Modeling EMIS Adoption with PLS-SEM: Integrating the Government Adoption Model and DeLone–McLean IS Success Model

Mardiyanto[1], Berlilana[2], Purwadi[3]

[1]Magister of Computer Science, Computer Science Faculty, Universitas Amikom Purwokerto, Indonesia
[2,3]Department of Computer Science, Universitas Amikom Purwokerto, Indonesia

Abstract: This study explores the key factors influencing the adoption of the Education Management Information System (EMIS) within Indonesia's Ministry of Religious Affairs (Kemenag), which is vital for managing data and distributing Teacher Professional Allowances (TPG). Data inconsistencies have been a significant challenge, leading to delays in TPG disbursement. To understand the determinants of EMIS adoption, this study integrates the Government Adoption Model (GAM) and DeLone & McLean's (D&M) Information Systems Success Model. A quantitative approach was used, collecting data from 328 valid responses from MTsN teachers in Kebumen Regency, analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that Perceived Uncertainty (PU), Perceived Security (PSC), and Perceived Privacy (PP) positively contribute to Perceived Trust (PT). Additionally, Information Quality (IQ) emerged as the strongest predictor of EMIS adoption, followed by System Quality (SYQ), Service Responsiveness (PSR), and Trust. The study emphasizes that improving data accuracy (IQ), ensuring system reliability (SYQ), and strengthening security measures (PSC) are critical for accelerating EMIS adoption. The findings offer practical implications for Kemenag to optimize the implementation of EMIS, ultimately improving the efficiency and timeliness of TPG disbursements for educators.

Keywords: DeLone & McLean, E-Government Adoption, GAM, Information Quality, PLS-SEM, Trust

1. INTRODUCTION

The era of digital disruption has become a catalyst for accelerating fundamental changes in the public service sector in various countries, including Indonesia. The principles of digital governance are now being progressively implemented by the Indonesian government to improve the effectiveness, transparency, and quality of services [1] [2]. The education sector is one of the main focuses of this transformation, with data now serving as a vital asset. Recognizing the significance of data in supporting the quality of educational institutions, the Directorate General of Islamic Education (2021) issued a regulation in the form of Director General of Islamic Education Decree Number 5974 of 2019. This policy requires the use of the Education Management Information System (EMIS) as a data and information management system in Islamic education [3] [4].

The implementation of EMIS is a concrete manifestation of data-based policy institutionalization that aims to support a more precise decision-making process at every level of the education bureaucracy. The Indonesian Ministry of Religious Affairs (Kemenag), as one of the foundations of national education, has established EMIS as the only integrated data center. The scope of this system is very broad, managing data from more than 86,000 educational institutions and more than one million educators and educational personnel [5]. Madrasahs play a central role in this ecosystem because EMIS is used as the definitive single source of data for their operations. This system is also a crucial tool for distributing various important allocations, such as Teacher Professional Allowances (TPG). The validity of educator data in EMIS is an absolute requirement in every stage of the allowance disbursement verification process [6] [7].

Although EMIS is mandatory and plays a central role, its implementation in the field faces various challenges. Total dependence on a single platform creates vulnerability, as any data inconsistency can directly result in delays in teachers' professional and administrative rights [8]. This issue is supported by internal evaluation findings: data from the Central Java Regional Office of the Ministry of Religious Affairs (2024) reveals that in each verification cycle, an estimated 15-20% of TPG proposals are rejected or delayed. The main cause is discrepancies between the data in EMIS and the actual situation in the field. This reality underscores the need for an in-depth investigation into the factors that influence the efficient acceptance and use of EMIS. Teachers are chosen as the primary

unit of analysis in this study because they are the frontline end-users whose welfare is directly impacted by system performance and data validity [9].

