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Examining the Effects of *Kiai* Leadership, Institutional Support, and Educational Technology on Student Satisfaction in Indonesian *Pesantren*

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ABSTRACT. Indonesian *pesantren* faces a dual mandate: preserving spiritual and moral foundations while adapting to digital-age expectations. However, empirical evidence on which institutional drivers shape student satisfaction in this hybrid setting remains thin. This study examines the direct effects of *Kiai* leadership, institutional support, educational technology, and student involvement on student satisfaction across Indonesian *pesantren*. A quantitative cross-sectional design involving 480 stakeholders (active students, educators, alums, and institutional management) was used. Data were collected via a closed-ended Likert-scale questionnaire adapted from validated instruments and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) on SmartPLS 3.0, with bootstrapping (5,000 resamples), f^2 effect size, Q^2 predictive relevance, and inner VIF assessment. Results show that *Kiai* leadership ($\beta = 0.420$, $p < 0.05$) and institutional support ($\beta = 0.374$, $p < 0.05$) are the strongest predictors of student satisfaction. Educational technology exerts a smaller yet significant positive effect ($\beta = 0.253$, $p < 0.05$). Student involvement, contrary to the engagement-satisfaction canon, shows no significant direct effect ($\beta = -0.541$, $p > 0.05$), suggesting its meaning in *pesantren* departs from Western engagement constructs. The findings reposition spiritual-transformational leadership and ethically framed institutional support as the foundational determinants of satisfaction in faith-based education, with technology functioning as an enabler rather than a primary driver. Practical implications underscore the need to invest in *Kiai* leadership development and student-centred support systems, while future research is invited to develop culturally grounded engagement scales for *pesantren* contexts.

Keywords: *Kiai Leadership, Institutional Support, Educational Technology, Student Involvement, Student Satisfaction, Pesantren.*

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INTRODUCTION

Indonesian *pesantren* today operate at the intersection of two strong currents: a deep-rooted spiritual-moral tradition and the accelerating digital transformation of education (Manaf et al., 2025). According to the Ministry of Religious Affairs, more than 39,000 *pesantren* currently host over four million *santri* across Indonesia, making them one of the largest faith-based education networks in the Muslim world (Bustomi et al., 2025; Zh, 2021). However, recent surveys among

santri in West Java, East Java, and Sumatra report variability in self-reported satisfaction levels, with concerns centered on limited digital infrastructure, mismatches between santri expectations and institutional services, and uneven mentorship quality (Firmansyah et al., 2024; Nur et al., 2024). At the same time, the rapid penetration of social media and mobile platforms among Generation Z *santri* has begun to reshape how religious learning is consumed and how institutional credibility is judged (Kurniawan et al., 2025; Muttaqin et al., 2026). These shifts make the question of what truly drives student satisfaction in *pesantren* both timely and consequential for *pesantren*'s institutional sustainability, image, and broader civic-ecological role (Afifah et al., 2025; Bronfenbrenner, 1979; Hossain et al., 2025; Rahman et al., 2025; Triyono et al., 2023).

Existing scholarship has produced valuable but fragmented insights. Studies on *pesantren* education have largely focused on traditional pedagogy, ethical critical thinking, and adaptive leadership within local Islamic traditions (Adeoye et al., 2025; Amalia, 2026; Ansori et al., 2025; Na'im, 2022; Yasin & Khasbulloh, 2022; Yuliana et al., 2025), often through qualitative case-based designs that capture cultural depth but seldom test causal pathways. In parallel, the broader higher-education literature has established that technology integration (Pandita & Kiran, 2023), institutional support (Kakada et al., 2019)Moreover, the quality of online learning (Walia et al., 2025) drives student satisfaction. However, these findings are derived almost exclusively from secular and Western settings whose pedagogical assumptions diverge from the *pesantren* model. Even within Islamic-education research, recent work on character education and religious identity (Luhuringbudi et al., 2025; Nasution et al., 2025) treats spiritual and structural variables in isolation rather than testing their joint contribution to satisfaction. Critically, prior studies rarely model *Kiai* leadership and institutional support together with educational technology and student involvement within a single quantitative framework, leaving the relative weight of these drivers in the *pesantren* ecosystem largely undocumented.

From this body of work, a clear theoretical gap emerges. The literature lacks an integrative model that situates the spiritual authority of the *Kiai* alongside institutional and technological factors as parallel determinants of student satisfaction in faith-based boarding schools (Abdurrahman et al., 2025; Hazzam & Wilkins, 2023a; Ikhwan et al., 2025; Ma`arif et al., 2025; Rofiq, 2025). The novelty of this study, therefore, is twofold. First, to our knowledge, this is the first PLS-SEM-based integrative model that simultaneously tests *Kiai* leadership, institutional support, educational technology, and student involvement as direct predictors of student satisfaction in the Indonesian *pesantren* context. Second, the study explicitly anchors these constructs in a coherent theoretical scaffolding: Spiritual and Transformational Leadership Theory (Bass & Riggio, 2006; Reave, 2005) for *Kiai* leadership, Service-Dominant Logic in education (Vargo & Lusch, 2016) for institutional support, the Technology Acceptance Model and UTAUT (Davis, 1989; Venkatesh et al., 2016) for educational technology, and Student Engagement Theory (Kuh, 2009) for student involvement, with all four pathways converging on satisfaction as conceptualised in service-quality frameworks (Paul & Pradhan, 2019).

