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The Impact of Technology Integration in Islamic Religious Education on Students' Learning Motivation in Schools/Madrasahs in Bandung

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Abstract: This study aims to analyse the influence of technology utilisation on students' learning motivation in Islamic Religious Education (IRE) at the Madrasah Ibtidaiyah (MI) or elementary school (SD) level in the City and Regency of Bandung. Although digital transformation in the education sector continues to evolve, empirical studies that specifically highlight IRE learning at the primary level remain limited. This study offers a novel quantitative contribution by focusing on IRE learning at the primary level, an area that remains underexplored in the literature on educational technology integration. The study aims to fill this gap by employing a predictive and explanatory analysis approach using the Structural Equation Modelling–Partial Least Squares (SEM-PLS) method. A quantitative approach was employed, utilising purposive sampling, with 57 IRE teachers serving as respondents. Data were collected through a structured questionnaire and analysed using SmartPLS version 3.2.9. The outer model results show that all indicators meet the criteria for validity and reliability. The inner model reveals that technology utilisation has a significant effect on learning motivation, as indicated by a path coefficient of 0.709 and an R-squared value of 0.503. The Q^2 value of 0.503 also reflects strong predictive relevance. These findings contribute academically by providing empirical evidence of the positive role of technology integration in enhancing student engagement, fostering positive perceptions of religious content, and supporting consistent participation in the learning process. This suggests that digital technology can serve as a strategic tool in creating more meaningful learning experiences within the context of elementary-level religious education.

Keywords: Islamic Religious Education, educational technology, learning motivation, MI/SD students, SEM-PLS

Abstrak: *Penelitian ini bertujuan menganalisis pengaruh pemanfaatan teknologi dalam pembelajaran Pendidikan Agama Islam (PAI) terhadap motivasi belajar siswa pada jenjang Madrasah Ibtidaiyah (MI) atau Sekolah Dasar*

(SD) di wilayah Kota dan Kabupaten Bandung. Meskipun transformasi digital dalam dunia pendidikan terus berkembang, kajian empiris yang secara khusus menyoroti pembelajaran PAI di tingkat dasar masih terbatas. Penelitian ini menawarkan kontribusi kuantitatif yang baru dengan memfokuskan kajian pada pembelajaran PAI di tingkat dasar, suatu area yang masih kurang tereksplorasi dalam literatur integrasi teknologi pendidikan. Studi ini berupaya mengisi celah tersebut dengan pendekatan analisis prediktif dan eksplanatif melalui metode Structural Equation Modeling–Partial Least Squares (SEM-PLS). Pendekatan kuantitatif digunakan dengan teknik purposive sampling, melibatkan 57 guru PAI sebagai responden. Pengumpulan data dilakukan melalui kuesioner terstruktur dan dianalisis menggunakan SmartPLS versi 3.2.9. Hasil outer model menunjukkan bahwa seluruh indikator memenuhi kriteria validitas dan reliabilitas. Inner model memperlihatkan bahwa pemanfaatan teknologi berpengaruh signifikan terhadap motivasi belajar, ditunjukkan oleh nilai koefisien jalur sebesar 0,709 dan nilai R2 sebesar 0,503. Nilai Q^2 sebesar 0,503 juga mencerminkan relevansi prediktif yang baik. Temuan ini memberikan kontribusi akademik dengan menghadirkan bukti empiris tentang peran positif integrasi teknologi dalam meningkatkan keterlibatan belajar siswa, persepsi positif terhadap materi keagamaan, serta konsistensi partisipasi mereka dalam proses pembelajaran. Hal ini mengindikasikan bahwa teknologi digital mampu menjadi sarana strategis dalam membangun pengalaman belajar yang lebih bermakna pada konteks pendidikan agama di tingkat dasar.

Kata Kunci: *Pendidikan Agama Islam, teknologi pembelajaran, semangat belajar, siswa MI/SD, SEM-PLS*

INTRODUCTION

Islamic Religious Education (IRE) plays a central role in shaping students' character, morals, and ethics. Its function is not limited to delivering religious material, but also serves as a medium for the internalisation of Islamic values, encompassing spiritual, social, and intellectual dimensions. In the era of globalisation and technological disruption, IRE faces increasingly complex challenges, particularly in addressing moral degradation and the identity crisis among younger generations. The development of information and communication technology (ICT) has transformed the learning paradigm across all levels of education, including IRE. The use of digital media, learning applications, interactive videos, and e-learning platforms creates opportunities to enrich teaching methods and improve the quality of religious education. Technology provides a powerful means of presenting material engagingly and contextually. However, it also presents challenges such as infrastructure readiness, teacher competence, and ethical issues related to the use of digital media.[1]

Advancements in ICT have reshaped learning approaches in all educational contexts, including Islamic Religious Education. The integration of digital media, learning applications, interactive videos, and e-learning platforms provides opportunities to enhance instructional strategies and elevate the quality of religious learning. Technology serves as an effective tool for delivering

[1] Simin Ghavifekr and Wan Athirah Wan Rosdy, "Teaching and Learning with Technology: Effectiveness of ICT Integration in Schools.," *International journal of research in education and science* 1, no. 2 (2015): 175–191.

