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Original Article

Analysis of Factors Influencing the Adoption of Electronic Nursing Documentation: A SEM-PLS Approach

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Abstract

Background: The Indonesian Ministry of Health mandates the use of electronic medical records (EMRs) across all healthcare facilities, impacting hospitals nationwide, including those in Pekanbaru. In response, hospitals in Pekanbaru have integrated digital applications into healthcare services, including nursing care. Nursing documentation is now conducted using Electronic Nursing Documentation (END). Despite its implementation, no formal evaluation of END usage has been conducted, even though service effectiveness remains a key performance indicator. **Objectives**: This study aims to analyze factors influencing the adoption of END using a Structural Equation Modelling–Partial Least Squares (SEM-PLS) approach. **Methods**: This quantitative study employed a cross-sectional design and utilized a structured questionnaire. A total of 287 inpatient nurses from three hospitals in Pekanbaru were selected through purposive sampling. Data were analyzed using SEM-PLS techniques. **Result**: The structural model showed that perceived usefulness (POU) significantly influenced attitude toward using (ATU) ($\beta = 0.749$, $p < 0.001$) and behavioral intention to use (BITU) ($\beta = 0.415$, $p < 0.001$). Perceived ease of use (PEOU) significantly influenced ATU ($\beta = 0.168$, $p = 0.010$) and POU ($\beta = 0.831$, $p < 0.001$). ATU significantly influenced BITU ($\beta = 0.490$, $p < 0.001$) and actual usage behavior (AUB) ($\beta = 0.464$, $p < 0.001$), while BITU significantly influenced AUB ($\beta = 0.479$, $p < 0.001$). The model explained 82.7% of the variance in AUB. IPMA showed that POU had the highest importance for AUB (0.722), whereas PEOU had the highest performance (72.115). These results suggest that enhancing system usability and demonstrating its practical benefits can strengthen adoption intentions. **Conclusion:** The TAM creates significantly influenced END adoption, with POU being the strongest predictor of AUB and PEOU showing the highest performance. Future longitudinal studies applying objective usage measures are needed to authenticate these associations and explore additional determinants of adoption.

Keywords: *Adoption; Electronic Nursing Documentation; Nurses; PLS; Structural Equation Modelling Approach.*

Introduction

In the era of healthcare digitization, Electronic Nursing Documentation (END) has become an important innovation in improving the efficiency and accuracy of nursing records (Shafiee *et al*., 2022). Electronic

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Nursing Documentation (END) is a digital-based nursing documentation system used to document patient care electronically. END replaces paper-based documentation with a more structured, accurate, and efficient system, thereby improving interprofessional communication and the quality of patient care (McCarthy *et al*., 2019; Shafiee *et al*., 2022)

END is part of Electronic Health Records (EHRs) and functions as a communication tool that allows nurses to record nursing interventions, patient conditions, and medical actions taken in digital format (Wang, 2021). This system also assists in clinical decision-making by providing data that is easier to access and analyze (Chand & Sarin, 2019). END enables nurses to document nursing interventions more systematically, reduce recording errors, and improve interprofessional communication (Saraswasta *et al*., 2018). However, despite its widely recognized benefits, the adoption rate of END still varies across healthcare facilities.

The acceptance of electronic nursing documentation (END) systems is influenced by various interrelated factors, including individual, technological, and work environment factors. The main factors influencing the acceptance of END are perceived usefulness, perceived ease of use, computer experience, compatibility with workflows, and organizational support (Iseni *et al.,* 2026). In addition, factors such as technological readiness, nurses' digital competence, and technological benefits also influence the success of END (Saraswasta *et al*., 2018).

The use of electronic nursing documentation systems in Indonesia is still in the development stage, and adoption is limited. Implementation of electronic systems is more common in large hospitals or institutions that have adequate infrastructure and human resources (Zaharany & Hariyati, 2020; Saraswasta *et al*., 2018; Wahyuni *et al*., 2024). According to data from the Indonesian Ministry of Health, as of February 2024, around 42.55% of 56,093 health facilities in Indonesia have been registered on the Satu Sehat platform or have implemented Electronic Medical Records (EMR). Additionally, out of a total of 3,052 hospitals in Indonesia, only 772 hospitals (25.29%) meet the criteria for EMR adoption assessment. The level of digitization is higher in class A hospitals and in the Java-Bali region compared to other regions (Kementerian Kesehatan Republik Indonesia, 2025).

The city of Pekanbaru is the capital of Riau province, which has 26 hospitals. Generally, these consist of private hospitals and seven government hospitals. Based on a survey of six major hospitals in the city of Pekanbaru, it was found that all of them have implemented the Ministry of Health's mandate on the use of EMR, including electronic-based nursing documentation. The EMR used was developed by the hospitals according to their service needs. Since its development and implementation, there has been no evaluation of user satisfaction with EMR, particularly END, by nurses. One of the models commonly used to assess user acceptance of a system is the Technology Acceptance Model (TAM) (Kristiana *et al*., 2023).