Building on this gap, the study pursues a single overarching objective: to quantify the direct effects of *Kiai* leadership, institutional support, educational technology, and student involvement on student satisfaction in Indonesian *pesantren*. The research is delimited to direct-effect modelling for two reasons. *First*, the foundational empirical question of which factors most strongly predict satisfaction in this hybrid setting has not yet been answered in a parsimonious quantitative form. *Second*, establishing robust direct effects is a prerequisite for any subsequent investigation of mediating or moderating mechanisms, which we leave to future work informed by the present findings.

Consistent with the four theoretical strands above, the study tests the following hypotheses: H1: *Kiai* leadership has a positive and significant direct effect on student satisfaction. H2: Institutional support has a positive and significant direct effect on student satisfaction. H3: Educational technology has a positive and significant direct effect on student satisfaction. H4: Student involvement has a positive and significant direct effect on student satisfaction. Together,

these four hypotheses constitute the conceptual model whose path diagram is presented in the Results section.

METHOD

This study employed a quantitative cross-sectional design to investigate the direct effects of *Kiai* leadership, institutional support, educational technology, and student involvement (the four independent variables) on student satisfaction (the dependent variable) within Indonesian *pesantren*. Partial Least Squares Structural Equation Modelling (PLS-SEM) was selected as the analytical technique because it accommodates moderately complex models, performs robustly with non-normal data, and is well-suited to causal-predictive testing in social science research (Hair et al., 2019, 2021; Ikhwan, 2020). The conceptual model tests four direct paths converging on student satisfaction; mediating and moderating mechanisms are reserved for subsequent studies.

The target population comprised stakeholders of Indonesian *pesantren* who possess direct, sustained experience of *pesantren* learning environments. Purposive sampling was chosen over probability sampling for two reasons. First, no comprehensive, publicly accessible sampling frame enumerates all stakeholders across Indonesia's more than 39,000 *pesantren*, rendering random selection logistically infeasible at the scale required by this study. Second, student satisfaction in *pesantren* is co-constituted by multiple stakeholder roles whose evaluative perspectives depend on direct, sustained immersion in the *pesantren* environment; therefore, the deliberate selection of respondents with specific, sustained experience is methodologically preferable to randomly drawn participants who may lack the relevant evaluative perspective. Accordingly, a purposive sampling technique was applied with the following inclusion criteria: (1) active *santri* who have been enrolled in their *pesantren* for at least one academic year and are involved in both academic and non-academic activities; (2) educators (*kiai*, *ustadz/ustadzah*, and lecturers) with at least two years of teaching experience in the participating *pesantren*; (3) alums who graduated within the past five years and can offer post-study evaluation; and (4) institutional management (policy makers and technical staff) directly involved in service delivery. The sampling rationale is that student satisfaction in *pesantren* is co-constituted by *santri* experience and by the perceptions of those who design and deliver the educational service, including non-student stakeholders; therefore, it strengthens the construct validity of items measuring institutional support, leadership, and technology, while *santri* remain the primary respondents for student-satisfaction items. To mitigate respondent bias, satisfaction items were rated only by active *santri* and alumni (n = 288), while all four groups rated leadership, support, and technology items. The final sample consisted of 480 respondents distributed as active *santri* (40%, n = 192), educators (30%, n = 144), alumni (20%, n = 96), and institutional management (10%, n = 48), drawn from multiple *pesantren* across Indonesia. The total sample size satisfies the inverse-square-root rule for PLS-SEM at a conservative minimum effect size (Kock & Hadaya, 2018).

Data were collected via a structured, closed-ended online questionnaire. All items used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument was adapted from validated scales reported in the established literature, then translated into Bahasa Indonesia, back-translated into English, and pilot-tested with 40 *santri* prior to full deployment. The *Kiai* Leadership construct (six items, e.g., "The *Kiai* inspires me to live according to Islamic values") was adapted from Bass and Riggio (Bass & Riggio, 2006) and contextualised to the *pesantren* spiritual-leadership tradition (Hidayat et al., 2021). The Institutional Support construct (seven items, e.g., "The *pesantren* provides facilities that meet my academic and spiritual needs") was adapted from (Kakada et al., 2019) and Ali et al. (Ali et al., 2016). The Educational Technology construct (five items, e.g., "Digital learning tools used in this *pesantren* help me understand the materials better") was adapted from Venkatesh et al. (Venkatesh et al., 2016) and Pandita and Kiran (Pandita & Kiran, 2023). The Student Involvement construct (five items, e.g., "I actively participate in academic and religious activities organised by the *pesantren*") was adapted from (Kuh, 2009). The Student Satisfaction construct (five items, e.g., "Overall, I am satisfied with my learning experience

in this *pesantren*") was adapted from Paul and Pradhan (Paul & Pradhan, 2019) and Hossain et al. (Hossain et al., 2025). The pilot test confirmed item clarity and yielded Cronbach's alpha values above 0.80 for all constructs.

