed studies pay limited attention to data-protection arrangements, which is a gap for future research.

4.2. Educational innovation: selective integration

4.2.1. Embedding digital tools in classical pedagogy

A recurrent finding is that *pesantren* adopt technology selectively rather than wholesale. In the Jambi study, stakeholders saw technology as a complement to, not a replacement for, the educational and spiritual values of *pesantren*; classical methods such as *sorogan* and *bandongan* remained foundational, and leaders argued that *barakah* is transmitted through direct guidance and exemplary conduct, which technology cannot replace [13]. A systematic literature network analysis of *pesantren* learning models, titled "from *sorogan* to digital learning," maps the movement from classical to digitally supported models [17]. A phenomenological study in Semarang reported that information technology contributed positively to Islamic religious education, but that implementation was constrained by infrastructure limits, shifts in traditional *pesantren* culture, and the need for curriculum adjustment [19].

Several documented examples illustrate how selective integration operates in practice. Digital libraries of classical texts can support Islamic learning and moderation in *pesantren* [55]. Creating digital content has been proposed as a way to strengthen the digital literacy of *santri* while enriching Islamic learning [56]. Students in the Jambi study reported that videos, podcasts, and presentations made learning more engaging, although access to computer laboratories only once a week hindered continuity [13]. Table 2 synthesizes how digital augmentation can be paired with safeguards for each major learning practice.

Table 2. Selective integration of digital tools in *pesantren* learning practices (synthesis of the reviewed studies)

Learning practice	Digital augmentation	Safeguard for pedagogical identity	Supporting sources
Sorogan (individual reading and correction with the teacher)	Digital libraries of classical texts; recorded explanations for revision	Reading and correction in the teacher's presence remain the core act of transmission	[13], [17], [55]
Bandongan (group lecture)	Recorded lectures, shared slides, and learning platforms for review	Live attendance, collective discipline, and the teacher's exemplary conduct are retained	[13], [19]
Memorization and recitation	Audio models and practice applications	Teacher verification of recitation; progress is judged by the teacher, not by the application	Author's synthesis
Assessment and reporting	Computer-based tests and digital report systems that reduce administrative work	Human judgment of character and moral conduct is kept alongside digital scores	[13]
Character formation and media ethics	Creative content production and structured instruction in online conduct	Scheduled, supervised access and the teacher's example guide use	[13], [56]

Theoretically, these patterns can be read through TPACK. In *pesantren*, the content is often a classical text whose meaning is mediated by a teacher's authorized reading, and the pedagogy relies on oral transmission and personal correction, so technological choices must be made in relation to both [29]. Blended learning designs that deliberately keep the core act of transmission face to face and use digital media for preparation, review, and access are consistent with this view [30]. The Community of Inquiry model suggests a further interpretive extension: besides social, cognitive, and teaching presence [31], *pesantren* learning appears to rely on a moral-spiritual presence embodied in the *kyai*'s exemplary conduct, which online media reproduce poorly. This idea is an interpretation by the author and requires empirical validation.

Research on educational change cautions that implementation takes time and sustained support, and that change is a process rather than an event [24]. For *pesantren*, this implies phased adoption with clear pilot and review points, rather than rapid, system-wide introduction.

4.2.2. Capacity, literacy, and equity

Technology acceptance in *pesantren* is shaped by policy support, infrastructure readiness, and human resource capacity [13]. This mirrors the facilitating conditions and social influence emphasized in acceptance theory [27] and the perceived usefulness and ease of use emphasized in earlier models [26]. In the Jambi study, unstable internet and power outages disrupted online learning and examinations, older teachers needed more time to become familiar with applications, and internal workshops and peer mentoring raised confidence [13]. Studies of digital literacy in *pesantren* treat literacy as an object of strategic management rather than a one-off training [16], and the digital literacy gap among *santri* has been linked to socio-economic factors [56].

Frameworks of educator competence, such as DigCompEdu, which spans professional engagement, digital resources, teaching and learning, assessment, learner empowerment, and the facilitation of learners' digital competence [32], could be adapted to *pesantren* by adding competences related to *adab*, media ethics, and the protection of *santri* online.

Equity warrants particular attention. The digital divide literature distinguishes inequalities of material access, skills, and use [33], and argues that meaningful inclusion also requires content, literacy, and community and institutional support [34]. The six *pesantren* in the Jambi study differed markedly in readiness: better-resourced institutions implemented digital learning, attendance systems, and online administration more effectively than remote ones [13]. Without targeted support, digitalization may therefore deepen existing gaps between well-resourced and remote *pesantren*. Diffusion theory suggests that peer networks and demonstration effects help innovations travel [28], so inter-*pesantren* mentoring, shared platforms, and associations could serve as channels for capacity sharing. The pandemic experience adds a design lesson: emergency remote teaching differs from planned online learning, and judging digital education by crisis improvisation understates what well-designed approaches can offer [10].