material in ways that are both relevant and appealing. Still, it also presents challenges such as infrastructure readiness, teacher digital competence, and ethical considerations in the use of online media.[2] The integration of digital technology into religious education enables the delivery of content in a more interactive and relevant manner, allowing students to relate religious values to the realities of modern life. The use of ICT such as e-learning platforms, multimedia resources, and mobile applications has been shown to increase engagement, deepen conceptual understanding, and foster critical thinking skills when designed in alignment with cultural values and the demands of twenty-first-century learning.[3]

Previous studies have generally been descriptive in nature and have not provided a clear picture of the extent to which technology use influences learning outcomes in Islamic Religious Education. This study offers a new contribution through a quantitative analysis using the SEM-PLS approach, with a specific focus on the Madrasah Ibtidaiyah or elementary school level. This level has rarely been the primary focus in discussions of technology integration within religious education. The research focuses on measuring the direct influence of technology use on teachers' perceptions of students' learning motivation. This approach differs from previous studies, which have tended to focus only on describing the effectiveness of media or teaching methods. The findings are expected to provide relevant empirical contributions to the development of digital-based Islamic Religious Education practices at the primary level within the context of contemporary educational transformation.

This research aims to assess the impact of technology use in IRE on students' learning motivation at the Madrasah Ibtidaiyah (elementary school) level. The focus is directed toward a quantitative assessment using the SEM-PLS method to examine the direct effect of technology use based on teacher perceptions. The results are expected to offer empirical contributions relevant to developing digital-based IRE learning strategies for the primary level.

To optimise data analysis, SmartPLS version 3.2.9 was employed. SmartPLS was selected due to several advantages, including the ability to examine direct relationships between variables, the absence of strict assumptions regarding data distribution, effectiveness with relatively small

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[2] Maryam Esfandiari et al., "Trends in Digital Technologies to Address Children's Online Safety Education: A Systematic Scoping Review," *International Journal of Educational Research Open* 9 (2025): 100462.

[3] Soleh Hasan Wahid, "Exploring the Intersection of Islam and Digital Technology: A Bibliometric Analysis," *Social Sciences & Humanities Open* 10 (2024): 101085; Amine Dehbi et al., "Towards Technology-Enhanced Learning: A Novel Machine Learning Approach in Education 4.0," *Available at SSRN 4974380* (n.d.).

sample sizes, and the capacity to analyse non-normally distributed data. [4] Based on the above discussion, the conceptual framework of this study is structured as follows:

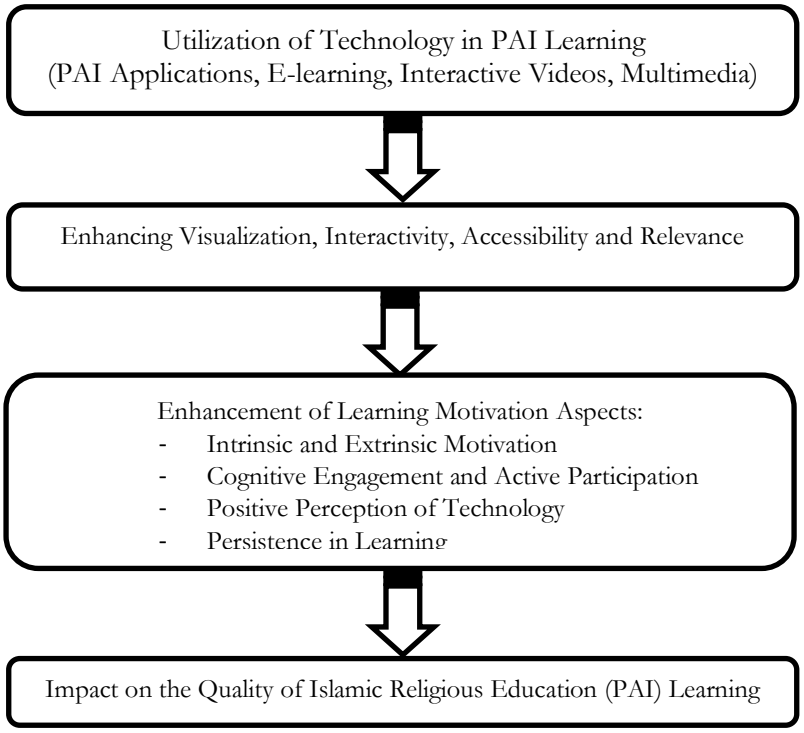

Figure 1. Conceptual Framework of the Study

This approach aims to generate empirical insights into the integration of technology within primary-level Islamic Religious Education (PAI) and inform the formulation of strategic efforts to enhance the quality of technology-based religious instruction.