However, despite numerous studies on e-government adoption, limitations persist (Research Gap). Most prior research focuses heavily on either technological factors or organizational factors separately. Few studies have integrated the Government Adoption Model (GAM) which addresses unique public sector characteristics like regulatory uncertainty—with the DeLone & McLean (D&M) model that specifically measures system success dimensions [10]. Furthermore, existing literature often overlooks the role of "Trust" as a pivotal mediator between government regulations and system usage in a mandatory environment [11].

To dissect the complexity of this issue and bridge the identified gap, a comprehensive theoretical framework is required. Therefore, this study combines two complementary theoretical models, namely the Government Adoption Model (GAM) and DeLone & McLean Information System Success Model (D&M) [12]. The GAM model is used to analyze the factors that encourage the Ministry of Religious Affairs as a government agency to adopt and implement EMIS in a top-down manner, by reviewing the dimensions of External Environment, Internal Organization, and Innovation Characteristics [12] [13]. On the other hand, the D&M model is used to measure the quality of the implemented system, particularly in terms of System Quality, Information Quality, and Service Quality of the EMIS platform as perceived directly by teachers at MTsN Kebumen [14] [15].

Based on this context, this study aims to empirically analyze the determinants that impact the adoption and utilization of the Ministry of Religious Affairs' EMIS. This study uses a combined GAM and D&M framework with a focus on MTsN teachers throughout Kebumen Regency. This study offers three main explicit contributions: (1) It integrates GAM and D&M to provide a holistic view of EMIS adoption; (2) It empirically tests Trust as a mediator in Islamic education institutions; and (3) It provides empirical evidence from MTsN Kebumen to guide policy improvements in the Ministry of Religious Affairs.

2. METHODS

2.1. Research Design and Sampling

This study employed a quantitative approach with a cross-sectional survey design to examine the factors influencing the adoption of EMIS among MTsN teachers in Kebumen Regency. The primary data was collected through an online questionnaire distributed via Google Forms. The target population for this study comprised all MTsN teachers in Kebumen Regency, with an estimated total of 477 teachers (N = 477) [16]. To determine the minimum sample size, the Slovin formula was applied with a margin of error set at 5% (0.05) [17]. The sample size was calculated as shown in Equation 1.

$$n = \frac{N}{1 + N \cdot e^2} \tag{1}$$

Where:

$N = 477$ (total population)

$e = 0.05$ (margin of error)

$$n = \frac{477}{1 + 477 \cdot (0.05)^2}$$
$$n = \frac{477}{1 + 477 \cdot 0.0025}$$
$$n = \frac{477}{1 + 1.1925}$$
$$n = \frac{477}{2.1925}$$
$$n = 218$$

Based on this calculation, the minimum required sample size was 218 respondents. In the data collection process, 332 responses were received, which were subsequently screened for completeness and relevance. After validation, 328 responses were deemed suitable for analysis, yielding a response rate of approximately 68.7% of the total population.

2.2. Measurement Items

To ensure content validity, the measurement items used in this study were adapted from established research. The constructs of the Government Adoption Model (GAM)—including Perceived Uncertainty (PU), Perceived Security (PSC), Perceived Privacy (PP), Perceived Trust (PT), and Perceived Service Responsiveness (PSR)—were adapted from previous studies [18]. Similarly, the constructs of the DeLone & McLean Information Systems Success (D&M) model, specifically Information Quality (IQ) and System Quality

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(SYQ), were derived from prior research [19]. All items were measured on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

2.3. Bias Control and Data Analysis

To mitigate Common Method Bias (CMB) inherent in self-reported survey data, several procedural remedies were employed. These included ensuring respondent anonymity and randomizing the order of question items. Additionally, statistical checks using the Variance Inflation Factor (VIF) were conducted to confirm that there were no issues of multicollinearity among the predictor variables [2]. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with the SmartPLS software. This analytical approach was selected due to its ability to model complex relationships between latent variables and its suitability for smaller sample sizes.

