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Digital Islamic Literacy and Self-efficacy in Shaping Santri Religious Behavior: Mediating Attitudes Toward Technology and Moderating Pesantren Culture

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Abstract

Digital transformation in pesantren education presents challenges in integrating technology use with the development of santri religious behavior, particularly in ensuring alignment with Islamic values and pesantren culture. This study examines the effects of Islamic digital literacy and digital self-efficacy on santri religious behavior, considering attitudes toward technology as a mediating variable and pesantren culture as a moderating variable. A quantitative approach was employed through a survey involving 200 Madrasah Aliyah students residing in traditional and modern pesantren in Kudus Regency, Central Java, Indonesia. Respondents were selected using proportionate stratified random sampling based on grade levels (X, XI, and XII) within each madrasah, with random selection following proportional allocation. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. The findings reveal that Islamic digital literacy and digital self-efficacy have positive and significant effects on santri religious behavior. Both variables also significantly influence attitudes toward technology, which mediate the relationships between digital competencies and religious behavior. Furthermore, pesantren culture strengthens the relationship between attitudes toward technology and santri religious behavior. These findings indicate that religious behavior in digitally evolving educational environments depends not only on individual digital competencies but also on positive attitudes toward technology and institutional cultural values. The study concludes that managing digital transformation in Islamic education requires integrating digital competency development, positive technological attitudes, and the preservation of pesantren culture. Accordingly, pesantren administrators are encouraged to implement Islamic value-based digital literacy programs supported by institutional guidance and cultural reinforcement.

Keywords: Attitudes Toward Technology; Digital Self-efficacy; Islamic Digital Literacy; Pesantren Culture; Santri Religious Behavior

INTRODUCTION

The rapid expansion of digital technology has fundamentally reshaped educational governance, learning practices, and value transmission within Islamic educational institutions (Digital & Pesantren, 2024; Shofwani et al., 2025). In pesantren-based education, digital platforms have shifted from peripheral tools to central instruments for religious learning, communication, and behavioral socialization among santri (Nasir et al., 2024; Suresman et al., 2025). Empirical evidence indicates that Muslim students increasingly rely on digital media for accessing religious knowledge, participating in online da'wah, and negotiating religious authority (Campbell & Evolvi, 2020; Evolvi, 2022; Al-Zaman, 2022). This transformation presents a critical managerial challenge for Islamic education institutions: how to ensure that digital engagement strengthens

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religious discipline and ethical conduct rather than weakening institutional control and moral formation (Harnadi et al., 2021; Paramansyah et al. 2024).

Existing studies in Islamic education and digital religion have primarily examined digital literacy, online religiosity, and technology adoption as separate domains. Research on Islamic digital literacy highlights its role in improving access to religious learning resources and fostering critical engagement with online Islamic content (Arsyad et al., 2023; Suryani et al., 2024). Other studies emphasize digital religious identity and online religious expression as outcomes of mediated religious participation (Cheong, 2017; Campbell & Tsuria, 2022; Kholili et al., 2024). Meanwhile, technology acceptance research, largely grounded in the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), explains students' attitudes toward educational technologies but rarely links these attitudes to religious behavior as a managed educational outcome (Venkatesh, 2022a, 2022b). As a result, prior literature remains fragmented and insufficient to explain how digital competencies are translated into religious behavior within pesantren as value-driven educational organizations.

A significant research gap is the insufficient attention given to digital self-efficacy in Islamic education contexts. While digital self-efficacy has been widely recognized as a key predictor of learning persistence, adaptive behavior, and responsible technology use in general education, its role in shaping religious behavior among santri remains underexplored (Abubakari et al., 2023; Muslim, 2024). Most existing studies privilege identity-based explanations of digital religiosity while overlooking students' perceived capability to manage, evaluate, and ethically control digital technologies. From a management perspective, this omission is critical because pesantren education emphasizes discipline, moral accountability, and guided autonomy, dimensions that align closely with the self-efficacy construct but are rarely operationalized in empirical models of Islamic education.

Furthermore, the institutional dimension of pesantren culture has not been adequately integrated into quantitative explanatory models. Pesantren function as normative organizations characterized by hierarchical leadership, strong moral regulation, and collective discipline, all of which shape how students interpret and enact technology-related attitudes (Harnadi et al., 2021; Pabbajah et al., 2026). Although qualitative studies suggest that pesantren culture can either facilitate or constrain digital integration, few studies empirically test its moderating role in the relationship between students' attitudes toward technology and their religious behavior (Mustaffa & Ibrahim, 2025; Ramdani et al., 2025). This gap limits our understanding of how institutional culture operates as a managerial mechanism that channels individual readiness into value-consistent behavior.

Addressing these gaps, this study aims to examine Islamic digital literacy and digital self-efficacy as predictors of santri religious behavior, with attitudes toward technology as a mediating mechanism and pesantren culture as a moderating institutional factor. Specifically, this study seeks to test whether digital competencies enhance religious behavior directly and indirectly through attitudinal processes, and whether pesantren culture strengthens the translation of technological attitudes into religious conduct. The study is conducted in pesantren-based Madrasah Aliyah in Kudus, Indonesia, with santri as the unit of analysis. From a broader educational management perspective, existing research on digital transformation has largely focused on technological infrastructure, digital services, organizational change, and institutional performance, while comparatively less attention has been given to how individual digital capabilities, attitudinal mechanisms, and organizational culture jointly shape student behavior (Purnomo et al., 2024; Burhanuddin, 2024). By integrating these individual, psychological, and institutional dimensions, this study extends educational management research by explaining how digital transformation can be aligned with institutional values to support value-consistent student behavior in pesantren.