LITERATURE REVIEW

Technology Integration in Islamic Religious Education

The integration of technology into Islamic Religious Education (IRE) has garnered increasing attention over the past two decades, coinciding with the rapid development of digital devices and internet connectivity. This shift has impacted how teachers and students engage with subject matter, access learning

[4] Lenni Khotimah Harahap and M Pd, "Analisis SEM (Structural Equation Modelling) Dengan SMARTPLS (Partial Least Square)," *Fakultas Sains Dan Teknologi Uin Walisongo Semarang* 1, no. 1 (2020): 1–11.

resources, and utilise instructional media. Several studies have shown that technology use can expand access to religious knowledge, promote active student engagement, and enhance instructional quality. Sagiman, Sahono, and Danim (2023) emphasise that digital tools in IRE support independent learning, promote autonomous thinking, and improve academic performance.[5] Ariza and Afifah (2024) report that technology enables teachers to conduct more comprehensive assessments that cover cognitive, affective, and psychomotor domains, while also facilitating efficient evaluation of students' attitudes, interests, and emotions.[6]

In classroom practice, Siringoringo and Alfaridzi (2024) show that the use of instructional videos and Android-based applications significantly improves students' comprehension of IRE content, particularly at the elementary level.[7] Similarly, Bukhori and Rahmad Hakim (2025) highlight the effectiveness of technology-based learning strategies such as Qur'an applications, online learning platforms, and flipped classroom models in enhancing interaction, accelerating access to religious information, and deepening spiritual understanding. Technology use in IRE also accommodates diverse learning styles, providing teachers with greater flexibility to deliver materials that match students' needs.[8]

In Bandung, the implementation of technology in IRE exhibits considerable variation. Schools and madrasahs in urban areas generally have better access to devices and stable internet connections, while those in suburban or rural areas face infrastructure challenges. These conditions encourage teachers to innovate and maximise the use of available resources. Local observations indicate that platforms such as Google Classroom and Quizizz are among the most frequently used in digital-based IRE due to their accessibility and interactive features.

Impacts on Learning, Motivation, and 21st Century Skills

[5] Sagiman Sagiman, Bambang Sahono, and Sudarwan Danim, "Development of a Blended Learning Model Assisted by Google Classroom to Enhance Learning Independence and Achievement in the Computer Applications Course," *Belajea: Jurnal Pendidikan Islam* 8, no. 2 (2023).

[6] Nurul Ariza and Qorina Khoirul Afifah, "Penggunaan Teknologi Dalam Pengembangan Asesmen Pembelajaran Pendidikan Agama Islam," *Belajea: Jurnal Pendidikan Islam* 9, no. 1 (2024): 25–44.

[7] Ryan Gabriel Siringoringo and Muhamad Yanuar Alfaridzi, "Pengaruh Integrasi Teknologi Pembelajaran Terhadap Efektivitas Dan Transformasi Paradigma Pendidikan Era Digital," *Jurnal Yudistira: Publikasi Riset Ilmu Pendidikan Dan Bahasa* 2, no. 3 (2024): 66–76.

[8] Bukhori Bukhori and Rahmad Hakim, "Islamic Religious Education Teachers' Strategies in Utilising Smartphones at Sumber Harta State High School, Musi Rawas Regency, South Sumatra Province," *Belajea: Jurnal Pendidikan Islam* 10, no. 1 (2025): 183–202.

Technology integration in IRE impacts not only cognitive learning outcomes but also contributes to the development of essential twenty-first-century skills. The use of digital media, when combined with culturally relevant pedagogies, can strengthen collaboration, creativity, and critical thinking, while also enhancing students' motivation to learn.[9] Miftahul Huda (2024) notes that digital platforms help connect abstract religious concepts to students' real-life contexts, making learning more relevant and meaningful.[10]

Teachers play a pivotal role in maximising these benefits. Cattaneo et al. (2025) found that personal factors such as optimism toward technology and mastery of relevant technical skills are significant predictors of effective technology use in teaching.[11] This underscores the importance of both technical and pedagogical readiness among teachers. In Bandung's schools and madrasahs, teacher readiness remains a crucial factor, particularly in terms of professional training and sustained support for integrating technology into IRE.[12]

Research Gap and Study Contribution

Although the literature widely acknowledges the benefits of technology in IRE, most studies remain descriptive in nature and focus primarily on secondary or higher education. Empirical research that directly measures the influence of technology use on students' learning motivation in primary and secondary IRE contexts in Bandung is still scarce. Furthermore, few studies have employed advanced statistical approaches, such as Structural Equation Modelling–Partial Least Squares (SEM-PLS), to predict the relationship between technology utilisation and learning motivation quantitatively.

The present study addresses this gap by examining the direct relationship between technology integration and learning motivation among

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[9] Vishnu Lal, Vishvajit Kumbhar, and G Varaprasad, "Novel Extension of the UTAUT Model to Assess E-Learning Adoption in Higher Education Institutes: The Role of Study-Life Quality.," *Knowledge Management & E-Learning* 16, no. 1 (2024): 42–64; Quoc Anh Vuong et al., "Teachers' Perspectives on the Application of Technology in Mathematics Education in Primary Schools: A Dataset from Vietnam," *Data in Brief* 60 (2025): 111473.

[10] Miftachul Huda et al., "Islamic Religious Education Learning Media in the Technology Era: A Systematic Literature Review," *At-Tadzkir: Islamic Education Journal* 3, no. 2 (2024): 83–103.

[11] Alberto Cattaneo et al., "The Role of Personal and Contextual Factors When Investigating Technology Integration in General and Vocational Education," *Computers in Human Behavior* 163 (2025): 108475.