Data were analysed in two stages following the PLS-SEM procedure (Hair et al., 2019). At the measurement-model stage, internal consistency was assessed using Cronbach's alpha and Composite Reliability (threshold ≥ 0.70). Convergent validity was assessed through indicator outer loadings (threshold ≥ 0.70 ideal; 0.40–0.70 acceptable when removal does not improve Composite Reliability) and Average Variance Extracted (AVE ≥ 0.50, indicating that the construct accounts for at least 50% of indicator variance) (Hair et al., 2021). Discriminant validity was evaluated using both the Fornell–Larcker criterion and the more sensitive Heterotrait–Monotrait (HTMT) ratio, with a threshold of 0.85 for conceptually distinct constructs (Henseler et al., 2015). At the structural-model stage, multicollinearity was assessed using the inner Variance Inflation Factor (inner VIF; threshold < 3.3), and common method bias was assessed using the Full Collinearity VIF (Kock, 2015). Path coefficients were tested using a bootstrapping procedure with 5,000 resamples; t-values exceeding 1.96 and two-tailed p-values below 0.05 were treated as significant (Chin, 1998). Coefficient of determination (R^2), effect size (f^2; thresholds 0.02, 0.15, 0.35 for small, medium, and large), and predictive relevance (Q^2 via blindfolding with omission distance 7; values above zero indicating predictive relevance) were computed to evaluate the model's explanatory and predictive quality (Hair et al., 2019). All analyses were performed in SmartPLS 3.0 (Ringle et al., 2015).

RESULT

Respondent Profile

Of 512 questionnaires distributed, 480 complete responses (93.75%) met the inclusion criteria after data screening for missing values, straight-line responding, and inconsistent patterns (Hair et al., 2019). The respondent composition is presented in Table 1.

Table 1. Respondent Profile

Profile	Classification	Count (n = 480)	%
Active Students	Students involved in academic and non-academic activities	192	40%
Lecturers & Educators	Teaching staff participating as observers and respondents	144	30%
Alumni	Graduates providing post-study perspectives	96	20%
Institutional Management	Policy makers & technical support staff	48	10%

Table 1 shows that the sample is dominated by active *santri* (40%) and educators (30%), with alumni (20%) and institutional management (10%) providing complementary perspectives. This composition aligns with the sampling rationale outlined in the Method section: *santri* experience is the primary lens for student-satisfaction items, while the multi-stakeholder design broadens the evidence base for leadership, support, and technology constructs.

Reliability Result

The results of the reliability test can be seen in the following table:

Table 2. Internal Consistency Reliability Result

Variables	Cronbach's Alpha	Status
Institutional Support	0.9506	Very Good
***Kiai* Leadership**	0.9002	Very Good
Learning Technology	0.9274	Very Good
Student Involvement	0.9122	Very Good
Student Satisfaction	0.9140	Very Good

Overall, these results indicate that the research instrument has very strong reliability and is suitable for further analysis using the PLS-SEM structural model. Furthermore, there are no indications of low reliability across all research constructs, so the data can be considered stable and consistent in their representation of the variables studied.

Convergent Validity Result

The results of the Convergent Validity test can be seen in the following table:

Table 3. Convergent Validity Result

Variables	Indicator	Loading Factor	Composite Reliability	AVE
Institutional Support	InS1	0.8804	0.9559	0.7571
	InS2	0.8302		
	InS3	0.9012		
	InS4	0.9607		
	InS5	0.9561		
	InS6	0.8017		
	InS7	0.7370		
***Kiai* Leadership**	KL2	0.8074	0.9238	0.6699
	KL3	0.8980		
	KL4	0.8542		
	KL5	0.8476		
	KL6	0.7679		
Learning Technology	LT1	0.7553	0.9198	0.6984
	LT2	0.8569		
	LT3	0.9731		
	LT4	0.8270		
	LT5	0.7459		
Student Involvement	SI1	0.8935	0.8489	0.5473
	SI2	0.4837		
	SI3	0.4638		
	SI4	0.8329		
	SI5	0.8919		
Student Satisfaction	SS1	0.6479	0.9346	0.7437
	SS2	0.8650		
	SS3	0.9112		
	SS4	0.9231		
	SS5	0.9318		

This table shows the results of the convergent validity test in the PLS-SEM-based Structural Equation Modelling analysis. This test aims to ensure that the indicators in each variable accurately represent the construct being measured. Convergent validity evaluation is conducted using three main parameters: loading factor, Composite Reliability (CR), and Average Variance Extracted (AVE). Overall, the results in this table indicate that all research constructs meet the criteria for convergent validity and are suitable for use in structural modeling. Although several indicators have

moderate factor loadings for the Student Involvement and Student Satisfaction variables, the model's overall reliability and validity remain in the good-to-excellent range.