2.4. Research Model and Hypotheses

The conceptual model used in this study, as illustrated in Figure 1, investigates the influence of both GAM and D&M factors on EMIS adoption. Within the GAM framework, the perception variables—Perceived Uncertainty (PU), Perceived Security (PSC), and Perceived Privacy (PP)—are hypothesized to influence user trust (PT). These variables are expected to have a positive and significant impact on PT based on prior research [13][20][21][22]. Therefore, the following hypotheses are formulated:

1) **H1:** PU has a positive and significant effect on PT.
2) **H2:** PSC has a positive and significant effect on PT.
3) **H3:** PP has a positive and significant effect on PT.

The model also examines the antecedents that directly influence the Adoption Effectiveness (AE). Trust (PT), supported by Perceived Service Responsiveness (PSR) from the GAM framework, is hypothesized to impact adoption [13][23]. Additionally, two crucial dimensions from the D&M model—Information Quality (IQ) and System Quality (SYQ)—are posited to be essential drivers of system adoption by users [12][13][22]. The following hypotheses are thus proposed:

1) **H4:** PT has a positive and significant effect on AE.
2) **H5:** PSR has a positive and significant effect on AE.
3) **H6:** IQ has a positive and significant effect on AE.
4) **H7:** SYQ has a positive and significant effect on AE.

These hypotheses aim to shed light on the complex relationships between the various factors influencing the adoption and utilization of EMIS, particularly from the perspective of MTsN teachers in Kebumen Regency.
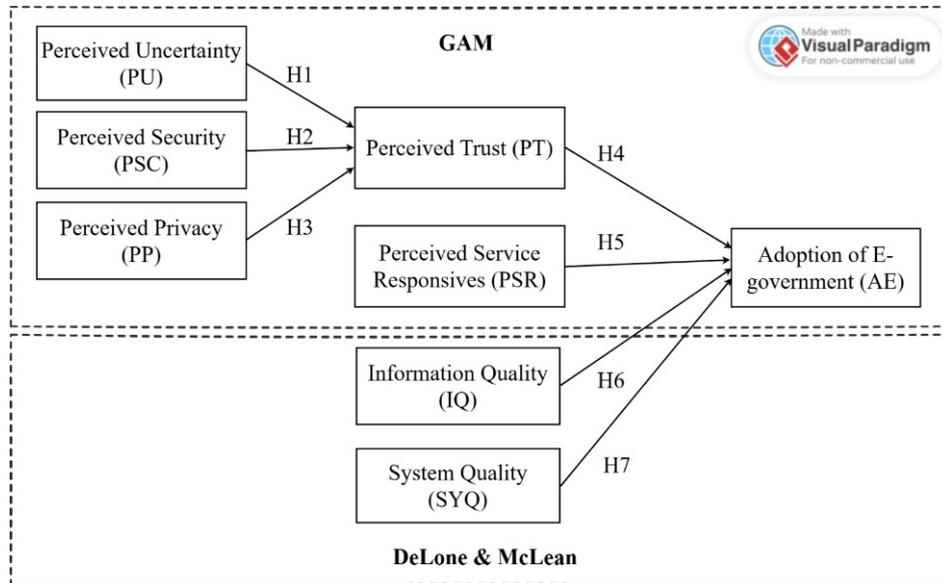

Figure 1. Research Model

3. RESULTS AND DISCUSSION

3.1. Respondent Characteristics

Data analysis for this study used the PLS-SEM method with SmartPLS software. This method was applied to evaluate the outer model and inner model to test the hypothetical relationship between elements. The elements that were the focus of the analysis were PU, PSC, PP, PT, PSR, IQ, SYQ, and AE. Primary quantitative data (n=328) for this analysis were obtained through an online questionnaire (Google Form) using a 1-5 Likert scale. The research respondents were active EMIS users, in this case MTsN teachers in Kebumen Regency. The demographic details of the respondents including gender and age range are presented in Table 1.