[12] Sutiah and Supriyono, "Enhancing Online Learning Quality: A Structural Equation Modeling Analysis of Educational Technology Implementation during the COVID-19 Pandemic," *Telematics and Informatics Reports* 16 (2024): 100175, https://www.sciencedirect.com/science/article/pii/S2772503024000616.

students in schools and madrasahs in Bandung. The findings are expected to provide strong empirical evidence and serve as a reference for developing practical, culturally relevant, and locally adaptable technology-based IRE strategies.

RESEARCH METHOD

This study employed a quantitative approach, utilising a survey method and Structural Equation Modelling with Partial Least Squares (SEM-PLS) as the analytical technique. SEM-PLS is a multivariate analysis method that has gained increasing attention in social and educational research due to its capacity to examine complex causal relationships among latent variables. Ghozali and Latan (2020) emphasise that SEM-PLS is particularly appropriate for predictive and exploratory models, especially when all indicators within a construct are reflective. Reflective indicators represent the latent variable and are assumed to be intercorrelated, making them relevant for measuring perceptions, attitudes, or behavioural intentions —central to studies on technology and education.[13]

SEM-PLS analysis comprises two primary components: the measurement model, which represents latent variables through their corresponding manifest indicators, and the structural model, which illustrates the relationships among latent constructs. The choice of SEM-PLS was made to enable an objective and measurable examination of inter-variable relationships through statistical analysis of numerical data. Creswell (2017) affirms that a quantitative approach aims to test theories by measuring the relationships among empirically observable variables.[14]

The primary focus of this study was to investigate the impact of technology use on students' learning motivation in Islamic Religious Education (IRE) at the Madrasah Ibtidaiyah (MI) or elementary school level within the Bandung City and Regency areas. The independent variable (X) in this study was the utilisation of technology in IRE instruction, measured by three indicators: the frequency of technology use, teachers' readiness to implement technology, and perceptions of the effectiveness of technology in the learning process. The dependent variable (Y) was students' learning motivation, measured through indicators such as persistence in attending lessons and responses to technology-based learning challenges. All indicators were measured using a four-point

[13] Imam Ghozali and Hengky Latan, "Partial Least Squares: Konsep, Teknik Dan Aplikasi Menggunakan SmartPLS 3.0 Untuk Penelitian Empiris (Vol. 2)," *Universitas Diponegoro* 2 (2020).

[14] H U Chih-Pei and Yan-Yi Chang, "John W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches," 2017.

Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1), with no neutral option, to minimise central tendency bias.[15]

The data used in this study were quantitative, obtained from both primary and secondary sources.[16] Primary data were collected through questionnaires distributed to 57 IRE teachers in the Bandung City and Regency areas, who served as respondents. Secondary data were obtained from a literature review and interviews with relevant informants. The questionnaire instrument was validated by two subject matter experts in Islamic education and educational technology. The questionnaires were distributed online via Google Forms to enable a broader and more efficient reach among respondents. Data collection was conducted in two stages: a literature review to strengthen the theoretical foundation, followed by a questionnaire to gather empirical data. Data analysis was conducted in two stages. Descriptive analysis was used to describe data characteristics, including means, medians, and response distributions. Inferential analysis was then performed using Partial Least Squares (PLS) to examine the relationships between constructs and to measure the strength and significance of their effects.[17]

The PLS-SEM method was chosen based on the adequacy of the available sample size. Hair et al. (2022) affirm that PLS-SEM does not require normally distributed data and remains capable of producing robust parameter estimates, making it suitable for studies with small sample sizes.[18] Ringle, Sarstedt, and Straub (2023) note that this method can still yield valid results with a sample of approximately 50 respondents, provided the model is not overly complex.[19] This is supported by a statistical power analysis using G*Power (Hyun Kang, 2021), which indicates that for models with moderate effect sizes and up to five predictors, a sample size of 50 to 60 is sufficient to achieve a statistical power of 0.80.[20]

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[15] Azwar Saifudin, "Metode Penelitian.Yogyakarta: Pustaka Pelajar" (Hal, 2016).

[16] D. Sugiono, P., Metode Penelitian Kuantitatif, Kualitatif, Dan R&D, CV. Alfabeta, Bandung, edisi ke-3. (Bandung: Alfabeta, 2017).

[17] Myung-Seong YIM, "A Study on Factor Analytical Methods and Procedures for PLS-SEM (Partial Least Squares Structural Equation Modeling)," *The Journal of Industrial Distribution & Business* 10, no. 5 (2019): 7–20.

[18] Joseph Hair and Abdullah Alamer, "Partial Least Squares Structural Equation Modeling (PLS-SEM) in Second Language and Education Research: Guidelines Using an Applied Example," *Research Methods in Applied Linguistics* 1, no. 3 (2022): 100027.

[19] Joe Jr et al., *Advanced Issues in Partial Least Squares Structural Equation Modeling (2nd Ed.)*, 2023.

[20] Hyun Kang, "Sample Size Determination and Power Analysis Using the G* Power Software," *Journal of educational evaluation for health professions* 18 (2021).

The model in this study consisted of two latent constructs, each with three indicators, and one structural path linking the exogenous and endogenous constructs. Based on the 10 Times Rule by Hair et al. (2022), the minimum required sample is ten times the highest number of indicators within a construct or ten times the number of structural paths pointing to a construct, whichever is greater. With a maximum of three indicators and one structural path, the minimum sample size needed was 30 respondents.[21] This study utilised 57 respondents, thus exceeding the minimum requirement and deemed valid for analysis using the SEM-PLS approach via SmartPLS version 3.2.9.