METHODS

Research Design and Approach

This study employed a quantitative research design using a cross-sectional survey approach to examine the relationships among Islamic digital literacy, digital self-efficacy, attitudes toward technology, *pesantren* culture, and *santri* religious behavior. The quantitative approach was selected because the study aimed to test theoretically derived hypotheses and estimate direct, mediating, and moderating relationships among latent constructs within a single analytical framework (Hair et al., 2025). Given the complexity of the proposed model and its predictive orientation, Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed as the primary analytical technique. PLS-SEM is appropriate for analyzing complex models involving multiple latent constructs, mediation, and moderation relationships, particularly when the research emphasizes prediction and explanation (Hair et al., 2022; Sarstedt et al., 2025). The overall research design, including the quantitative approach, cross-sectional survey, proposed relationships among constructs, data collection procedure, and PLS-SEM analysis, is illustrated in Figure 1.

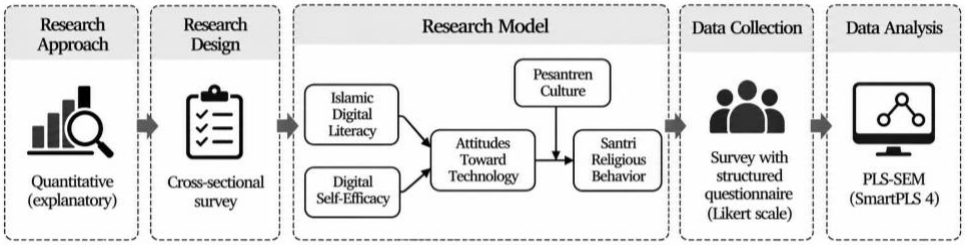


Figure 1. Research Design and Analytical Framework

Research Context and Unit of Analysis

The research was conducted in pesantren-based Madrasah Aliyah (MA) located in Kudus Regency, Central Java, Indonesia. Kudus was selected due to its strong pesantren tradition and the coexistence of salaf (traditional) and modern pesantren educational models, making it a relevant setting for examining how digital competencies interact with institutional culture (Harnadi et al., 2021; Paramansyah et al., 2024). The unit of analysis in this study was individual santri enrolled at the Madrasah Aliyah level and residing within pesantren environments. This focus enabled the analysis to capture individual perceptions, attitudes, and behaviors while situating them within a shared organizational and cultural context, consistent with prior studies on Islamic education management (Muslim, 2024).

Population and Sample

The population of this study consisted of 1,447 santri enrolled in Madrasah Aliyah affiliated with both salaf and modern pesantren in Kudus Regency during the 2025/2026 academic year. Kudus was selected because it represents a distinctive educational setting in which strong pesantren traditions coexist with increasing adaptation to digital technology. Previous research in Kudus has shown that pesantren have progressively integrated digital technologies into learning, communication, and religious activities while continuing to maintain traditional religious authority and institutional values (Zafi, 2021; Taufikin et al., 2025). This combination makes Kudus a relevant context for examining how digital competencies, attitudes toward technology, and pesantren culture interact in shaping santri religious behavior. A proportionate stratified random sampling technique was employed based on grade levels (X, XI, and XII) within each

madrasah, with respondents randomly selected according to proportional allocation. A total of 200 female santri participated in the study, comprising 56 students (28%) from MA Yanbu'ul Qur'an 2 Muria Kudus and 144 students (72%) from MA NU Banat Kudus. All respondents were female students enrolled in grades X–XII in pesantren-based Madrasah Aliyah. Although the respondents were familiar with digital technology in educational and religious contexts, their daily duration of digital use was not separately recorded. The sample size was considered adequate for Partial Least Squares Structural Equation Modeling (PLS-SEM), following established recommendations regarding sample requirements for complex structural models (Hair et al., 2025).

Instrument Development and Measurement

The research instrument was developed by adapting validated scales from prior studies and contextualizing them to pesantren-based Islamic education. All constructs were operationalized as reflective variables and measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), which is commonly used in behavioral and educational research (Hair et al., 2023). Islamic digital literacy was measured through indicators assessing respondents' ability to access, evaluate, and apply Islamic content in digital environments (Arsyad et al., 2023; Suryani et al., 2024). Digital self-efficacy captured santri's confidence in managing and utilizing digital technologies responsibly for learning and religious activities, drawing on self-efficacy perspectives in technology use (Abubakari et al., 2023; Muslim, 2024). Attitudes toward technology reflected evaluative beliefs regarding the usefulness and compatibility of digital tools with Islamic values, consistent with technology acceptance research (Venkatesh, 2022a). Pesantren culture was operationalized through indicators representing institutional norms, values, and organizational support related to digital engagement (Harnadi et al., 2021; Mustaffa & Ibrahim, 2025). Santri religious behavior encompassed both ritual practices and ethical conduct in offline and online contexts, following prior measurements in pesantren and Islamic youth studies (Saepudin & Fajar, 2024).