The Technology Acceptance Model (TAM) is a model that explains how users accept and adopt new technologies. This model focuses on two main factors that influence users' intentions to use a technology: perceived usefulness and perceived ease of use. These two factors together influence users' attitudes and intentions in adopting a technology (Davis & Granić, 2024).

Despite the increasing implementation of EMR and END in Indonesia, there remains a clear research gap regarding nurses' acceptance and actual usage of END, particularly in Pekanbaru hospitals. Previous studies have emphasized infrastructure readiness and general EMR adoption (Rahayu & Ariyanti, 2025), but limited empirical evidence exists on how nurses' perceptions, such as perceived usefulness, perceived ease of use, and attitudes, translate into behavioral intention and actual usage in the Indonesian context (Zaman *et al*., 2021). This study is needed because nurses are the primary users of END, and their acceptance directly determines the sustainability of the system and the impact on patient safety. The novelty of this research lies in applying SEM-PLS to rigorously test TAM constructs among Indonesian nurses, extending the model with contextual factors such as education background, work experience, hospital type, and socialization, and focusing on Pekanbaru Hospitals, where WMR adoption is mandated but understudied. By addressing these gaps, the study contributes theoretically by validating TAM in a new context and practically by providing evidence-based

recommendations for hospital administrators and system developers to enhance END adoption through usability improvements and users-centered design.

Based on this description, the researcher was interested in conducting research aimed at analyzing the factors that influence the adoption of Electronic Nursing Documentation (END). This research used a quantitative approach with the Structural Equation Modelling-Partial Least Squares (SEM-PLS) method (Hair *et al*., 2021).

Methodology

Design and Sampling

This research was a quantitative study with a cross-sectional design. A purposive sampling technique was consistently applied to select respondents who met the inclusion criteria. Specifically, nurses from three hospitals in Pekanbaru were invited to participate if they were actively using Electronic Nursing Documentation (END) in their daily practice, while head nurses and managerial staff were excluded to ensure focus on direct users of the system. A self-administered questionnaire was employed to explain each item of the construct in the conceptual model. The questionnaire was administered via Google Forms to 287 respondents over a period of four weeks in September 2025 at three hospitals in Pekanbaru. To ensure that the number of responses met the criteria, G*Power was used to measure the sample size based on statistical power. The statistical power value for this sample was 0.94, higher than the minimum requirement of 0.8. Thus, the sample size of this study was accepted.

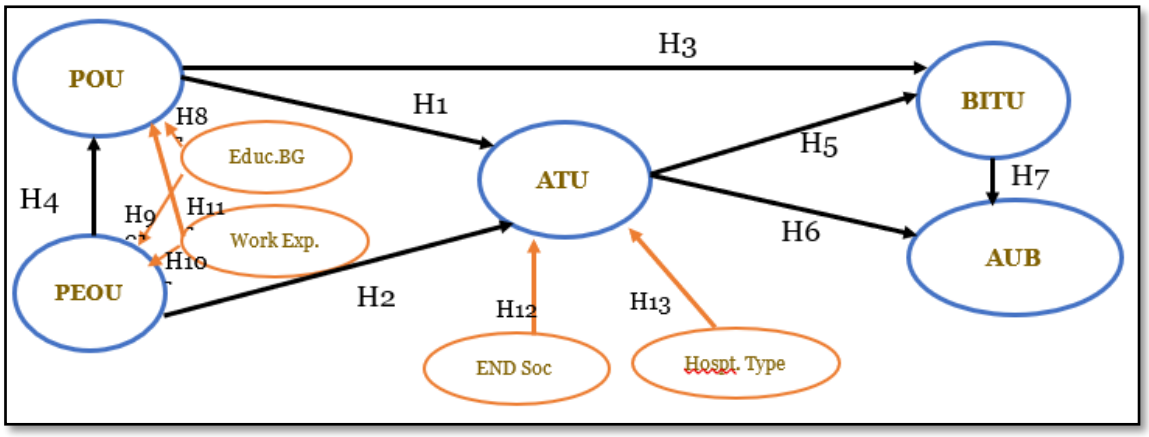


Figure 1. Research model

The hypothesis of this research in figure 1 is:

H1: Perceived of Usefulness (POU) of nurses has a positive and significant effect on Intention to Attitude Toward Using (ATU) the END system.

H2: Perceived Ease of Use (PEOU) of nurses have a positive and significant effect on Intention to Attitude Toward Using (ATU) the END system.

H3: Perceived of Usefulness (POU) of nurses have a positive and significant effect on Intention to Behavioral Intention to Use (BITU) the END system.

H4: Perceived Ease of Use (PEOU) of nurses have a positive and significant effect on Intention to Perceived of Usefulness (POU) the END system.

H5: Attitude Toward Using (ATU) the END system have a positive and significant effect on Intention to Behavioral Intention to Use (BITU) the END system.

H6: Attitude Toward Using (ATU) the END system have a positive and significant effect on Intention to Actual Usage Behavior (AUB) due to END system.