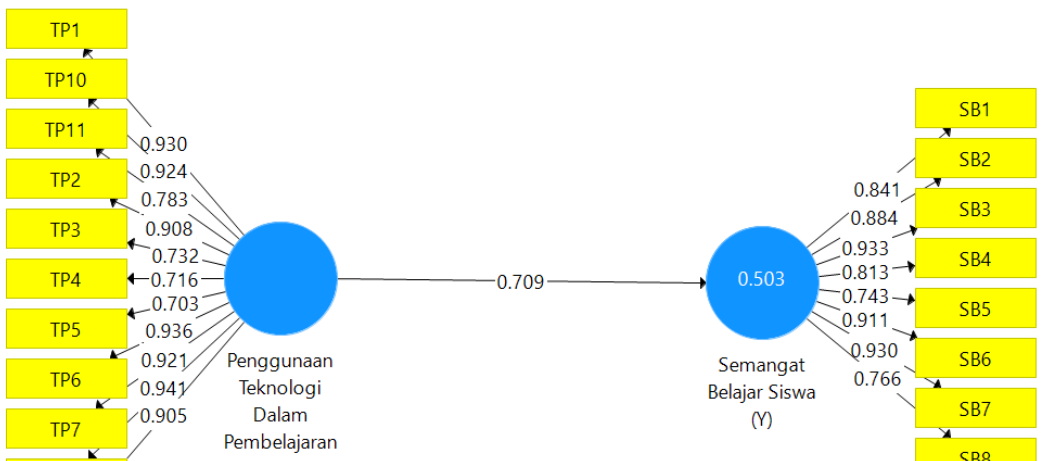
The analysis was conducted in three stages: evaluation of the measurement model (outer model), the structural model (inner model), and the significance of paths (bootstrapping). The outer model evaluation included assessments of convergent validity, discriminant validity, and reliability, indicated through factor loadings and composite reliability values. The inner model was used to test the strength of relationships among constructs, while bootstrapping was conducted to assess the significance of effects based on t-statistics and p-values.[22]

RESULTS AND DISCUSSIONS

The majority of respondents hold a Bachelor's degree (56%) and a Master's degree (44%). In terms of gender, respondents are predominantly male (53%). Most respondents fall within the age range of 31–40 years (33%), and a significant proportion have more than 15 years of teaching experience (40%). Overall, the respondents are well-educated, in their productive age, and possess substantial teaching experience.

The research findings illustrate the factors influencing students' learning motivation in relation to the use of technology in Islamic Religious Education (PAI) learning. Data from the questionnaires completed by PAI teachers in Bandung City and Regency were processed using the SmartPLS software version 3.2.9. The model illustrating the relationship between the independent and dependent variables is presented in Figure 2.

Figure 2. Variable Relationship Model



Evaluation of the Measurement Model (Outer Model)

At this stage, validity and reliability testing were conducted. Validity testing ensures that the instrument used is truly capable of measuring what it is intended to measure and that each indicator or item in the questionnaire accurately represents the variable under investigation. Convergent validity was assessed to determine whether the indicators within a single variable are strongly correlated with one another. Discriminant validity testing was carried out to ensure that the indicators of one variable do not overlap with those of another variable.[23] Table 1 presents the outer loading values (convergent validity):

Table 1. Convergent Validity Model

No	Convergent Validity		
	Indicator	Loading Factor	Validity
1	TP1	0.930	Valid
	TP2	0.908	Valid

[23] Ejike Edeh, Wen-Juo Lo, and Jam Khojasteh, "Review of Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook: By Joseph F. Hair Jr., G. Tomas M. Hult, Christian M. Ringle, Marko Sarstedt, Nicholas P. Danks, Soumya Ray. Cham, Switzerland: Springer," *Structural Equation Modeling: A Multidisciplinary Journal* 30 (September 9, 2022): 1–5.

	TP3	0.732	Valid
	TP4	0.716	Valid
	TP5	0.703	Valid
	TP6	0.936	Valid
	TP7	0.921	Valid
	TP8	0.941	Valid
	TP9	0.905	Valid
	TP10	0.924	Valid
	TP11	0.783	Valid
2	SB1	0.841	Valid
	SB2	0.884	Valid
	SB3	0.933	Valid
	SB4	0.813	Valid
	SB5	0.743	Valid
	SB6	0.911	Valid
	SB7	0.930	Valid
	SB8	0.766	Valid

Source: Data processing from SmartPLS output

Based on Figure 2 and Table 1, all construct variables demonstrate valid outer loading values, ranging from 0.73 to 0.94. According to Ghozali and Latan (2020), an indicator is considered valid if it has an outer loading value of at least 0.70.[24]

The next step involved testing discriminant validity by examining the Average Variance Extracted (AVE) values. In the SmartPLS application, AVE values are obtained through the Construct Reliability and Validity output. A construct is considered to have good validity if its AVE value is equal to or greater than 0.60.[25]

Table 3. Loading, Rho, CR, and AVE

Variabel	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Students' Learning	0,964	0,981	0,969	0,739

[24] Ghozali and Latan, "Partial Least Squares: Konsep, Teknik Dan Aplikasi Menggunakan SmartPLS 3.0 Untuk Penelitian Empiris (Vol. 2)."