Table 1. Respondent Characteristics

Characteristics	Frequency	Percentage
Gender		
Female	197	60%
Male	131	40%

Characteristics	Frequency	Percentage
Age Range (Years)		
< 30	72	22%
31 – 40	115	35%
41 – 50	82	25%
> 50	59	18%
Highest Level of Education		
Diploma	67	20,4%
Bachelor's Degree	259	79%
Master's Degree	2	0,6%
Doctorate	0	0%

3.2. Outer Model

The outer model evaluation was conducted to assess the relationship between indicators (questionnaire items) and their latent elements, which included validity and reliability tests [24] [25]. The validity of the instrument was ensured through two stages. First, convergent validity is assessed using Average Variance Extracted (AVE), which requires a value above 0.5 to be considered valid [26].

Table 2. AVE Test

Elements	AVE
PU	0.590
PSC	0.648
PP	0.634
PT	0.580
PSR	0.627
IQ	0.715
SYQ	0.638
AE	0.599

Based on the results in Table 2, all research elements (such as IQ, PSC, SYQ) exceeded the recommended threshold of > 0.50 [27] [28]. This achievement indicates that the indicators used were representative in measuring each latent element.

Second, discriminant validity was tested using the Fornell-Larcker Criterion. This test compares the AVE square root value (diagonal value in the table) with the correlation coefficient between elements [29].

Table 3. Fornell Larcker Criterion Test

	AE	IQ	PP	PSC	PSR	PT	PU	SYQ
AE	0.774							
IQ	0.652	0.846						
PP	0.591	0.578	0.796					
PSC	0.633	0.606	0.784	0.805				
PSR	0.630	0.588	0.710	0.667	0.792			
PT	0.635	0.632	0.631	0.652	0.648	0.762		
PU	0.459	0.505	0.619	0.601	0.561	0.555	0.768	
SYQ	0.614	0.582	0.686	0.673	0.634	0.655	0.568	0.799

The results in Table 3. confirm that the AVE square root values for each element are consistently greater than their correlation values with other elements. This proves that each element in this research model is unique and different from one another. Furthermore, the reliability test aims to measure the internal consistency of the measuring instrument. This assessment is based on CR and CA, with a standard reliability value above 0.7 [24] [30].

Table 4. CR and CA

Element	CA	CR
PU	0.652	0.654
PSC	0.726	0.725
PP	0.716	0.722
PT	0.637	0.639
PSR	0.708	0.731
IQ	0.802	0.819
SYQ	0.721	0.729
AE	0.672	0.679

The data in Table 4 shows that all research elements have excellent CA and CR values and have met the required criteria [24]. Although the CA values for PU (0.652), PT (0.637), and AE (0.672) are slightly below the 0.70 threshold, they are considered acceptable for exploratory research involving newly integrated models, especially since the CR and rho_A values demonstrate satisfactory internal consistency [31]. Thus, it can be concluded that this research instrument is valid and reliable.

3.3. Inner Model

Inner model analysis focuses on evaluating the relationship between exogenous and endogenous elements [20] [25]. The initial stage of structural model evaluation involves assessing lateral collinearity among predictor constructs to ensure that the path coefficients are free from bias. This assessment is conducted using the Variance Inflation Factor (VIF). According to established guidelines, VIF values should remain below the threshold of 5.0 (or more stringently < 3.3) to indicate the absence of multicollinearity issues.

Table 5. VIF

Indicator	VIF
PU1	1,569
PU2	1,441
PU3	1,343
PSC1	1,236
PSC2	1,235
PSC3	1,182
PP1	1,664
PP2	1,738
PP3	1,586
PT1	1,313
PT2	1,226
PT3	1,425
PSR1	1,387
PSR2	1,915
PSR3	1,798
IQ1	1,675
IQ2	1,640

Indicator	VIF
IQ3	1,748
SYQ1	1,533
SYQ2	1,247
SYQ3	1,269
AE1	1,306
AE2	1,242
AE3	1,237

As indicated in Table 5, the VIF values for all predictor indicators range from 1.182 to 1.915. Since all observed values are well below the recommended threshold of 5.0, it can be concluded that there are no multicollinearity issues in this study, allowing the hypothesis testing to proceed without estimation bias. This evaluation subsequently assesses the structural model using two main indicators: R^2 and Q^2. First, R^2 is used to measure the extent to which independent elements explain the variation in dependent elements, with influence strength categories of 0.67 (strong), 0.33 (moderate), or 0.19 (weak) [27].