H7: Behavioral Intention to Use (BITU) the END system have a positive and significant effect on Intention to Actual Usage Behavior (AUB) due to END system.

H8: Education Background of nurses have a positive and significant effect on Perceived of Usefulness (POU) of nurses on END system.

H9: Education Background of nurses have a positive and significant effect on Perceived Ease of Use (PEOU) of nurses on END system.

H10: Work experiences of nurses have a positive and significant effect on Perceived of Usefulness (POU) of nurses on END system.

H11: Work experiences of nurses have a positive and significant effect on Perceived Ease of Use (PEOU) of nurses on END system.

H12: The END socialization acceptance by nurses has a positive and significant effect on Attitude Toward Using (ATU) the END system.

H13: The type of hospital has a positive and significant effect on Attitude Toward Using (ATU) the END system.

Research Instrument and Measurement

The questionnaire in this study used a four-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree) and was designed to measure such variables as Perceived Ease of Use (PEOU), Perceived of Usefulness (POU), Attitude Toward Using (ATU), Behavioral Intention to Use (BITU), and Actual Usage Behavior (AUB). The item for each construct was adapted from Davis (1989) and subsequent TAM-based studies in healthcare informatics, with contextual modifications to reflect the use of END in Indonesian hospitals. Specifically, the questionnaire consisted of 12 items for PEOU (e.g., “The EMR software is easily accessible in my workplace”), 11 items for PU (e.g., “EMR increases the accuracy of patient data recording”), 6 items for ATU (e.g., “I feel positive about using EMR software in my work”), 10 items for BITU (e.g., “I plan to use EMR routinely in nursing documentation”), and 10 items for AUB (e.g., “I use EMR software every time I perform nursing documentation”).

The adaptation process involved translating and contextualizing the original TAM items into nursing documentation practices, followed by expert judgment from nursing informatics specialists to ensure content validity. Prior to the main survey, **a pre-test** was conducted with 30 nurses from the target population to evaluate the clarity, relevance, and reliability of the items. Feedback from the pre-test confirmed that no major revisions were required, and the instrument was deemed ready for use.

In addition to TAM constructs, demographic data such as gender, age, education level, work experience, hospital type, job unit, and acceptance of END socialization were collected using structured questions and numeric scales. This comprehensive design ensured that both individual and contextual factors could be analyzed in relation to END.

Data Analysis

This study applied the SEM-PLS analysis technique, a comprehensive multivariate approach to statistical analysis that can simultaneously test every relationship between constructs in the conceptual model, including measurements and structural components (Hair *et al*., 2022). The measurement model and structural model are the two sub-models that exist in this SEM PLS measurement and analysis (Hair *et al*., 2022). The measurement model includes outer loading with a cut-off value of ≥0.6 and average variance extracted (AVE), which is valid and acceptable when the value is ≥0.5. This reliability value refers to composite reliability with a minimum recommendation of 0.7 and a maximum of 0.9. The measurement model evaluates the reliability and validity of the reflective construct, while the structural model evaluates the coefficients R^2, f^2, Q^2 and path coefficients (Hair *et al*., 2022). Importance-performance map analysis (IPMA) was then conducted to determine the importance of the independent construct in forming the target or dependent construct (Hair *et al*., 2019).

Results

Demographic Data

In terms of gender, the sample group was split relatively evenly between men 54 (18.8%) and Female 233 (81.2%). Based on age, the minimum was 22 y.o and maximum were 57 y.o with mean 36.81 St. Deviation 6.685 y.o, the works experience between 1 until 37 years with mean 11.13 St. Deviation 6.880 years. With respect to education, 193 (67.2%) of the respondents were nursing bachelor & nursing profession graduates, 88 (30.7%) nursing diploma, and 6(2.1%) were others health bachelor education. In terms of job unit, most of the respondents inpatient care 118(41.1%), from intensive care unit 103 (35.9%), emergency unit 31 (10.8%), outpatient care 22 (7.7%), and others unit 13 (4.5%). While the socialization acceptance most of the participant has accept the socialization about END 247 (86.2%), and the nurses were does not accepted were 40 (13.9%).

Measurement Model

Reliability and validity tests confirmed that all constructs met the recommended thresholds. Cronbach's alpha values ranged from 0.938 to 0.978, composite reliability values exceeded 0.94, and AVE values were above 0.60 (Table1).

Table 1: Cronbach's Alpha, Composite Reliability, Average Variance Extracted

Construct/Item	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	(AVE)
Attitude Toward Using (ATU)	0.954	0.956	0.963	0.815
Actual Usage Behavior (AUB)	0.974	0.975	0.977	0.808
Behavioral Intention to Use (BITU)	0.978	0.978	0.980	0.834
Perceived Ease of Use (PEOU)	0.938	0.951	0.948	0.607
Perceived of Usefulness (POU)	0.966	0.967	0.970	0.745

All Significant

Discriminant validity was established using the Fornell-Larcker criterion, with all latent variables showing higher loadings compared to their indicators (see Table 2). Thus, the measurement model was considered valid and reliable.