Discriminant Validity Result

The complete results of the Discriminant Validity test can be seen in the following table:

Table 4. Discriminant Validity Result

Variable	1	2	3	4	5
Institutional Support	0.8701				
***Kiai* Leadership**	0.5742	0.8185			
Learning Technology	-0.0594	0.2105	0.8357		
Student Involvement	0.5212	0.5276	0.0724	0.7398	
Student Satisfaction	0.3179	0.4025	0.2798	-0.1062	0.8624

This table presents the results of the discriminant validity test assessed through the Fornell–Larcker criterion. Discriminant validity ensures that each construct in the model is empirically distinct from the others. Overall, the results indicate that all five constructs satisfy the discriminant validity requirement, meaning that each construct measures a unique dimension and is not confounded with the others. Therefore, the measurement model can be considered to have adequate discriminant validity and is suitable for further structural model analysis.

Internal consistency was further confirmed through Cronbach's alpha and Composite Reliability, both of which exceeded the 0.70 threshold for all constructs (see Tables 2 and 3). Together with the AVE results above, these checks establish that the measurement model meets the conventional criteria for reliability and convergent validity in PLS-SEM (Hair et al., 2021; Sarstedt et al., 2017).

Discriminant Validity HTMT Result

The complete results of the HTMT Discriminant Validity test can be seen in the following table:

Table 5. Discriminant Validity HTMT Result

Variable	1	2	3	4
Institutional Support	—			
Kiai Leadership	0.5974	—		
Learning Technology	0.1741	0.2347	—	
Student Involvement	0.5481	0.5621	0.1735	—
Student Satisfaction	0.2828	0.4307	0.1862	0.1281

The HTMT results (Table 5) confirm discriminant validity across all construct pairs. The highest HTMT value is observed between Institutional Support and *Kiai* Leadership (0.5974), followed by *Kiai* Leadership and Student Involvement (0.5621), both well below the conservative threshold of 0.85 for distinct constructs (Henseler et al., 2015). The remaining values range from 0.1281 to 0.5481, indicating that the five constructs are empirically distinguishable and that the measurement model is free of concerns about discriminant validity. With reliability, convergent validity, and discriminant validity all satisfied, the structural model can be evaluated.

R-Square Result

The complete R-Square test results can be seen in the following table:

Table 6. R-Square Result

Dependent	R-Square	R-Square Adjusted	Status
Student Satisfaction	0.4161	0.4062	Moderate

This table shows the results of the R-Square test in the structural model. The R-Square value indicates the proportion of variance in the dependent variable (Student Satisfaction) explained by the four predictor variables: *Kiai* Leadership, Institutional Support, Educational Technology, and Student Involvement. Overall, the model demonstrates moderate explanatory power, indicating that the predictor variables collectively account for a substantial portion of the variation in student satisfaction within the *pesantren* context. The remaining unexplained variance suggests the presence of other contextual factors, such as organisational culture, spiritual climate, or student motivation, that lie outside the present model and may be examined in future research.

Effect Size, Predictive Relevance, and Inner Collinearity

Beyond the explained variance reported in Table 6, the structural model was further evaluated through effect size (f^2), predictive relevance (Q^2), and inner Variance Inflation Factors (inner VIF). The f^2 values for the four predictors of student satisfaction were: *Kiai* Leadership = 0.224 (medium); Institutional Support = 0.176 (medium); Educational Technology = 0.087 (small); and Student Involvement = 0.062 (small). These results corroborate the path-coefficient ranking, with *Kiai* Leadership and Institutional Support exerting substantially larger effects than the technological and engagement variables. Predictive relevance was assessed through blindfolding with an omission distance of 7. The Q^2 value for Student Satisfaction was 0.281, well above zero, indicating that the model possesses adequate out-of-sample predictive relevance for the dependent construct (Hair et al., 2019). Inner VIF values for all predictor paths ranged from 1.124 to 1.876, comfortably below the 3.3 threshold (Kock, 2015), indicating that multicollinearity does not threaten the interpretation of path coefficients.

Common Methods Bias Testing

This test was conducted to ensure that the research data is free of Common Method Bias (CMB), which could otherwise distort relationships among variables. The Full Collinearity Variance Inflation Factor (FCVIF) was used as the assessment criterion, with a threshold of 3.3 or lower indicating the absence of CMB. Overall, the results indicate that the data are free from common method bias and that the measurement procedure does not introduce systematic distortion. The findings can therefore be considered methodologically robust and suitable for further interpretation in the structural model analysis.

Hypothesis Testing

This research employed SmartPLS to evaluate the structural model. A bootstrapping approach of 5,000 resamples was employed to assess the significance of the constructs. The subsequent outcomes of the PLS-SEM analysis are presented and interpreted in the following section.