4.3. Social transformation: authority, capital, and risk

4.3.1. Religious authority and *da'wah* in the digital public sphere

Digitalization alters who is able to speak with religious authority. New media widen the public sphere and multiply voices [35], and cyber-Islamic environments reshape how religious knowledge is produced and validated [37]. *Pesantren* therefore compete for attention with online preachers, short-video content, and search engines. Their distinctive assets are scholarly lineage, face-to-face mentoring, and *adab*, which differentiate authorized learning from the consumption of fragmented content [1], [2]. A digital strategy that foregrounds these assets, for example by publishing authorized readings, recorded lectures, and explanations linked to named teachers, can extend *da'wah* while reinforcing rather than diluting authority.

Digital media are also arenas of ideological contestation. *Pesantren* are diverse, ranging from traditionalist to Islamist orientations [57], and Muslim schools in Indonesia operate amid pressures of religious conservatism [58]. A digital library built to promote Islamic moderation illustrates how technology can serve a particular pedagogical

and ideological purpose [55]. Concerns have also been raised that unrestricted access may expose students to misinformation, cyber addiction, and moral degradation [13]. These concerns explain why many *pesantren* regulate device use, but regulation alone is insufficient; digital literacy, understood as a combination of technical competence, ethics, and character formation, becomes part of *pesantren* education itself [56].

4.3.2. Social capital, community engagement, and economic empowerment

Pesantren constitute dense social networks linking *santri*, alumni, families, and surrounding communities. The Buntet case study shows how *santri* social capital supports engagement with globalization [20]. In Bourdieu's terms, such networks are a form of capital that can be converted into educational, economic, and symbolic benefits [38]. In Putnam's terms, digital platforms can strengthen bonding ties among alumni and families and create bridging ties to universities, employers, and civic organizations [39]. These are interpretations of the theoretical frameworks rather than findings reported in the reviewed *pesantren* studies, but they point to a plausible mechanism through which digitalization could expand the social base of *pesantren*.

Community participation is a long-standing resource. Research on Islamic schooling in Indonesia has linked community participation to democratizing effects [59], and *pesantren* have been analyzed as actors within civil society [6], [7]. Digital administrative and financial systems can improve efficiency, transparency, and accountability [13], [51], which supports public trust at a time when the Law on *Pesantren* recognizes community empowerment as a core function [4]. Research on women in traditional Islamic educational institutions shows how women negotiate public spaces within and beyond *pesantren* [60]; digital media may extend these negotiations, although empirical evidence on this point remains limited.

4.4. An integrative framework: selective integration and institutional resilience

Integrating the three themes yields the SIIR framework (Figure 1). Its central premise is that sustainability is not achieved by maximizing digitalization but by aligning it with an identity anchor. The anchor consists of the *kyai–santri* relationship, *adab*, scholarly lineage, classical texts, and *barakah* as understood within *pesantren* tradition. Governance, educational innovation, and social transformation operate as three mutually reinforcing subsystems around this anchor. Governance provides rules, data, and learning mechanisms; innovation provides pedagogical tools and capacity; and social transformation provides legitimacy, networks, and public roles. Feedback through monitoring, evaluation, and organizational learning links the subsystems, and the external environment of regulation, funding, technology, and public expectations conditions all of them. The expected outcome is institutional resilience, understood as legitimacy, quality, and relevance sustained over time.