Table 2: Discriminant Validity

Variables	ATU	AUB	Age	BITU	END Socialization	Education BG	Hosp Type	PEOU	POU	Work Exp
ATU	0.903									
AUB	0.875	0.899								
Age	-0.066	-0.043	1.000							
BITU	0.858	0.878	-0.019	0.913						
END Socialization	0.007	-0.033	0.149	0.012	1.000					
Education BG	-0.033	-0.009	-0.330	-0.022	-0.133	1.000				
Hosp Type	0.049	-0.072	-0.080	-0.007	0.067	0.015	1.000			
PEOU	0.783	0.765	-0.148	0.740	-0.043	0.097	-0.027	0.779		
POU	0.887	0.823	-0.062	0.850	-0.011	0.014	0.018	0.824	0.863	
Work Exp	-0.072	-0.057	0.855	-0.031	0.075	-0.267	-0.032	-0.084	-0.033	1.000

Note: ATU; Attitude Toward Using, AUB; Actual Usage Behavior, BITU; Behavior Intention to Use, END; Electronic Nursing Documentation, Education BG; Education Background, Hosp. Type; Hospital Type, PEOU; Perceived Ease to Use, POU; Perceived of Usefulness, Work. Exp; Work Experience

Structural Model Evaluation

The structural model was evaluated using collinearity diagnostics, path coefficients (β), significance testing, coefficient of determination (R^2), and effect sizes (f^2). The VIF values ranged from 1.000 to 4.948, indicating that no critical multicollinearity problem was identified among the predictor constructs.

The path coefficients and hypothesis-testing results are presented in Table 3, while the coefficient of determination (R^2) for the endogenous constructs is presented in Table 4.

Table 3: The Structural Path Coefficients, Effect Sizes, and Hypothesis Decisions

Hypothesis	Path	*β*	*p*-value	f^2	Decision
H1	POU → ATU	0.749	<0.001	0.885	Supported
H2	PEOU → ATU	0.168	0.010	0.044	Supported
H3	POU → BITU	0.415	<0.001	0.162	Supported
H4	PEOU → POU	0.831	<0.001	2.154	Supported
H5	ATU → BITU	0.490	<0.001	0.225	Supported
H6	ATU → AUB	0.464	<0.001	0.328	Supported
H7	BITU → AUB	0.479	<0.001	0.350	Supported
H8	Education BG → POU	−0.061	0.126	0.011	Not supported
H9	Education BG → PEOU	0.081	0.037	0.006	Supported
H10	Work Experience → POU	0.021	0.518	0.001	Not supported
H11	Work Experience → PEOU	−0.063	0.158	0.004	Not supported
H12	END Socialization → ATU	0.020	0.480	0.002	Not supported
H13	Hospital Type → ATU	0.039	0.163	0.008	Not supported

Note: β represents the standardized path coefficient. Statistical significance is based on the p-value criterion of $p < 0.05$. f^2 represents the effect size of each predictor on the corresponding endogenous construct.

The results showed that the principal TAM relationships were statistically significant. Perceived usefulness (POU) positively influenced attitude toward using (ATU) (β = 0.749, $p < 0.001$), while perceived ease of use (PEOU) also positively influenced ATU (β = 0.168, $p = 0.010$). POU had a significant positive effect on behavioral intention to use (BITU) (β = 0.415, $p < 0.001$), and PEOU strongly influenced POU (β = 0.831, $p < 0.001$). ATU significantly influenced BITU (β = 0.490, $p < 0.001$) and actual usage behavior (AUB) (β = 0.464, $p < 0.001$), while BITU also significantly influenced AUB (β = 0.479, $p < 0.001$).

The contextual variables showed more limited associations. Education background was not significantly associated with POU (β = −0.061, $p = 0.126$), but it had a small positive and statistically significant association with PEOU (β = 0.081, $p = 0.037$). Work experience was not significantly associated with POU (β = 0.021, $p = 0.518$) or PEOU (β = −0.063, $p = 0.158$). END socialization acceptance (β = 0.020, $p = 0.480$) and hospital type (β = 0.039, $p = 0.163$) were also not significantly associated with ATU.

The effect-size results showed that POU had a large effect on ATU ($f^2 = 0.885$), while PEOU had a large effect on POU ($f^2 = 2.154$). ATU and BITU demonstrated medium effects on AUB ($f^2 = 0.328$ and 0.350, respectively), and ATU showed a medium effect on BITU ($f^2 = 0.225$). POU had a small-to-medium effect on BITU ($f^2 = 0.162$). The contextual variables demonstrated small or negligible effect sizes. These results indicate that the principal TAM relationships account for most of the explanatory power of the structural model.