Data Collection Procedure

Primary data were collected using a structured questionnaire administered directly to respondents in both printed and digital formats. The distribution process was facilitated by pesantren administrators and Madrasah Aliyah teachers to ensure institutional legitimacy and respondent accessibility, as recommended in educational research conducted within religious institutions (Paramansyah et al., 2024). Prior to data collection, respondents were informed about the purpose of the study, the voluntary nature of their participation, and the confidentiality of their responses. Data collection was conducted over a defined period to ensure consistency in responses and to minimize external influences, following ethical and procedural standards commonly applied in Islamic education research (Report, 2024).

Data Analysis Technique

Data analysis was conducted using SmartPLS 4 following a two-stage analytical procedure. The first stage involved evaluating the measurement model by assessing indicator reliability, internal consistency reliability, convergent validity, and discriminant validity using established PLS-SEM criteria (Hair et al., 2025; Rönkkö & Cho, 2022). The second stage focused on testing the structural model by examining path coefficients, t-statistics, and p values generated through a bootstrapping procedure with 5,000 resamples, as recommended for mediation and moderation analysis in PLS-SEM (Sarstedt et al., 2025; Hair et al., 2025). Mediation effects were assessed using specific indirect effects, while the moderating role of pesantren culture was tested using interaction terms. Model quality was further evaluated using coefficients of determination and predictive relevance to ensure robustness and explanatory power.

RESULTS AND DISCUSSION

Results

Table 1. Outer Loadings of the Measurement Model

Indicator	Attitudes Toward Technology	Digital Self-efficacy	Islamic Digital Literacy	Pesantren Culture	Santri Religious Behavior	Pesantren Culture × Attitudes Toward Technology
ATT1	0.921					
ATT2	0.896					
ATT3	0.916					
ATT4	0.942					
ATT5	0.916					
DSE1		0.961				
DSE2		0.958				
DSE3		0.945				
DSE4		0.926				
DSE5		0.953				
IDL1			0.950			
IDL2			0.952			
IDL3			0.946			
IDL4			0.952			
IDL5			0.944			
PC1				0.966		
PC2				0.973		
PC3				0.954		
PC4				0.950		
PC5				0.972		
SRB1					0.976	
SRB2					0.979	
SRB3					0.982	
SRB4					0.975	
SRB5					0.979	
PC × ATT						1.000

Table 1 presents the outer loading values for all indicators used to measure the latent constructs in the measurement model. The results indicate that all indicators load strongly on their respective constructs, with outer loading values exceeding the recommended minimum threshold of 0.70. This finding confirms that each observed variable is an adequate reflection of the latent variable it is intended to measure, demonstrating satisfactory convergent validity across all constructs included in the model. In addition, the consistently high outer loading values across Attitudes Toward Technology, Digital Self-efficacy, Islamic Digital Literacy, Pesantren Culture, and Santri Religious Behavior indicate that the indicators adequately represent their respective constructs. The interaction construct Pesantren Culture × Attitudes Toward Technology also shows an acceptable loading value, supporting the suitability of the product-indicator approach for testing

moderation effects in the PLS-SEM framework. Overall, these results confirm that the measurement model meets the required validity criteria and is appropriate for further structural model evaluation.

Table 2. Reliability and Convergent Validity of the Measurement Model

Construct	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Attitudes Toward Technology	0.953	0.964	0.843
Digital Self-efficacy	0.972	0.978	0.900
Islamic Digital Literacy	0.972	0.978	0.900
Pesantren Culture	0.980	0.985	0.927
Santri Religious Behavior	0.989	0.991	0.957

Table 2 reports the results of construct reliability and convergent validity assessment for all latent variables included in the measurement model. The findings indicate that Cronbach's alpha values for all constructs exceed the recommended threshold of 0.70, demonstrating a high level of internal consistency among the indicators measuring each construct. In addition, both composite reliability coefficients (ρa and ρc) show consistently high values, further confirming the robustness and reliability of the measurement instruments used in this study. Moreover, the average variance extracted (AVE) values for all constructs are well above the minimum criterion of 0.50, indicating that a substantial proportion of variance in the indicators is explained by their respective latent variables. These results provide strong empirical evidence that the measurement model satisfies the requirements for convergent validity. Consequently, the constructs are deemed reliable and valid, allowing for a confident evaluation of the structural relationships in the subsequent analysis.

Table 3. Discriminant Validity (HTMT)

Construct	ATT	DSE	IDL	PC	SRB
Attitudes Toward Technology	–				
Digital Self-efficacy	0.707	–			
Islamic Digital Literacy	0.780	0.407	–		
Pesantren Culture	0.088	0.028	0.096	–	
Santri Religious Behavior	0.880	0.844	0.699	0.166	–
PC × ATT	0.094	0.136	0.037	0.470	0.145

Table 3 presents the results of the discriminant validity assessment using the heterotrait-monotrait ratio (HTMT). The HTMT values for all construct pairs are below the conservative threshold of 0.90, indicating that each latent construct is empirically distinct from the others. This suggests that the indicators used in the measurement model capture different conceptual domains and do not exhibit problematic overlap.