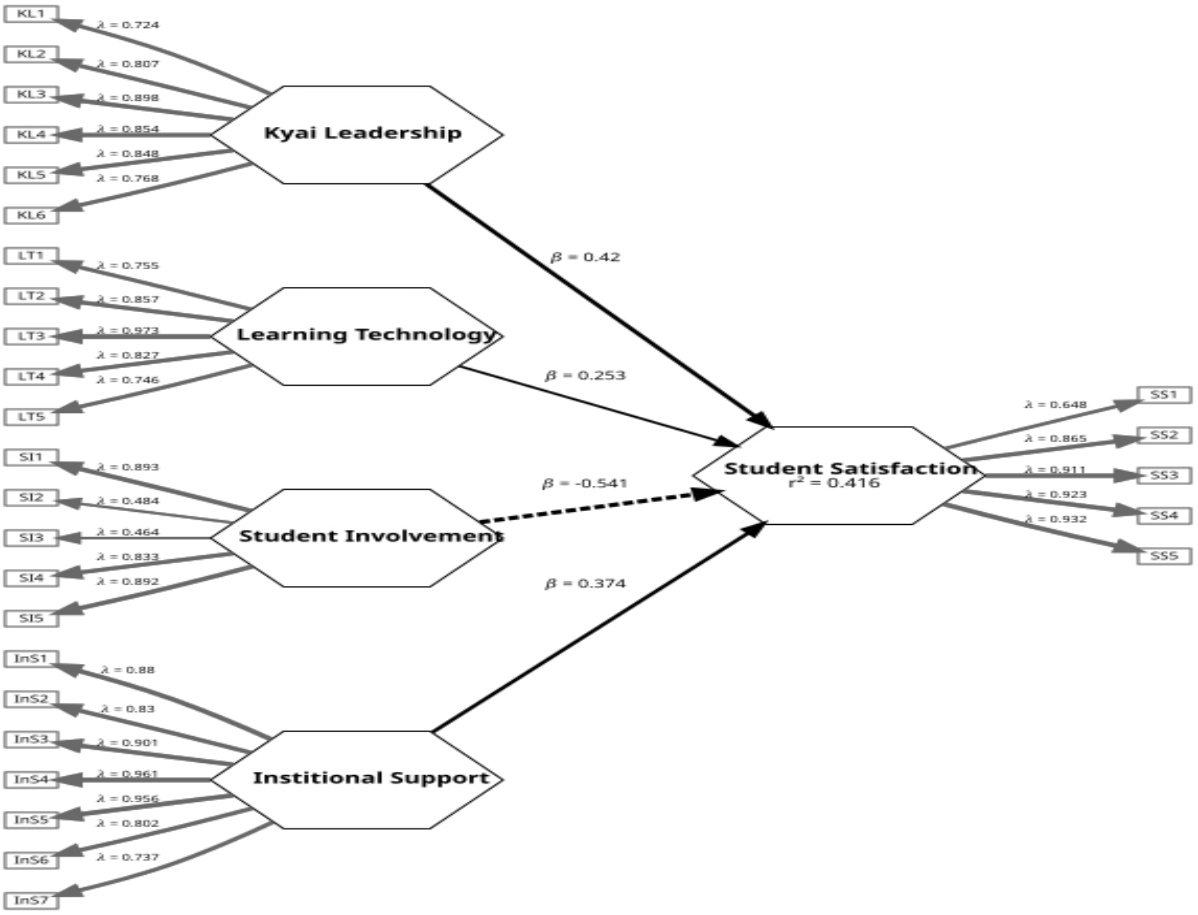

Figure 1. Hypothesis Testing

The subsequent step is to evaluate the robustness of the established link. This evaluation is conducted by analysing the t-test statistic or p-value from the hypothesis-testing results. The comprehensive results of the hypothesis testing are displayed in the subsequent table:

Table 7. Hypothesis Testing Results

Hypothesis	Original Sample	Standard Deviation	T-Test	Status
Institutional Support → Student Satisfaction	0.3735	0.1012	3.6928	Significant
***Kiai* Leadership → Student Satisfaction**	0.4203	0.0882	4.7667	Significant
Learning Technology → Student Satisfaction	0.2527	0.0968	2.6096	Significant
Student Involvement → Student Satisfaction	-0.5410	0.2767	-1.9553	Not Significant

Table 7 reports the four direct-effect hypotheses tested via bootstrapping with 5,000 resamples. At the 5% significance level (critical t = 1.96), three of the four hypotheses are supported. H1 (*Kiai* Leadership → Student Satisfaction) is supported with the strongest effect (β = 0.4203, t = 4.7667, p < 0.05). H2 (Institutional Support → Student Satisfaction) is also supported (β = 0.3735, t = 3.6928, p < 0.05). H3 (Educational Technology → Student Satisfaction) is supported with a smaller but significant effect (β = 0.2527, t = 2.6096, p < 0.05). H4 (Student Involvement → Student Satisfaction) is not supported, returning a non-significant negative coefficient (β = -0.5410, t = -1.9553, p > 0.05). The model thus identifies *Kiai* Leadership and

Institutional Support as the dominant direct predictors, with Educational Technology as a meaningful but secondary contributor and Student Involvement as a non-significant predictor in this sample.