The coefficient of determination (R^2) was 0.798 for ATU, 0.683 for POU, 0.773 for BITU, 0.827 for AUB, and 0.013 for PEOU. Thus, the model explained 79.8% of the variance in ATU, 68.3% in POU, 77.3% in BITU, and 82.7% in AUB, whereas the predictors included in the model explained only 1.3% of the variance in PEOU. The R^2 values and their corresponding predictor constructs are presented in Table 4.

Table 4: Coefficient of Determination (R^2) for Each Endogenous Construct

Endogenous construct	R^2
ATU	0.798
POU	0.683
BITU	0.773
AUB	0.827
PEOU	0.013

Note: R^2 represents the proportion of variance in an endogenous construct explained by its predictors in the structural model

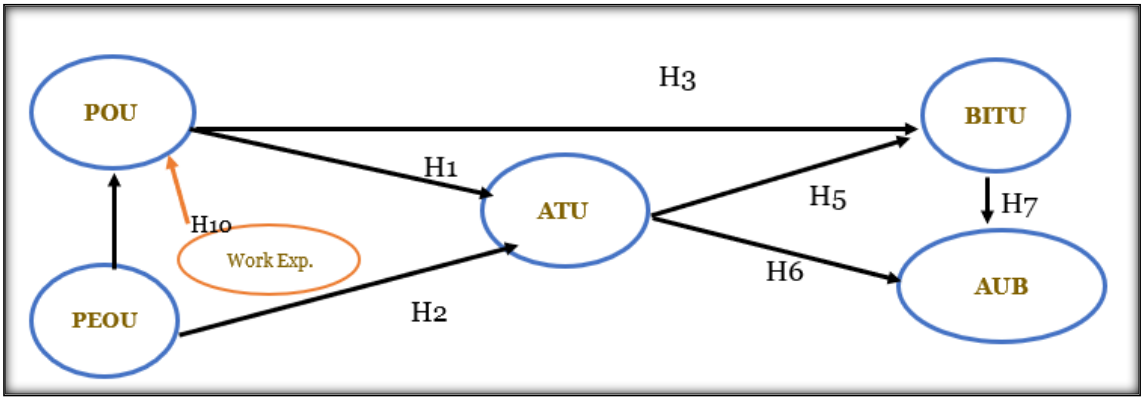


Figure 2: Result Model

Taken together, the structural model demonstrates that perceived usefulness, perceived ease of use, attitude toward using, and behavioral intention are central constructs in explaining nurses' use of END. The contextual variables included in the extended model showed comparatively small effects and limited statistical significance. The final structural model is presented in Figure 2.

Impact-Performance Map Analysis

Citation Table 5 and Figure 3 present the IPMA results for the nurse intention to Actual Usage Behavior (AUB) due to END system. The IPMA aims to identify the importance of the independent variable in forming a particular target construct in both high and low-performance scores. The results show that the extended constructs of Perceived Ease of Use (PEOU), Perceived of Usefulness (POU), Attitude Toward Using (ATU), and Behavioral Intention to Use (BITU) have different performances, with scores of 72.115, 68.434, 68.324, and 67.964, respectively. It can be seen that, compared with other constructs, perceived ease of use control has the highest level of a performance value of 72.115 and with importance (0.718). Thus, to increase the intent to actual usage behavior of nurses on END, aspects related to perceived ease of use control should be prioritized because they have a large composition of interests and good performance. Next, perceived of usefulness has a level of importance of 0.722, with a performance value of 68.434. Thus, aspects related to perceived of usefulness also need to be prioritized because they have a good importance value. Supporting these findings, the analysis was subsequently extended with attitude toward using, which is also necessary to consider performance values 68.324 and important scores 0.699. Further analysis revealed that the behavior intention to use evaluation should also be taken into consideration, because it has a relevance score of 0.479 and performance index 67.964.

Table 5: IPMA on Target Construct "Intent to Actual Usage Behavior of Nurses on END

Construct	AUB Important	Performance
Attitude Toward Using (ATU)	0.699	68.324
Behavioral Intention to Use (BITU)	0.479	67.964
Perceived Ease of Use (PEOU)	0.718	72.115
Perceived of Usefulness (POU)	0.722	68.434