Table 6. R Square

Elements	R Square	Information
PT	0.485	Moderate
AE	0.562	Moderate

The results in Table 6 R^2 value for the PT element 0.485, which falls into the moderate category. This indicates that the variability in PT can be collectively explained by PU, PSC, and PP at a moderate level. Similarly, the R^2 value for AE is 0.562, recorded at a moderate to substantial level, indicating a significant contribution from PT, PSR, IQ, and SYQ to the variation in EMIS adoption. To further validate the model, the predictive relevance Q^2 was assessed using the blindfolding procedure. A Q^2 value greater than zero implies that the model has predictive relevance for a certain endogenous construct.

Table 7. Q Square

	Q^2
PT	0.339
AE	0.266

As presented in Table 7, the Q^2 values for Perceived Trust (0.339) and Adoption (0.266) are considerably above zero. This confirms that the structural model possesses sufficient predictive relevance for the endogenous constructs. Finally, the Goodness of Fit (NFI) is used to assess the accuracy and suitability of the research model as a whole, where values closer to 1 indicate a better fit.

Table 6. Goodness of Fit

	Saturated Model
NFI	0.620

The Goodness of Fit evaluation (Table 6) produced an NFI value above the recommended limit (generally 0.50 or higher) [32]. This achievement indicates that the proposed research model has a good level of suitability with empirical data.

3.4. Hypothesis Testing

Hypothesis testing in this study was conducted using the bootstrapping procedure. A hypothesis is considered accepted and statistically significant if the T Statistic value exceeds 1.96 and the P Value is lower than 0.05 [19].

Table 8. Hypothesis Testing

Hypothesis	Original Sample (O)	T Statistics	P Values	Information
PU -> PT	0.201	3.415	0.001	Accepted
PSC -> PT	0.347	5.221	0.000	Accepted
PP -> PT	0.234	3.118	0.002	Accepted
PT -> AE	0.186	3.125	0.002	Accepted
PSR -> AE	0.219	3.251	0.001	Accepted
IQ -> AE	0.302	5.165	0.000	Accepted
SYQ -> AE	0.177	2.710	0.007	Accepted

The results in Table 9 confirm that all seven hypotheses are accepted. Notably, the path analysis reveals the strongest determinants for each endogenous variable. PSC emerged as the most significant predictor of Trust with the highest path coefficient of 0.347.

Meanwhile, IQ proved to be the strongest driver for AE with a coefficient of 0.302, outperforming other factors [32].

3.5. Discussion

H1 confirms that PU has a positive and significant effect on PT. These findings, supported by statistical data, indicate that teachers' perceptions of uncertainty (e.g., related to regulatory changes) are an important factor shaping their trust in the EMIS system. These results are in line with studies in the public sector, where certainty regarding TPG regulations is crucial in building trust in the system as a reliable data reference [22] [33] [34].

PSC has a positive and significant impact on PT. Notably, the statistical results identify PSC as the strongest predictor of trust (Path Coefficient: 0.347). This indicates that teachers' confidence in the security of their data from external threats (such as hacking) is the primary foundation of their trust. The dominance of this factor can be interpreted by the high stakes involved; since EMIS holds sensitive data for professional allowances, any security breach poses a direct financial risk to teachers. Therefore, technical security guarantees are prioritized over other trust factors [23] [35] [36].