[25] Edeh, Lo, and Khojasteh, "Review of Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook: By Joseph F. Hair Jr., G. Tomas M. Hult, Christian M. Ringle, Marko Sarstedt, Nicholas P. Danks, Soumya Ray. Cham, Switzerland: Springer."

Motivation (Y)				
The Utilisation of Technology in PAI Learning (X)	0,948	0,968	0,956	0,732

The following is a histogram of Construct Reliability and Validity.

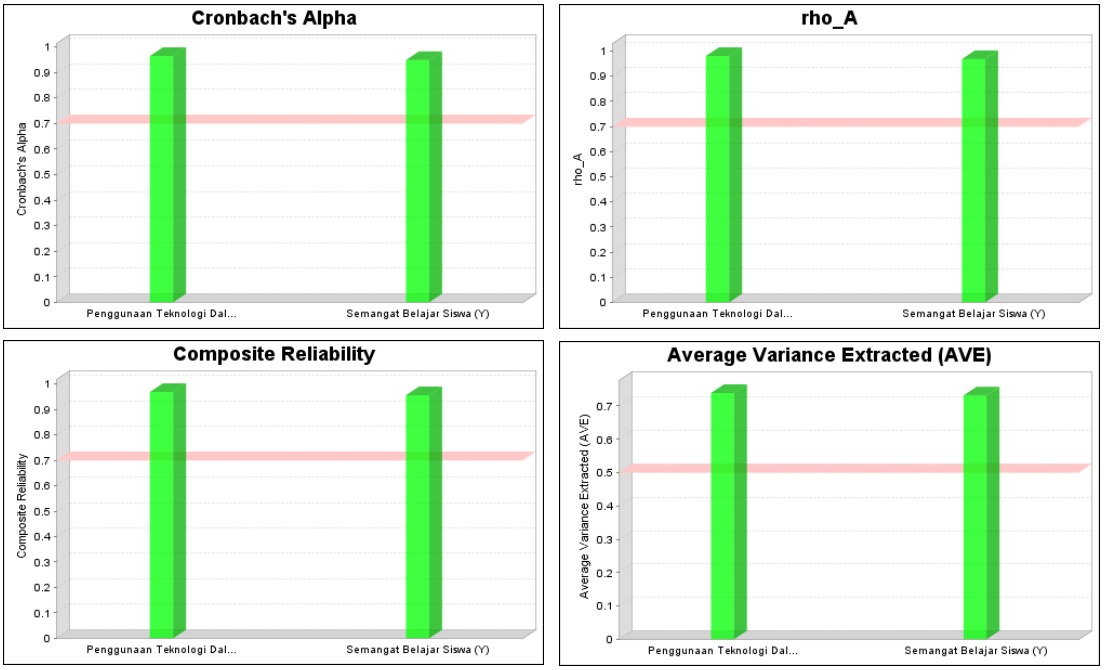


Figure 3. Histogram Construct Reliability and Validity

Based on Table 3 and Figure 3, the Cronbach's Alpha value for the variable of technology utilisation in Islamic Religious Education (IRE) learning (X) is 0.948, while the value for the variable of students' learning motivation (Y) is 0.964. Both values exceed the minimum threshold of 0.60, indicating a high level of internal consistency within the questionnaire instrument. These results confirm that each construct has been accurately measured by its respective indicators, as evidenced by the results of the discriminant validity test.

The next step was to conduct a reliability test by assessing the consistency of respondents' answers through the Composite Reliability values. A variable is considered to possess high reliability if its Composite Reliability

exceeds 0.70. [26]According to Table 3, the composite reliability values for variables X and Y are 0.956 and 0.969, respectively. Both values surpass the minimum required threshold, indicating that the instrument used demonstrates strong stability and consistency in measuring the intended constructs.

Structural Model Evaluation (Inner) Model

After the evaluation of the outer model indicated valid and reliable results, the next step is to evaluate the inner model (structural model). The inner model explains the influence and relationships among the latent variables, which are constructed based on the research focus. In evaluating the inner model, several key indicators are analysed, including the R-squared (R^2) value, Path Coefficient, Predictive Relevance (Q^2), Goodness of Fit, and hypothesis testing. These values are obtained through bootstrapping analysis using the SmartPLS software.

The analysis of the coefficient of determination (R^2) is used to measure the extent to which the variable of technology use in PAI (Islamic Religious Education) learning can explain the variation in Students' motivation to learn. The interpretation of the R^2 value follows the categories proposed by Nana S (2019): 0.00–0.199 indicates a very weak relationship, 0.20–0.399 is weak, 0.40–0.599 is moderate, 0.60–0.799 is strong, and 0.80–1.000 is very strong.[27] Therefore, the higher the R^2 value, the greater the independent variable's contribution to explaining the dependent variable in the research model.