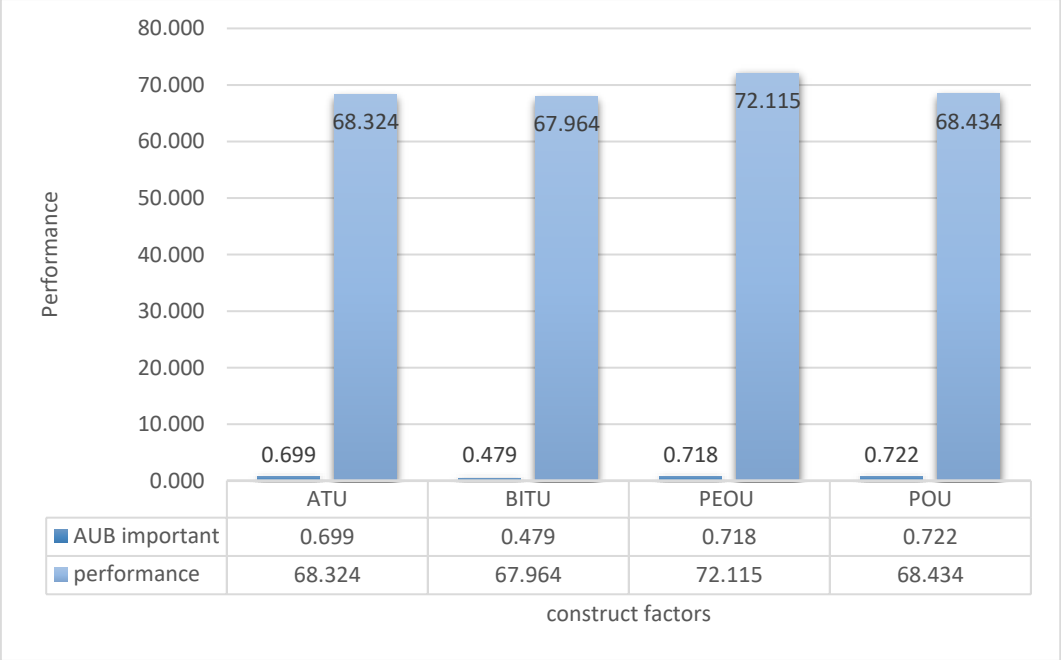


Figure 3: IPMA Component Measuring the Important of Actual Usage Behavior of Nurses on END

The Importance-Performance Map Analysis (IPMA) was conducted using AUB as the target construct. The results showed that POU had the highest importance value (0.722), followed closely by PEOU (0.718), ATU (0.699), and BITU (0.479). In terms of performance, PEOU had the highest score (72.115), followed by POU (68.434), ATU (68.324), and BITU (67.964). Thus, PEOU combined relatively high importance with the highest performance, whereas POU showed the highest importance but a lower performance score than PEOU. These results indicate that both perceived usefulness and perceived ease of use are central constructs in understanding actual END usage, with different implications for system implementation: usability is already relatively strong but remains important, while the practical usefulness of END has the highest importance and may benefit from further strengthening.

Discussion

The adoption of Electronic Nursing Documentation (END) in Indonesian hospitals, particularly in Pekanbaru, reflects the broader transition toward digital health services. In this study, perceived usefulness (POU) and perceived ease of use (PEOU) were positively associated with nurses' attitudes toward using END, supporting the central proposition of the Technology Acceptance Model (TAM) that perceived usefulness and perceived ease of use are important determinants of technology acceptance (Davis & Granić, 2024). The findings are also consistent with evidence that nurses' experiences with electronic documentation are closely related to usability, workflow integration, and perceptions of documentation burden (Jacques *et al*., 2025). Previous work on electronic nursing documentation further emphasizes the importance of a structured and usable system in supporting nursing documentation processes (Shafiee *et al*., 2022).

The significant associations of attitude toward using (ATU) with behavioral intention to use (BITU) and actual usage behavior (AUB) further indicate that nurses' evaluations of END are related to their intention and reported use of the system. This pattern is consistent with the TAM framework, in which favorable attitudes are linked to stronger behavioral intentions (Davis & Granić, 2024). In the context of electronic health records, Jacques *et al*. (2025) also reported that nurses' perceptions of documentation and usability were relevant to system use and future improvement needs. In addition, the systematic review by Wahyuni *et al*. (2024) indicates that electronic nursing documentation can contribute to documentation quality, nursing care quality, and patient safety when the system is appropriately designed and implemented.

The role of user perceptions is further supported by studies addressing psychosocial and practical barriers to healthcare technology adoption. Lee *et al*. (2025) highlighted that technology adoption is influenced by users' perceptions and psychosocial factors, reinforcing the importance of considering user experience rather than technology availability alone. Abuadas & Albikawi (2025) likewise reported that attitude was associated with behavioral intention to use digital technologies among nursing students, although their population and technology context differed from the present study. Németh (2025) also emphasized the relevance of digital tools to nursing assessment and documentation. Taken together, these studies provide a consistent context for interpreting the present findings: acceptance of END is not determined solely by system availability but is also related to how users perceive and experience the technology.

Work experience was not significantly associated with either POU or PEOU in the present study. This indicates that length of clinical experience alone may not be sufficient to explain nurses' perceptions of the usefulness or ease of use of END. Education background was not significantly associated with POU, although it showed a small positive association with PEOU. This finding suggests that formal educational background may have a limited direct relationship with technology perceptions once nurses are already working with an electronic documentation system. Reierson *et al*. (2025) similarly emphasized the importance of learning and practice opportunities when developing competence in electronic health record documentation, suggesting that exposure and training may be more relevant than educational level alone. Németh (2025) also points to the importance of nurses' interaction with digital tools in supporting documentation practice.