In H3, PP was proven to have a positive and significant effect on PT. The acceptance of this hypothesis means that teachers' belief that their personal data will not be misused internally by the organization is a key pillar of trust building. In line with [22] [13], this finding is important because it distinguishes privacy issues (internal data use) from security issues (external threats), both of which are equally crucial.

The H4 analysis shows PT as a positive and significant predictor for AE or EMIS adoption. The findings with accepted hypotheses indicate that teachers' trust in the system formed by PU, PSC, and PP is the main driving factor in their willingness to accept and use EMIS. According to the GAM model [22] [37] [38], trust functions as an important mediator; teachers who are confident that their data and policies are secure will find it easier to adopt the system.

Furthermore, H5 finds that PSR has a positive and significant effect on AE. The acceptance of this hypothesis indicates that the quality of support services (such as the

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responsiveness of the help desk or admin) is an important factor in encouraging adoption. This finding confirms the relevance of the GAM service aspect in the complex context of EMIS [38] [39]. When teachers encounter TPG data discrepancies, a quick and solution-oriented response from administrators is vital to reduce frustration and increase acceptance.

In H6, IQ was found to have a positive and significant impact on AE. Crucially, this study identifies IQ as the strongest determinant of adoption (Path Coefficient: 0.302), outperforming all other factors. This finding addresses the data inconsistency issue raised in the introduction. The reason IQ is the most critical driver is that EMIS is not merely an administrative tool but the basis for Teacher Professional Allowances (TPG). If the data is accurate, relevant, and timely, adoption is high because it secures teachers' rights. Conversely, poor data quality directly hinders the disbursement of funds, making accuracy the most valued attribute by users [35] [39] [40].

Finally, H7 confirms that SYQ has a positive and significant effect on AE. The acceptance of this hypothesis implies that the technical quality of the EMIS platform, including a user-friendly interface, system stability (error-free), and access speed, are drivers of adoption. This finding supports the D&M pillar [40] [41], which asserts that systems that are difficult to use or frequently down will create resistance. This confirms the need for the Ministry of Religious Affairs to focus on user experience (SYQ) in addition to data accuracy (IQ) for successful adoption.

Practical Implication Mapping Based on these findings, a strategic path for increasing EMIS adoption can be mapped. To maximize adoption, the Ministry of Religious Affairs must prioritize IQ and SYQ as the core technical foundations. Simultaneously, to sustain this adoption, PSR must be strengthened to handle user grievances. Finally, the entire ecosystem must be underpinned by reinforcing Trust, which is achieved primarily by ensuring robust PSC and PP measures.

4. CONCLUSION

This study analyzes the determinants of e-government system (EMIS) adoption among 328 MTsN teachers in Kebumen Regency. By applying a hybrid GAM and D&M model, the findings confirm that all seven hypotheses have a positive and significant impact. The main results indicate that IQ is the strongest determinant of adoption, while PSC is the primary driver of PT. Teachers' trust, shaped by certainty, security, and privacy, significantly mediates the relationship between government factors and system usage. Practical Implications The practical implications suggest that the Ministry of Religious Affairs (Kemenag) must prioritize IQ specifically the validity of TPG and teaching data and SYQ to accelerate adoption. Simultaneously, strengthening guarantees regarding Security, Privacy, and Service Responsiveness is crucial to foster Trust, which is the foundation for widespread acceptance. Limitations and Future Research Despite its contributions, this study has several limitations. First, the sample is restricted to teachers in Kebumen Regency, which limits the generalizability of the findings to a national level. Second, the study employs a cross-sectional design, capturing perceptions at a single point in time rather than observing changes over verification cycles. Third, the reliance on self-reported data may introduce response bias. Fourth, the study focuses solely on teachers, excluding operators who handle technical data entry. Future research should address these gaps by: (1) Expanding the scope to include operators and administrators for a multi-perspective view; (2) Conducting comparative studies across different provinces or institution types (e.g., Islamic boarding schools); and (3) Employing a longitudinal design to observe adoption patterns across different TPG policy cycles.

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