Furthermore, the relatively low HTMT values observed between Pesantren Culture and other constructs indicate a clear distinction between institutional cultural dimensions and individual-level technological and behavioral constructs. The interaction construct Pesantren Culture × Attitudes Toward Technology also demonstrates acceptable HTMT values, confirming that the moderation term represents a unique construct rather than a redundant combination of its constituent variables. Overall, these results confirm that the measurement model satisfies the criteria for discriminant validity and supports subsequent structural model analysis.

Table 4. Structural Model Results and Hypothesis Testing

Hypothesis	Structural Relationship	Path Coefficient	t-value	p-value	Conclusion
H1	Islamic Digital Literacy ⟶ Santri Religious Behavior	0.242	6.536	0.000	Supported
H2	Digital Self-efficacy ⟶ Santri Religious Behavior	0.506	13.771	0.000	Supported
H3	Islamic Digital Literacy ⟶ Attitudes Toward Technology	0.572	14.681	0.000	Supported
H4	Digital Self-efficacy ⟶ Attitudes Toward Technology	0.454	10.540	0.000	Supported
H5	Attitudes Toward Technology ⟶ Santri Religious Behavior	0.302	6.602	0.000	Supported
H6	Digital Self-efficacy ⟶ Attitudes Toward Technology ⟶ Santri Religious Behavior	0.137	5.308	0.000	Supported
H7	Islamic Digital Literacy ⟶ Attitudes Toward Technology ⟶ Santri Religious Behavior	0.173	5.876	0.000	Supported
H8	Pesantren Culture × Attitudes Toward Technology ⟶ Santri Religious Behavior	0.164	4.630	0.000	Supported

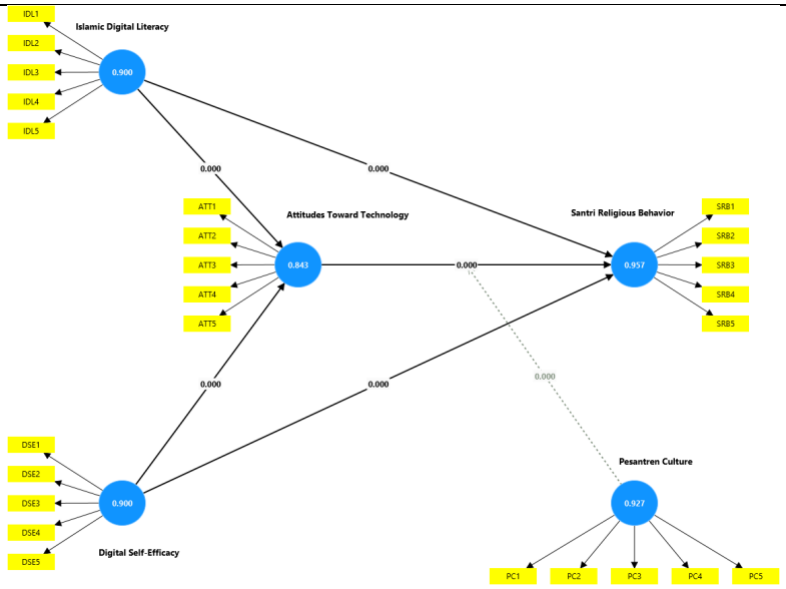


Figure 2. PLS-SEM Structural Model of Santri Religious Behavior

The structural relationships among the constructs are presented in Table 4 and visualized in Figure 2. The results indicate that Islamic Digital Literacy and Digital Self-efficacy have significant direct effects on

Santri Religious Behavior, demonstrating that both value based digital competence and perceived digital capability play important roles in shaping religious conduct within pesantren-based education. In addition, both constructs significantly influence Attitudes Toward Technology, confirming that digital readiness contributes to more positive evaluative orientations toward technology use. As illustrated in Figure 2, Attitudes Toward Technology also shows a significant direct effect on religious behavior, highlighting its central position as a behavioral transmission mechanism in the proposed model.

Furthermore, the combined results in Table 4 and Figure 2 confirm the presence of mediating and moderating effects. Attitudes Toward Technology significantly mediate the relationships between Islamic Digital Literacy and Digital Self-efficacy and Santri Religious Behavior, indicating that digital competencies are translated into religious outcomes through attitudinal processes. In addition, Pesantren Culture significantly moderates the relationship between Attitudes Toward Technology and religious behavior, as depicted by the interaction effect in Figure 2. This finding suggests that supportive institutional norms and cultural values strengthen the behavioral impact of positive technological attitudes. Overall, the integrated interpretation of Table 4 and Figure 2 demonstrates that santri religious behavior is shaped by the interaction between individual digital readiness, psychological evaluation, and pesantren cultural context.