This study provides empirical evidence on factors associated with nurses' adoption of Electronic Nursing Documentation (END) using an extended Technology Acceptance Model (TAM). The structural results show that POU and PEOU were positively associated with ATU; POU also directly influenced BITU, while ATU influenced both BITU and AUB. In addition, PEOU had a strong positive association with POU. Taken together, these findings are consistent with the theoretical structure of TAM described by Davis and Granić (2024). They also extend previous evidence on electronic nursing documentation by showing how user perceptions are statistically connected with intention and reported use in the context of hospital nursing practice.

The strongest direct association within the TAM portion of the model was between PEOU and POU ($\beta = 0.831$, $p < 0.001$; $f^2 = 2.154$). This finding indicates that nurses who perceive END as easier to use also tend to perceive greater usefulness in the system. The result is consistent with the theoretical relationship proposed in TAM, where perceived ease of use contributes to perceived usefulness (Davis & Granić, 2024). In the context of nursing documentation, this interpretation is also supported by Shafiee *et al*. (2022), whose work on electronic nursing documentation emphasized the importance of developing and evaluating a system that fits documentation requirements. Similarly, Jacques *et al*. (2025) identified usability and documentation workflow as important considerations in nurses' experiences with electronic health records.

POU also showed a strong positive association with ATU ($\beta = 0.749$, $p < 0.001$; $f^2 = 0.885$), whereas PEOU had a smaller but significant association with ATU ($\beta = 0.168$, $p = 0.010$; $f^2 = 0.044$). This pattern suggests that nurses' attitudes toward END were more closely associated with perceived usefulness than with ease of use alone. The finding is consistent with TAM, which positions perceived usefulness as a central determinant of technology acceptance (Davis & Granić, 2024). It is also relevant to evidence from electronic nursing documentation research showing that system design and documentation functionality need to support nurses' clinical work (Shafiee *et al*., 2022). Wahyuni *et al*. (2024) further reported that appropriately designed electronic nursing documentation is associated with improvements in documentation, nursing care quality, and patient safety.

ATU and BITU were both significantly associated with AUB ($\beta = 0.464$ and $\beta = 0.479$, respectively; both $p < 0.001$). ATU also significantly influenced BITU ($\beta = 0.490$, $p < 0.001$). The R^2 for AUB was 0.827, indicating that ATU and BITU together accounted for 82.7% of the variance in the latent AUB score. The corresponding effect sizes were medium for both ATU ($f^2 = 0.328$) and BITU ($f^2 = 0.350$). These

findings indicate that actual END usage is closely associated with users' attitudes and behavioral intentions. This pattern is compatible with the TAM framework (Davis & Granić, 2024) and with empirical evidence emphasizing nurses' perceptions and usability as important aspects of electronic documentation use (Jacques *et al*., 2025). However, because the study used a cross-sectional and self-reported design, these associations should not be interpreted as evidence of causal effects.

The contextual variables produced more limited effects. Education background had a significant positive association with PEOU (β = 0.081, p = 0.037), but its association with POU was not significant (β = −0.061, p = 0.126). Work experience was not significantly associated with either POU or PEOU. END socialization acceptance and hospital type were also not significantly associated with ATU. These findings suggest that demographic or institutional characteristics alone may not adequately explain nurses' acceptance of END within the study population. Lee *et al*. (2025) emphasized that technology adoption involves psychosocial and user-related factors, while Reierson *et al*. (2025) highlighted the importance of learning opportunities and practical exposure to electronic documentation. Therefore, the present results support an interpretation that direct user experience with the system may be more relevant than demographic characteristics alone.

The IPMA results provide an additional perspective. POU had the highest importance for AUB (0.722), while PEOU had the highest performance score (72.115) and almost the same importance (0.718). This distinction is important: PEOU should not be described as having the highest importance because POU had a slightly higher importance value. Rather, PEOU demonstrated the highest performance, whereas POU demonstrated the highest importance. From an implementation perspective, maintaining usability while strengthening nurses' understanding of the practical value of END may therefore be relevant to sustained use. This interpretation is consistent with Jacques *et al*. (2025), who identified usability and documentation workflow as important areas for improving nurses' experiences with electronic health records, and with Shafiee *et al*. (2022), who emphasized evaluation of electronic nursing documentation systems in relation to users' documentation needs.

The R^2 results further demonstrate that the model explained substantial variance in ATU (79.8%), BITU (77.3%), AUB (82.7%), and POU (68.3%), but only 1.3% of the variance in PEOU. The low R^2 for PEOU indicates that education background and work experience, as specified in the present model, explain little variation in nurses' perceived ease of use. This result suggests that future research should examine additional determinants of PEOU, such as digital literacy, prior exposure to electronic health records, training intensity, technical support, workflow compatibility, and interface characteristics. Reierson *et al*. (2025) provides support for considering structured learning and practical exposure, while Lee *et al*. (2025) emphasizes psychosocial and technology-related factors in healthcare technology adoption.