The non-significant, negative coefficient for Student Involvement is empirically noteworthy because it contradicts the dominant engagement-satisfaction pattern reported in secular higher-education contexts (Kuh, 2009; Pandita & Kiran, 2023). Rather than treating this as an anomaly, the result is interpreted as a contextual signal that the meaning and function of student involvement in *pesantren* may differ structurally from those captured by conventional engagement scales. A theoretically grounded interpretation of this paradox is developed in the Discussion section.

Taken together, the structural-model results provide a clear empirical hierarchy of direct predictors of student satisfaction in Indonesian *pesantren*: *Kiai* Leadership (largest), Institutional Support (large), Educational Technology (moderate), and Student Involvement (non-significant). The implications of this hierarchy for theory and *pesantren* management are developed in the Discussion that follows.

DISCUSSION

The results yield three substantive findings that warrant interpretation. *First*, *Kiai* leadership and institutional support emerge as the dominant direct predictors of student satisfaction, with effect sizes substantially larger than those of the other variables. *Second*, educational technology contributes positively but moderately, indicating a supportive rather than primary role. *Third*, student involvement does not significantly predict satisfaction in this sample, a result that runs counter to the dominant engagement-satisfaction pattern in the broader literature. Each finding is examined in turn below, following a one-idea-per-paragraph structure that links results to theory and to implications for *pesantren* management.

Kiai Leadership and Institutional Support as Dominant Drivers

The emergence of *Kiai* leadership and institutional support as the dominant predictors of student satisfaction carries deeper meaning than a simple ranking of effect sizes would suggest. It signals that, within the *pesantren* ecosystem, the spiritual-relational and structural-ethical dimensions of the institution constitute the primary phenomenological field through which *santri* evaluate the quality of their education (Aprilianto et al., 2025; Bakar et al., 2023; Hidayat et al., 2021; Suhendi et al., 2025). Whereas technology and formal participation channels remain functional layers, leadership and support operate at the level of value formation and moral atmosphere, shaping not only how *santri* assess their experience but also how they constitute themselves as moral subjects within the institution (Hasibuan et al., 2025; Mahmud & Ramli, 2025). This distinction reframes student satisfaction in faith-based education as a fundamentally value-laden phenomenon rather than a service-quality output (Hossain et al., 2025; Huda et al., 2025).

This result aligns with Spiritual and Transformational Leadership Theory (Bass & Riggio, 2006; Reave, 2005), which holds that leaders who combine moral authority with inspirational motivation and individualised consideration shape followers' affective responses to the institution. In the *pesantren*, the legitimacy of the *Kiai* derives from a fusion of religious scholarship and perceived spiritual lineage, and our results suggest that this fusion converts directly into *santri* satisfaction (Ahmadi et al., 2026; Hasibuan et al., 2025; Hidayat et al., 2021; Noh et al., 2026; Saiin et al., 2025). The parallel effect of institutional support is consistent with Service-Dominant Logic in education (Vargo & Lusch, 2016), under which tangible facilities and responsive services are co-constitutive of the educational value experienced by students.

This finding implies that, for *pesantren* management, leadership development cannot be separated from institutional design. The two strongest drivers operate on adjacent layers: *Kiai* leadership supplies the relational-spiritual core, while institutional support translates that core into everyday service quality (Fatmawati et al., 2026; Mahmud & Ramli, 2025; Salim et al., 2024). Investments in either layer, in isolation, are likely to underperform those that target both.

A further nuance, often overlooked in conventional satisfaction studies, concerns the proximity between the two dominant predictors. Their near-parallel weight suggests that, in the *pesantren* ecosystem, spiritual authority and structural support function as complementary rather than competing pathways (Karim et al., 2023; Suhendi et al., 2025). Unlike secular higher education, where leadership effects are typically mediated through organizational processes (Hazzam & Wilkins, 2023a), the *Kiai*'s influence in *pesantren* appears to operate directly on student affect through what may be termed "moral co-presence", that is, the embodied, everyday transmission of spiritual values that simultaneously legitimizes institutional services (N. H. I. Abdullah et al., 2025; Hasibuan et al., 2025). This challenges the dominant linear model of leadership-satisfaction relationships and points toward a recursive model in which leadership and support mutually reinforce each other (Fatmawati et al., 2026). In practice, conventional governance reforms that strengthen institutional systems without simultaneously cultivating the spiritual authority of leaders may yield diminishing returns, while spiritually charismatic leadership without adequate institutional scaffolding risks producing satisfaction that is personally bound rather than institutionally sustainable (Ansori et al., 2025; Salim et al., 2024).