Table 4. R^2 Results

Rated Aspect	R Square	R Square Adjusted
Students' Learning Motivation (Y)	0,503	0,494

The R^2 value presented in Table 4 shows a coefficient of 0.494, which falls into the moderate category based on the interpretation of correlation strength. This value indicates that the use of technology in Islamic Religious Education (IRE) accounts for 50.3 per cent of the variation in learning motivation among elementary and Madrasah Ibtidaiyah students in Bandung City and Regency. The remaining 49.7 per cent is influenced by other factors not examined in this study. The result affirms the significance of technology in

[26] Rex B Kline, *Principles and Practice of Structural Equation Modeling* (Guilford publications, 2023); Vuong et al., "Teachers' Perspectives on the Application of Technology in Mathematics Education in Primary Schools: A Dataset from Vietnam."

[27] Nana Syaodih Sukmadinata, *Metode Penelitian Pendidikan*, 12th ed. (Bandung: PT Remaja Rosdakarya Bandung, 2019).

shaping motivation, while also suggesting that additional contributions may arise from personal, social, or cultural dimensions.

A study by Cattaneo et al. (2025), involving 1,660 teachers across 106 secondary schools in Switzerland, indicates that personal factors such as teachers' optimism and technological knowledge consistently emerge as strong predictors of quality in technology use.[28] This finding reinforces the conclusion that the individual readiness of IRE teachers, including their perception and belief in the value of technology, plays a key role in fostering student learning motivation.

Table 5. Path Coefficient (β) Test Results

Variable	Students' Learning Motivation (Y)
The Utilisation of Technology in PAI Learning (X)	0.709

Path Coefficient Estimation was examined by assessing whether the coefficient values exceeded the minimum threshold of 0.1. A path in the model is considered to influence if its coefficient is greater than this threshold.[29] Based on Table 5, the results indicate that the path in this model has a coefficient value of 0.709, which meets the requirement and is considered a significant effect within the research model.

In addition to observing the R^2 and path coefficient values, the PLS model was also evaluated using the Q^2 Predictive Relevance value to assess how well the model and its parameter estimates can predict the observed values. According to Guenther et al. (2022), a Q^2 value greater than zero indicates that the model has predictive relevance, while a value of zero or lower suggests a lack of predictive power.[30] The calculation of Predictive Relevance (Q^2) was performed using the following formula:

$$Q^2 = 1 - (1- R^2)$$

$$Q^2 = 1 - (1 - 0.709^2)$$

$$= 1 - (1 - 0{,}503)$$

[28] Cattaneo et al., "The Role of Personal and Contextual Factors When Investigating Technology Integration in General and Vocational Education."

[29] Harahap and Pd, "Analisis SEM (Structural Equation Modelling) Dengan SMARTPLS (Partial Least Square)."

[30] Peter Guenther et al., "PLS-SEM and Reflective Constructs: A Response to Recent Criticism and a Constructive Path Forward," *Industrial Marketing Management* 128 (2025): 1–9, https://www.sciencedirect.com/science/article/pii/S0019850125000744.

$= 1 – (0{,}497)$

$Q^2 = 0{,}503$

$Q^2 = 50{,}3\%$

The Q^2 calculation for this research model yielded a value of 0.503, or 50.3%, indicating that the model can explain a significant portion of the variance in the research data. This result suggests that the model demonstrates a satisfactory level of fit.

The final stage involved hypothesis testing through bootstrapping, as illustrated in Figure 4, by analysing the initial research hypothesis. Based on the bootstrapping output in Table 6, the t-statistic value was obtained. A hypothesis is accepted if the t-statistic is equal to or greater than the critical value of the t-table. In this study, using a 5% significance level (two-tailed), the critical t-table value is 1.96.[31]

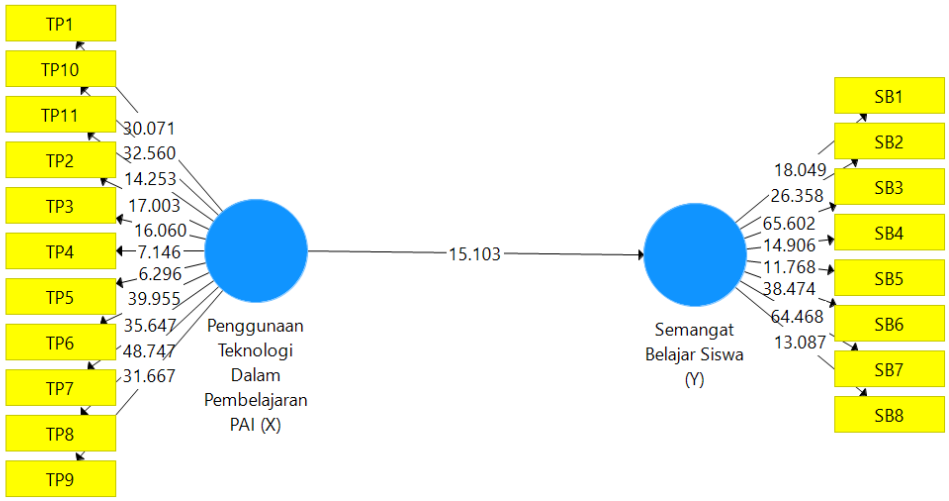


Figure 4. Results of Hypothesis Testing (Bootstrapping)

Hypothesis testing through bootstrapping, as shown in Figure 4, was conducted to analyse the initial research hypotheses. Based on the bootstrapping output in Table 6, the t-statistic (or t-calculated) values are obtained. A hypothesis is accepted if the t-statistic value is greater than or equal to the t-table value. In this study, using a 5% significance level (2-tailed), the critical t-table value is 1.96.[32]

[31] Ned Kock, "Hypothesis Testing with Confidence Intervals and P Values in PLS-SEM," *International Journal of e-Collaboration* 12 (July 1, 2016): 1–6.