Discussion

The findings confirm that Islamic Digital Literacy (LDI) has a significant positive effect on santri religious behavior (PBS), indicating that the ability to critically access, evaluate, and apply Islamic content in digital environments directly strengthens religious practices and ethical conduct. Recent international studies emphasize that value-based digital literacy enhances moral judgment and self-regulation in digitally mediated religious contexts (Campbell & Evolvi, 2020; Evolvi, 2022; Raya, 2025). Previous research further suggests that digitally literate religious learners are better equipped to resist misinformation and maintain doctrinal coherence when navigating fragmented online religious discourses (Al-Zaman, 2022; Larson, 2024). In institutional religious education settings, digital literacy operates as a behavioral safeguard that aligns online engagement with moral expectations and religious authority (Harnadi et al., 2021; Pabbajah et al., 2026). These findings reinforce the role of LDI as a foundational capability that supports religious behavior amid digital transformation.

Beyond its direct effect, Islamic Digital Literacy was found to significantly influence attitudes toward technology (ATT), suggesting that competence in evaluating religious digital content fosters positive evaluations of technology as a legitimate learning medium. This result aligns with recent extensions of technology acceptance theory, which emphasize that domain-specific literacy reduces perceived risk and increases value congruence in technology adoption (Venkatesh, 2025; Xue et al., 2025). Previous studies indicate that students with strong subject-specific digital literacy tend to develop more favorable attitudes toward educational technologies when these tools align with their values and expectations (Getenet et al., 2024; Sanguineti & Maran, 2024). In religious education contexts, literacy reframes technology from a disruptive force into a pedagogical resource, strengthening attitudinal readiness for digital integration (Campbell & Tsuria, 2022; Larson, 2024).

The direct relationship between Digital Self-efficacy (DSE) and santri religious behavior highlights the importance of perceived capability in managing digital engagement responsibly. International research consistently shows that digital self-efficacy predicts disciplined behavior, ethical decision-making, and persistence in value-oriented activities (Bandura, 1999; Abubakari et al., 2023). Recent studies further suggest that individuals with high self-efficacy are more likely to regulate their digital behavior in accordance with institutional norms and moral expectations (Peng et al., 2024; Getenet et al., 2024). In religious educational

institutions, self-efficacy strengthens moral agency by enabling learners to exercise control over digital consumption and interaction (Larson, 2024; Raya, 2025). Thus, DSE emerges as a critical psychological resource supporting religious behavior in digitally intensive environments.

Digital Self-efficacy was also found to significantly enhance attitudes toward technology, indicating that confidence in digital ability fosters positive evaluations of technological tools. This finding is consistent with international evidence showing that self-efficacy reduces perceived complexity and increases perceived usefulness in technology adoption (Venkatesh, 2025; Xue et al., 2025). Previous studies suggest that learners with higher digital self-efficacy tend to demonstrate greater openness to digitally mediated instruction and lower resistance to technology integration (Getenet et al., 2024; Zhang & Tian, 2025). Within religious education, self-efficacy supports the perception that technology can be used responsibly and meaningfully for faith-based learning, reinforcing positive attitudes toward its use (Campbell & Tsuria, 2022; Larson, 2024)

The significant effect of attitudes toward technology on santri religious behavior confirms the central role of attitudinal acceptance in translating digital readiness into action. This finding aligns with contemporary applications of the Theory of Planned Behavior and UTAUT, which identify attitudes as a proximal determinant of behavior across educational and organizational contexts (Ajzen, 1991; Venkatesh, 2025). Recent international studies show that positive technology attitudes increase engagement in value-oriented digital practices, including ethical online participation and disciplined learning behavior (Zhan & Xie, 2025; Abubakari et al., 2023). In religious settings, favorable attitudes toward technology facilitate the integration of digital tools into spiritual routines without undermining moral commitments (Evolvi, 2023; Gao et al., 2022).

The mediation analysis demonstrates that attitudes toward technology partially mediate the relationship between Islamic Digital Literacy and santri religious behavior, indicating that literacy influences behavior through evaluative beliefs. This cognitive-affective pathway is consistent with recent PLS-SEM research emphasizing attitudinal mediation in educational technology studies (Sarstedt et al., 2025; Hair et al., 2023). International evidence suggests that digital literacy enhances ethical behavior most effectively when accompanied by positive value-based attitudes toward technology (Getenet et al., 2024; Santini et al., 2025). In religious education contexts, this mediation underscores the importance of framing literacy initiatives within moral narratives that explicitly connect digital competence to religious purpose (Campbell & Tsuria, 2022; Raya, 2025).

Similarly, attitudes toward technology were found to mediate the relationship between Digital Self-efficacy and santri religious behavior, reinforcing the idea that confidence must be channeled through positive evaluations to generate consistent behavior. Recent international studies confirm that self-efficacy leads to sustained behavioral outcomes primarily when learners perceive technology as beneficial and value-consistent (Venkatesh, 2022a; Xue et al., 2025). In institutional religious environments, attitudes help align personal confidence with organizational expectations, ensuring that digital engagement remains ethically regulated (Larson, 2024; Pabbajah et al., 2026). This mediation effect highlights the integrative role of ATT in linking capability with religious conduct.