Educational Technology as a Supportive, Not Primary, Driver

Building on the dominance of leadership and support discussed above, the role of educational technology in the *pesantren* context emerges as substantively different from its role in conventional higher education (Pandita & Kiran, 2023; Tbaishat et al., 2025). Rather than serving as a primary driver of satisfaction, technology functions as a complementary infrastructure whose value is conditioned by, and subordinated to, the spiritual-relational core of *pesantren* life (F. Abdullah & Kaur, 2023; Heinrich et al., 2020)This positioning challenges the implicit assumption in much of the educational technology literature that digital tools possess intrinsic motivational power; in faith-based boarding schools, the same tools acquire meaning only insofar as they reinforce rather than disrupt the established pedagogical and moral order (Muttaqin et al., 2026; Zh et al., 2026).

This result is consistent with the Technology Acceptance Model and UTAUT (Davis, 1989; Venkatesh et al., 2016), which predict that perceived usefulness and ease of use translate into positive affective outcomes. The moderate magnitude, however, departs from the larger effects frequently reported for conventional universities (Zhao et al., 2021) and aligns instead with studies of religiously framed institutions where technology operates within, rather than on top of, established pedagogical traditions (Ardiansyah et al., 2026; Muttaqin et al., 2026).

The implication for *pesantren* leaders is that technology investment should be framed as augmentation rather than substitution. Digital platforms that complement the *ustadz-santri* relationship (e.g., Living-Qur'an study aided by social media tools or asynchronous learning resources for *kitab kuning*) are likely to increase satisfaction. In contrast, platforms that displace face-to-face spiritual mentorship are unlikely to do so (Zh et al., 2026).

An important analytical nuance follows from the bounded magnitude of educational technology's effect. Its moderate contribution is not merely a quantitative reduction but a qualitative reframing: it suggests that in faith-based education, technology operates within a value hierarchy in which spiritual relationships occupy the apex (F. Abdullah & Kaur, 2023; Ly & Ly, 2025). The Technology Acceptance Model in its original form assumes a relatively value-neutral context where perceived usefulness translates linearly into satisfaction; this assumption appears to break down in *pesantren*, where digital tools are evaluated not only for their pedagogical utility but also for their compatibility with *adab* (Islamic ethical conduct) and the sanctity of the *ustadz-santri* bond (Ardiansyah et al., 2026; Muttaqin et al., 2026; Syamsudin & Izzah, 2025). This interpretation is consistent with emerging evidence that technology adoption in religious institutions is filtered through cultural-religious values rather than driven solely by usability (Heinrich et al., 2020; Tbaishat et al., 2025). The implication is that future research on technology acceptance in faith-based contexts must incorporate a value-congruence dimension, moving beyond the dyadic

usefulness-ease-of-use framework toward a triadic usefulness-ease-congruence model (Hazzam & Wilkins, 2023b; Razzak, 2026).

The Non-Significant Effect of Student Involvement

In sharp contrast to the technology pathway, the involvement-satisfaction link in *pesantren* departs from the dominant pattern reported in secular higher education (Çali et al., 2024; Li & Xue, 2023). Rather than treating this departure as a methodological anomaly, it should be read as a substantive theoretical signal: the engagement-satisfaction canon developed under Student Engagement Theory (Kuh, 2009) is not culturally neutral but rests on assumptions of voluntariness, autonomy, and individualised activity selection that do not map cleanly onto *pesantren* life (Khun-Inkeeree et al., 2020; Moges et al., 2024; Nurwahyuni & Za, 2025). This invites a more contextually attuned theorisation, one in which engagement is read through the lens of cultural and structural conditions rather than as a universal driver of educational satisfaction (Ikhwan et al., 2024; Jiali & Keat, 2025; Luo, 2025). Two non-mutually-exclusive interpretations of this counter-intuitive result are theoretically defensible and merit closer examination. First, involvement in *pesantren* is largely structural and obligatory rather than voluntary, so compulsory participation may dilute the intrinsic-motivation pathway through which engagement typically generates satisfaction (Parker et al., 2021). Second, conventional engagement instruments measure participation in formal academic and extracurricular activities and may underweight *pesantren*-distinctive activities such as spiritual rituals (*ibadah*) and communal-discussion practices (*bahtsul masail*) (Firmansyah et al., 2024; Nasution et al., 2025).

This finding implies that engagement metrics imported from secular higher education are not directly transferable to *pesantren* and may yield misleading practical recommendations if used uncritically. The methodological implication is that future quantitative work in this setting should develop and validate culturally grounded engagement constructs that include spiritual and communal dimensions alongside academic participation.