[32] Ibid.

Table 6. Path Coefficient Values from Bootstrapping Results

Rated Aspect	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
The Utilisation of Technology in PAI Learning (X) -> Students' Learning Motivation (Y)	0.709	0.718	0.047	15.103	0.000

Table 6 presents the results of hypothesis testing in this study. Based on the analysis using the path coefficient value, the variable Use of Technology in Islamic Religious Education (PAI) Learning (X) shows a value of 0.709. Since this value is greater than 0, it indicates a positive direction of influence. Furthermore, the obtained T-statistic value is 15.103, which exceeds the threshold of 1.96. The P-value is 0.000, which is less than 0.05. Based on these three indicators (path coefficient > 0; T-statistics > 1.96; and P-values < 0.05), it can be concluded that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted. Therefore, there is a positive and significant effect of the use of technology in PAI learning (X) on Students' learning motivation (Y). This finding is consistent with the findings of Lal et al. (2024) and Vuong et al. (2025), which also provide supporting evidence that integrating technology effectively enhances student engagement and appreciation of religious content.[33]

The results of the hypothesis testing are further supported by the R-squared (R^2) value of 0.503, indicating that 50.3% of the variance in students' learning motivation (Y) can be explained by the use of technology in Islamic Religious Education (IRE) learning (X). The Q-square (Q^2) value, also measured at 0.503, reflects the predictive relevance of the model. These findings lead to the conclusion that the null hypothesis (H_0) is rejected, while the alternative hypothesis (H_a) is accepted. This indicates that the use of technology in IRE learning (X) has a positive and significant influence on students' learning motivation (Y).

This result is reinforced by the study of Miftahul Huda (2024), which found that integrating digital media in IRE instruction positively impacts students' active engagement, particularly by facilitating the understanding of abstract religious concepts. Digital technology functions as a bridge between

[33] Lal, Kumbhar, and Varaprasad, "Novel Extension of the UTAUT Model to Assess E-Learning Adoption in Higher Education Institutes: The Role of Study-Life Quality."; Vuong et al., "Teachers' Perspectives on the Application of Technology in Mathematics Education in Primary Schools: A Dataset from Vietnam."

instructional content and students' real-life experiences, thereby strengthening both affective and cognitive connections within the learning process. [34]

Although this study makes a meaningful contribution to the analysis of how technology influences learning motivation in the context of Islamic Religious Education, several limitations must be considered when interpreting its findings. The sample consisted of only 57 IRE teachers from the Bandung City and Regency area, which suggests that generalisation to other regions should be approached with caution. The data were gathered from teachers' perspectives rather than directly from students, meaning that interpretations of student motivation remain indirect. Other variables that potentially influence motivation, such as family background, social environment, and students' digital readiness, were not explored in depth. These limitations provide direction for future research by involving student respondents and applying a mixed-methods approach to generate a more comprehensive understanding.

CONCLUSION

The instrument used in this study was proven to be both valid and reliable. Outer loading values exceeded 0.70, the Average Variance Extracted (AVE) surpassed 0.50, and the Composite Reliability and Cronbach's Alpha values demonstrated strong internal consistency. Discriminant validity was confirmed using the Fornell-Larcker criterion. The structural model produced an R^2 value of 0.503, indicating a moderate contribution of technology use to students' learning motivation. The path coefficient value of 0.709, along with a Q^2 value of 0.503, Consistent with previous research highlighting the positive impact of digital tools on student engagement and motivation in religious education contexts (Cattaneo et al., 2025; Lal et al., 2024), the analysis in this study revealed that the path coefficient value of 0.709 indicates that technology utilization has a substantial and significant effect on students' learning motivation. This aligns with the view of Guenther et al. (2022), who assert that a Q^2 value greater than zero indicates the predictive relevance of a model.

The hypothesis testing revealed a positive and significant relationship between technology use and students' learning motivation. These findings affirm that the integration of technology in Islamic Religious Education (IRE) has the potential to enhance learning engagement, foster more positive perceptions of instructional content, and promote active student participation. Ethical approval was obtained.

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[34] Miftahul Huda, "Teaching Tolerance through Literature: A Study in English Language Classrooms in Indonesian Islamic Higher Education" (University of Antwerp, 2025).

Certain limitations should be considered when interpreting the findings of this study. The sample size was limited to 57 IRE teachers in the Bandung City and Regency area, which may not fully represent the broader population. The data reflect teachers' perspectives rather than those of the students, leaving the students' own perceptions of motivation unaccounted for. Other influential factors, such as family support, social environment, or students' digital readiness, were not included in the analysis.

Future research may involve students as primary respondents, expand the geographic scope of data collection, and apply a mixed-methods approach to explore the dimensions of motivation more thoroughly. Further analysis may also focus on comparing various digital platforms used in religious instruction to identify more adaptive strategies for technology-based learning environments.

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