Finally, the moderating effect of pesantren culture on the relationship between attitudes toward technology and santri religious behavior demonstrates that institutional context significantly shapes how individual readiness translates into action. In pesantren with supportive and adaptive cultural norms, positive technology attitudes are more likely to result in observable religious behavior, whereas in more restrictive environments, the same attitudes may be constrained (Pabbajah et al., 2026; Kusuma et al., 2025). This finding is consistent with organizational culture theory, which posits that institutional values condition individual behavior (Sanguineti & Maran, 2024; Sanguineti & Maran, 2024). Within Islamic education management, pesantren culture functions as a normative control mechanism that channels digital engagement toward

morally acceptable and educationally meaningful outcomes (Harnadi et al., 2021; Mustaffa & Ibrahim, 2025; Larson, 2024; Raya, 2025). Collectively, these results affirm that digital religiosity among santri is not solely an individual phenomenon but a culturally embedded process shaped by institutional governance.

The findings provide theoretical and practical implications for Islamic education, particularly in understanding santri religious behavior within digitally evolving pesantren environments. Theoretically, this study extends the application of the Technology Acceptance Model and Social Cognitive Theory by demonstrating the relationships among Islamic digital literacy, digital self-efficacy, attitudes toward technology, and religious behavior. The mediating role of attitudes toward technology highlights the importance of students' evaluations of technology in linking digital competencies with religious conduct, while the moderating role of pesantren culture underscores the relevance of institutional values in shaping these relationships. From a practical perspective, these findings suggest that pesantren administrators and educators should integrate Islamic digital literacy and digital self-efficacy development into educational practices. Such initiatives should encourage students to critically evaluate online religious information, develop confidence in responsible technology use, and maintain consistency with Islamic ethical principles. Strengthening institutional guidance alongside digital learning activities may therefore support the integration of technology into religious education without compromising established pesantren values.

Despite its contributions, this study has several limitations that should be considered when interpreting the findings. The research involved 200 female santri from two pesantren-based Madrasah Aliyah in Kudus Regency, which may limit the generalizability of the results to male students and other Islamic educational settings. Furthermore, the cross-sectional design restricts causal interpretation, while the use of self-reported questionnaires may introduce response bias when assessing religious behavior and attitudes toward technology. Considering these limitations, future studies should include participants from different geographical regions, institutional backgrounds, and gender groups to improve the generalizability of the findings. Longitudinal or mixed-methods approaches are also recommended to provide a deeper understanding of how digital competencies, technology-related attitudes, and institutional culture relate to religious behavior over time. Further research could additionally examine digital usage patterns, including daily usage duration and the purposes of technology use, to better understand variations in santri religious behavior within digital environments.

CONCLUSION

This study concludes that Islamic Digital Literacy (IDL) and Digital Self-efficacy (DSE) play important roles in shaping santri religious behavior within pesantren-based Islamic education. The findings demonstrate that Islamic digital literacy supports students' ability to critically access, evaluate, and apply religious information, while digital self-efficacy strengthens their confidence in using technology responsibly and consistently with Islamic values. Both competencies contribute positively to religious behavior and attitudes toward technology (ATT), highlighting the importance of digital readiness in religious educational settings. Furthermore, attitudes toward technology serve as a significant mediating mechanism through which digital competencies are associated with religious behavior, indicating that technological capabilities should be accompanied by favorable evaluations of their educational and religious relevance. The findings also confirm the moderating role of pesantren culture in the relationship between attitudes toward technology and religious behavior, emphasizing that institutional norms and values provide an important context for students' digital engagement. Taken together, these results suggest that religious behavior in the digital era is associated with the interaction of individual competencies, technology-related attitudes, and institutional culture. Therefore, effective digital transformation in Islamic education requires an integrated approach that

strengthens digital literacy and self-efficacy, promotes responsible attitudes toward technology, and maintains the cultural and religious values of pesantren.

REFERENCES

Abubakari, M. S., Abdul Nasir Zakaria, G., Priyanto, P., & Triantini, D. T. (2023). Analysing technology acceptance for digital learning in Islamic education: The role of religious perspective on ICT. *Journal of Computing Research and Innovation*, *8*(1), 1–16. https://doi.org/10.24191/jcrinn.v8i1.344

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(4), 179–211. https://doi.org/10.1002/hbe2.195

Al-Zaman, M. S. (2022). Social mediatization of religion: Islamic videos on YouTube. *Heliyon*, *8*(3), e09083. https://doi.org/10.1016/j.heliyon.2022.e09083

Arsyad, A., Syariati, F., & Sukarno, S. (2023). Digital Literacy and Learning Motivation: Impacts on Online Learning Outcomes in Fiqh Study. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, *8*(1), 167–180. https://doi.org/10.24042/tadris.v8i1.14523

Bandura, A. (1999). Social Cognitive theory: An agency perspective. *Asian Journal of Scocial Psychology*, *2*(1), 21–41. https://doi.org/10.1111/1467-839X.00024

Burhanuddin, B. (2024). Effects of university organizational culture on student academic behavior in Indonesia. *International Journal of Educational Management*, *38*(2), 549–567. https://doi.org/10.1108/IJEM-11-2023-0553

Campbell, H. A., & Evolvi, G. (2020). Contextualizing current digital religion research on emerging technologies. *Human Behavior and Emerging Technologies*, *2*(1), 5–17. https://doi.org/10.1002/hbe2.149