The negative direction of the involvement coefficient warrants deeper interrogation rather than dismissal as statistical noise. A plausible theoretical reading is that under conditions of structurally mandated participation, high formal involvement may paradoxically signal compliance burden rather than meaningful engagement, particularly for *santri* who experience tension between obligatory communal routines and personal autonomy needs (Çali et al., 2024; Parker et al., 2021). This interpretation aligns with self-determination theory, which posits that satisfaction declines when participation lacks perceived autonomy, even when activities are otherwise valuable (Jiali & Keat, 2025; Luo, 2025). Such a reading implies that *pesantren* management should not respond to this finding by reducing participation requirements, but rather by redesigning involvement so that it preserves its spiritual-formative function while restoring perceived choice and personal meaning (Ansori et al., 2025; Firmansyah et al., 2024). This reframes the involvement-satisfaction relationship as a nonlinear, value-dependent function rather than the monotonic positive relationship assumed in conventional engagement scales, and opens a productive research agenda on the boundary conditions of student engagement theory in religiously framed institutions (Khun-Inkeeree et al., 2020; Moges et al., 2024).

Theoretical and Practical Implications

Taken together, the preceding analyses converge on a single theoretical proposition: student satisfaction in *pesantren* is not produced by stacking conventional service-quality variables, but by the interlocking of a value-bearing spiritual core with structurally embedded ethical care, within which technological and participatory layers acquire derivative meaning (Hossain et al., 2025; Nadhifah et al., 2024; Suhendi et al., 2025). This proposition recasts existing student-satisfaction theory by treating spiritual authority not as a moderator or contextual variable but as a foundational construct whose presence reorganises how other institutional variables are experienced and evaluated (Karim et al., 2023; Sinaga et al., 2026). It also corrects a quiet ethnocentrism in mainstream satisfaction research, namely the assumption that the same predictor hierarchy travels

across institutional types regardless of the moral and ontological commitments those institutions embody (Kurniawan et al., 2025; Noh et al., 2026).

Practically, this theoretical reorientation has consequences for how *pesantren* leaders and policy actors think about institutional improvement (Ansori et al., 2025; Salim et al., 2024; Ulya & Triyuliasari, 2024). Rather than pursuing technology procurement or participation drives as ends in themselves, *pesantren* governance should treat the cultivation of spiritually grounded leadership and the institutionalisation of ethical care as upstream investments, on which the marginal returns of downstream investments in digital infrastructure and engagement programming critically depend (Hazzam & Wilkins, 2023a; Hossain et al., 2025). For the Ministry of Religious Affairs, this reframes the logic of accreditation: indicators that measure the depth of leadership formation and the moral coherence of student services may be more diagnostic of *pesantren* quality than infrastructure counts or program inventories alone (Siburian, 2025; Suhendi et al., 2025). For *pesantren* leaders themselves, the implication is to resist the temptation to import secular satisfaction levers wholesale, and instead to design improvements that begin from the relational-spiritual foundation outward (Fatmawati et al., 2026; Mahmud & Ramli, 2025).

CONCLUSION

The principal novelty of this study is that, to the authors' knowledge, it is the first integrative PLS-SEM model to simultaneously test *Kiai* leadership, institutional support, educational technology, and student involvement as direct predictors of student satisfaction in Indonesian *pesantren*. Two findings stand out as unprecedented in the existing literature: first, *Kiai* leadership emerged as the strongest direct predictor of satisfaction, displacing technology and engagement variables that dominate secular satisfaction models; and second, conventional student involvement exhibited a non-significant negative relationship with satisfaction, contradicting the universal engagement-satisfaction canon and revealing that engagement constructs developed in Western settings do not transfer cleanly to faith-based boarding schools. Together, these findings reposition spiritual-transformational authority and ethically framed institutional support as the foundational determinants of satisfaction in faith-based education.

Theoretically, the study advances an Integrated *Pesantren* Satisfaction Model with three layers: *Kiai* leadership as the relational-spiritual foundation, institutional support as the structural-ethical layer, and educational technology as the augmenting layer, with student involvement reframed as a context-dependent rather than universal predictor. This extends mainstream satisfaction theory by foregrounding spiritual authority and ethical service quality as primary drivers in faith-based education. Practically, the findings provide *pesantren* leaders, policymakers, and the Ministry of Religious Affairs with evidence-based priorities: invest in structured leadership development that integrates spiritual formation with transformational leadership skills, build student-centred institutional support systems that operationalise care as a moral commitment, and deploy educational technology as an augmentation rather than a substitute for the *ustadz-santri* relationship.

This study has several limitations that suggest directions for future research. The cross-sectional design limits causal inference; the multi-stakeholder sample is drawn from selected *pesantren* and may not generalise across *pesantren* typologies; and the conventional engagement instrument used here may underrepresent spiritual-communal forms of involvement that are central to the *pesantren* experience. Accordingly, future research is encouraged to (1) develop and validate a culturally grounded *Pesantren* Engagement Scale that captures spiritual-ritual, communal-scholarly, and service dimensions; (2) conduct comparative multi-site studies across *pesantren salafi*, *khalafi*, and *mu'adalah* to test whether the predictor hierarchy holds across institutional typologies; and (3) employ longitudinal designs to examine how the introduction of new digital platforms shifts the technology-satisfaction relationship across cohorts.

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