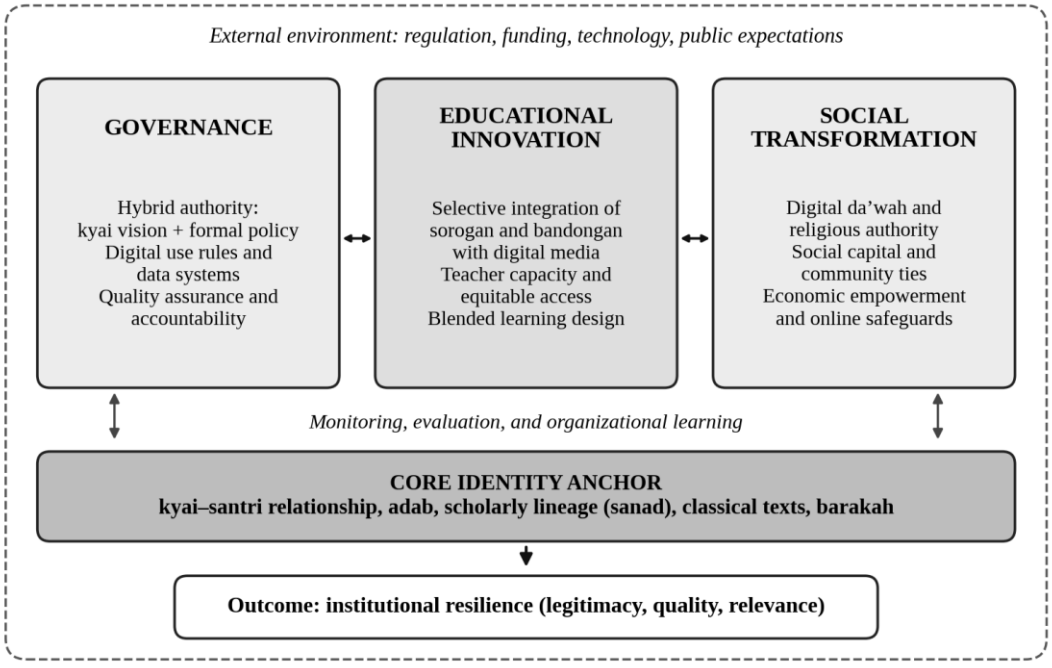

Figure 1. The Selective Integration and Institutional Resilience (SIIR) framework

SIIR is related to, but differs from, the strategic digital governance cycle proposed for *pesantren* in [13], which centers on leadership vision, policy, infrastructure, implementation, monitoring, and evaluation. SIIR retains the governance logic but adds educational and social dimensions and makes the identity anchor explicit as the criterion against which digital change is judged. Four propositions follow from the synthesis and can guide future empirical work.

P1 (Governance). *Pesantren* that combine *kyai* authority with formal digital policies, assigned responsibilities, and review routines will sustain digital initiatives across leadership transitions better than those that rely on personal authority alone.

P2 (Innovation). Digital tools embedded in classical practices with explicit safeguards will be adopted more durably, and perceived as less threatening to identity, than tools introduced as substitutes.

P3 (Social transformation). *Pesantren* that produce and curate authorized digital religious content and invest in digital ethics will strengthen legitimacy and social capital, whereas passive exposure to digital media will increase risk.

P4 (Equity). Infrastructure and human capacity moderate P1 to P3; without targeted support, digitalization will widen disparities among *pesantren*.

4.5. Implications and limitations

For *pesantren* leaders, the synthesis suggests establishing a digital governance team with a clear mandate; adopting written policies on device use, content, and data; sequencing adoption in phases with pilot and review points; investing in peer mentoring and teacher competence; and stating publicly which practices will not be digitized and why. For policymakers, including the new Directorate General of *Pesantren*, priorities include connectivity and electricity in remote *pesantren*, funding for capacity building and not only for hardware, quality assurance that respects *pesantren* diversity [52], reliable single-source data, and collaborative partnerships with universities and communities [25]. For researchers, longitudinal and comparative designs, mixed-methods studies, and measures of institutional resilience are needed to test the propositions.

Several limitations should be acknowledged. The study relies on published sources and no primary data were collected. Source selection was purposive, so relevant studies may have been missed. Many of the available studies are qualitative case studies of one or a few institutions, which limits generalization, and published cases may over-represent successful or better-resourced *pesantren*. Several empirical claims also rest heavily on one multi-site study [13], so the synthesis may inherit its context and emphases; corroboration from additional studies is needed. SIIR is a theoretically derived framework that has not yet been tested empirically. Finally, the policy developments discussed are recent and were drawn partly from news reports; details may therefore change as implementing regulations are issued.

5. CONCLUSION

This article asked how *pesantren* can remain sustainable in the digital era. In answer to the first question, governance matters most when *kyai* authority is complemented by formal digital policies, structures, data, and learning mechanisms, so that innovation does not depend on a single leader. In answer to the second, educational innovation is most durable when digital tools are embedded in classical pedagogy through selective integration, with safeguards that protect the core acts of transmission and the moral-spiritual relationship between teacher and student. In answer to the third, digitalization reconfigures religious authority, social capital, and community roles, offering opportunities for *da'wah*, networks, and empowerment while introducing risks that call for digital ethics and literacy. Across all three, unequal infrastructure and capacity remain a decisive condition.

The SIIR framework and its four propositions integrate these findings and offer a basis for future research and practice. Future studies should test the propositions through comparative multi-site, longitudinal, and mixed-methods designs, develop indicators of institutional resilience, and examine under-studied topics such as data protection, the participation of women in digital *pesantren*, and the effects of the new national governance structure for *pesantren*.

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