Campbell, H. A., & Tsuria, R. (2022). Digital Religion: Understanding Religious Practice in Digital Media. In *Routledge* (2nd ed.). Routledge. https://doi.org/10.4324/9780429295683

Cheong, P. H. (2017). The vitality of new media and religion: Communicative perspectives, practices, and changing authority in spiritual organization. *New Media and Society*, *19*(1), 25–33. https://doi.org/10.1177/1461444816649913

Digital, T., & Pesantren, P. (2024). Digital Transformation of Islamic Boarding School Education. *Indonesian Journal of Islamic Studies*, *12*(2), 1–6. https://doi.org/10.21070/ijis.v12i2.1723

Evolvi, G. (2023). Religion and the internet: digital religion, (hyper) mediated spaces, and materiality. *Zeitschrift Für Religion, Gesellschaft Und Politik*, *6*(1), 9–25. https://doi.org/10.1007/s41682-021-00087-9

Gao, Q., Woods, O., Kong, L., & Shee, S. Y. (2022). Lived religion in a digital age : technology , affect and the pervasive space-times of ' new ' religious praxis. *Social & Cultural Geography*, *25*(1), 29–48. https://doi.org/10.1080/14649365.2022.2121979

Getenet, S., Cantle, R., Redmond, P., & Albion, P. (2024). Students' digital technology attitude, literacy and self-efficacy and their effect on online learning engagement. *International Journal of Educational Technology in Higher Education*, *21*(1). https://doi.org/10.1186/s41239-023-00437-y

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2023). *Partial Least Squares Structural Equation Modeling* (3 (ed.)). SAGE Publications, Inc.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *PLS-SEM Book: A Primer on PLS-SEM* (Third Edit). SAGE Publications, Inc. https://doi.org/10.1016/j.lrp.2013.01.002

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Danks, N. (2025). *State of the Art in Partial Least Squares Structural Equation Modeling (PLS-SEM) Methodological Extensions and Applications in*

the Social Sciences and Beyond (M. S. Lăcrămioara Radomir, Raluca Ciornea, Huiwen Wang, Yide Liu, Christian M. Ringle (ed.)). Springer.

Harnadi, D., Siahaan, H., & Hilmy, M. (2021). Pesantren and the preservation of traditional religious authority in the digital age. *Masyarakat, Kebudayaan Dan Politik*, *34*(3), 272. https://doi.org/10.20473/mkp.v34i32021.272-280

Kholili, M., Izudin, A., & Hakim, M. L. (2024). Islamic proselytizing in digital religion in Indonesia: the challenges of broadcasting regulation. *Cogent Social Sciences*, *10*(1). https://doi.org/10.1080/23311886.2024.2357460

Kusuma, M. T. A., Muharom, F., & Jandra, M. (2025). Transformation of Pesantren Education Management in the Digital Era. *Educational Studies and Research Journal*, *2*(1), 48–56. https://doi.org/10.60036/1q2rm780

Larson, E. M. (2024). Smartphones and the education of religious youth in Indonesia : Highway to hell or path of righteousness ? *Social Compass*, *71*(7), 119–135. https://doi.org/10.1177/00377686231182251

Muslim, M. (2024). Internalising Digital Technology in Islamic Education. *Scaffolding: Jurnal Pendidikan Islam Dan Multikulturalisme*, *6*(3), 180–197. https://doi.org/10.37680/scaffolding.v6i3.6309

Mustaffa, N. N. M., & Ibrahim, M. N. H. (2025). Technology and Access to Islamic Contents: The Acceptance of Islamic Digital Contents. *International Journal of Research and Innovation in Social Science (IJRISS)*, *9*(20), 129–139. https://doi.org/https://dx.doi.org/10.47772/IJRISS.2025.90200013

Nasir, M., Rizal, S., & Pabbajah, M. (2024). Revolutionizing Teungku Dayah learning model : exploring the transformative impact of technological advancements on Islamic education in Aceh Revolutionizing Teungku Dayah learning model : exploring the transformative impact of technological advancements . *Cogent Education*, *11*(1), 1–14. https://doi.org/10.1080/2331186X.2024.2335720

Santini, F. de O., Sampaio, C. H., Rasul, T., Ladeira, W. J., Kar, A. K., Perin, M. G., & Azhar, M. (2025). Understanding students' technology acceptance behaviour: A meta-analytic study. Technology in Society, 81, 102798. https://doi.org/10.1016/j.techsoc.2024.102798

Pabbajah, M., Muchammadun, Mckenna, T., & Deraman. (2026). The Shift of Ulema Authority in the Understanding of Religious "Fiqh" in Virtual Space. *Journal of Religious and Theological Information*, *0*(0), 1–15. https://doi.org/10.1080/10477845.2024.2432057

Paramansyah, A., Judijanto, L., Trinova, Z., Rahmah, S., & Zulihi, Z. (2024). Transformation of Islamic Boarding School Education to Address Moral Challenges in the Digital Era. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, *16*(2), 1271–1280. https://doi.org/10.37680/qalamuna.v16i2.6090

Peng, R., Razak, R. A., & Halili, S. H. (2024). Exploring the role of attitudes, self-efficacy, and digital competence in influencing teachers' integration of ICT: A partial least squares structural equation modeling study. *Heliyon*, *10*(13), e34234. https://doi.org/10.1016/j.heliyon.2024.e34234

Purnomo, E. N., Imron, A., Wiyono, B. B., Sobri, A. Y., & Dami, Z. A. (2024). Transformation of Digital-Based School Culture : implications of change management on Virtual Learning Environment integration. *Cogent Education*, *11*(1), 1–18. https://doi.org/10.1080/2331186X.2024.2303562

Ramdani, I., Apri Wenando, F., & Ondri, D. (2025). Religious-Cultural Mediation in Technology Adoption: A Qualitative Study of Islamic Communities in Indonesia. *Surau Journal of Islamic Studies*, *1*(2), 104–122. https://doi.org/10.63919/surau.v1i2.33

Raya, M. K. F. (2025). Digital Islam: new space for authority and religious commodification among Islamic preachers in contemporary Indonesia. In *Contemporary Islam* (Vol. 19, Issue 1). Springer Netherlands. https://doi.org/10.1007/s11562-024-00570-z

Report, T. B. (2024). *Ethical principles and guidelines for research involving human subjects. U.S. Department of Health and Human Services*. Office for Human Research Protections. https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/index.html

Rönkkö, M., & Cho, E. (2022). An Updated Guideline for Assessing Discriminant Validity. In *Organizational Research Methods* (Vol. 25, Issue 1). https://doi.org/10.1177/1094428120968614

Saepudin, A., & Fajar, R. (2024). Islamic Tradition and Digital Resistance : Constructing Moderate Religious Habitus in Indonesian Pesantren Salaf. *Tashwirul Afkar*, *43*(1). https://doi.org/10.51716/ta.v43i1.647

Sanguineti, F., & Maran, T. (2024). Navigating the clouds: Cultural influences on technology acceptance in the workplace. *Technology in Society*, *77*(March 2024), 102553. https://doi.org/10.1016/j.techsoc.2024.102553

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2025). Partial Least Squares Structural Equation Modeling. In C. Homburg, M. Klarmann, & A. Vomberg (Eds.), *Handbook of Market Research* (pp. 1–56). Springer Nature. https://doi.org/10.1007/978-3-319-05542-8_15-3

Shofwani, W., Arifudin, I., Gloria, R. Y., & Wiradinata, D. R. (2025). Transforming Educational Management in Islamic Boarding Schools: A Historical and Digital Perspective. *JP (Jurnal Pendidikan) : Teori Dan Praktik*, *10*(2), 174–187. https://doi.org/10.26740/jp.v10n2.p174-187 174

Suresman, E., Faqihuddin, A., & Abdullah, M. (2025). From sorogan to digital learning : a systematic literature network analysis of pesantren learning models. *Cogent Education*, *12*(1). https://doi.org/10.1080/2331186X.2025.2580776

Suryani, S., Asyraf, M. F. A., Mustofa, A., & Muntafi, M. S. (2024). Digital Literacy Based on Islamic Values to Improve Risk Perception and Critical Thinking among Muslim Adolescents. *Psikis : Jurnal Psikologi Islami*, *10*(1), 80–90. https://doi.org/10.19109/psikis.v10i1.19067

Taufikin, Nurhayati, S., Falah, A., Sholihuddin, M., & Badawi, H. (2025). Integrating Creative Digital Content In Pesantren: Improving Santri's Digital Literacy And Islamic Learning. *Edukasia Islamika*, *10*(1), 172–190. https://doi.org/10.28918/jei.v10i1.10326

Venkatesh, V. (2022a). Adoption and use of AI tools: a research agenda grounded in UTAUT. *Annals of Operations Research*, *308*(1–2), 641–652. https://doi.org/10.1007/s10479-020-03918-9

Venkatesh, V. (2022b). IT Use and Job Outcomes: A Longitudinal Field Study of Technology Contingencies. *Journal of the Association for Information Systems*, *308*, 641–652. https://doi.org/10.1007/s10479-020-03918-9

Venkatesh, V. (2025). Paradigm changing metaverse: Future research directions in design, technology adoption and use, and impacts. *Decision Support Systems*, *188*(August 2024), 114307. https://doi.org/10.1016/j.dss.2024.114307

Xue, L., Ghazali, N., & Mahat, J. (2025). A Systematic Review of UTAUT and UTAUT2 for AI Adoption in Education. *International Journal of Human-Computer Interaction*, *0*(0), 1–25. https://doi.org/10.1080/10447318.2025.2552867

Zafi, A. A. (2021). The Existence of Pesantren Based Technology : Digitalization of Learning in Pondok Pesantren Darul Ulum Kudus. *Jurnal Pendidikan Agama Islam*, *18*(2), 493–510. https://doi.org/10.14421/jpai.2021.182-15

Zhan, X., & Xie, S. (2025). Linking workplace digitalization to work engagement : evidence from China public sector organizations. *Front. Psychol*, *16*(January), 1–11. https://doi.org/10.3389/fpsyg.2025.1455250

Zhang, X., & Tian, H. (2025). Modeling information literacy in Chinese physical education : the roles of technology integration ,. *Scientific Reports*, *15*(3), 1–17. https://doi.org/10.1038/s41598-025-26990-2