Overall, the findings strengthen the empirical application of TAM to END adoption among nurses in Pekanbaru. They indicate that implementation strategies should consider both system characteristics and users' perceptions. This interpretation is consistent with the broader electronic nursing documentation literature, which emphasizes system design, usability, documentation quality, and patient-safety implications (Shafiee *et al*., 2022; Wahyuni *et al*., 2024). Nevertheless, the findings should be interpreted within the limits of the cross-sectional design, purposive sampling, and self-reported measures described in the Methods section.

The structural model's collinearity assessment showed VIF values within the reported acceptable range (1.744–4.948), indicating no critical multicollinearity problem among the predictor constructs (Hair *et al*., 2019). This supports the interpretation of the structural estimates, although it does not by itself establish causal relationships or generalizability beyond the study population. The findings should therefore be considered in conjunction with the study design and sampling limitations.

Limitations

This study was conducted using a cross-sectional design in three hospitals located in Pekanbaru, which may limit the generalizability of the findings to other healthcare settings in Indonesia. The reliance on self-reported questionnaires introduces the possibility of response bias, particularly in measuring

attitudes and behavioral intentions. Furthermore, the study did not include head nurses or managerial staff, whose perspectives could provide additional insights into organizational readiness and system integration. The absence of longitudinal data also restricts the ability to capture changes in nurses' perceptions and usage behavior over time.

Future Directions

Future research should employ multicentre longitudinal designs, incorporate qualitative approaches, and explore organizational and policy dimensions to provide a more comprehensive understanding of Electronic Nursing Documentation adoption.

Conclusion

The findings show that nurses' adoption of Electronic Nursing Documentation is strongly associated with the core TAM constructs. POU significantly influenced ATU and BITU, PEOU significantly influenced ATU and POU, and both ATU and BITU significantly influenced AUB. The structural model explained 82.7% of the variance in AUB, with additional substantial explanatory power for ATU (79.8%), BITU (77.3%), and POU (68.3%). The IPMA showed that POU had the highest importance for AUB (0.722), while PEOU had the highest performance score (72.115). These findings indicate that both the perceived practical value and usability of END are important considerations in implementation. Because the study was cross-sectional and based on self-reported data, the observed relationships should be interpreted as associations rather than causal effects. Future research should include longitudinal designs, objective usage measures, and additional determinants of perceived ease of use.

CRediT Authorship Contribution Statement

SMS: Conceptualization, methodology, analysis, result; F.M.S.: Literature search, data extraction, validation, and critical review; R.F.L.: Result, analysis; D.A.P.: Result, analysis, extraction.

AI Assistance Declaration

The author hereby declares that, during the preparation of this manuscript, generative AI tools such as ChatGPT, Microsoft Copilot, and Google Gemini were utilized to assist with language enhancement and grammar correction. Following the use of these tools, the author thoroughly reviewed and revised the content and takes full responsibility for the final version of the manuscript, ensuring its accuracy and adherence to the required academic standards.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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References

Abuadas, M., & Albikawi, Z. (2025). Predicting nursing students' behavioral intentions to use AI: the interplay of ethical awareness, digital literacy, moral sensitivity, attitude, self-efficacy, anxiety, and social influence. *Journal of Human Behavior in the Social Environment, 36*(7), 579-599. https://doi.org/10.1080/10911359.2025.2472852

Chand, S., & Sarin, J. (2019). Impact of Electronic Nursing Documentation (End) In Terms Of Quality of Nursing Documentation. *IOSR Journal of Nursing and Health Science. 8*(3), 25–32. https://doi.org/10.9790/1959-0803032532

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Davis, F. D., & Granić, A. (2024). *Revolution of TAM*. In: The Technology Acceptance Model. Human–Computer Interaction Series (eds). Springer, Cham; pp. (59–101). Springer International Publishing. https://doi.org/10.1007/978-3-030-45274-2_3

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workboo*k. Springer. https://doi.org/10.1007/978-3-030-80519-7

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hair, Joseph F, J., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. (p. 355). SAGE.

Iseni, J., Swoboda, W., Houben, D., & Hilla, R. (2026). Acceptance of digital technology among nursing staff in geriatric long-term care: Systematic review. *JMIR Nursing, 9*, e82223. https://doi.org/10.2196/82223

Jacques, D., Will, J., Dauterman, D., Evanovich, K., Delmore, B., Doty, G. R., Brien, K. O., & Groom, L. (2025). Evaluating Nurses ' Perceptions of Documentation in the Electronic Health Record : Multimethod Analysis. *JMIR Nursing, 8*, e69651. https://doi.org/10.2196/69651

Kementerian Kesehatan Republik Indonesia. (2025). *Selamat datang di situs resmi Kementerian Kesehatan Republik Indonesia* [Welcome to the official website of the Ministry of Health of the Republic of Indonesia]. Retrieved October 14, 2026. https://kemkes.go.id/id

Kristiana, E., Dedi, B., & Nurhayati, S. (2023). Implementation of technology acceptance model (TAM) in electronic documentation of nursing care: Phenomenology explorative. *JHeS (Journal of Health Studies), 7*(1), 46–57. https://doi.org/10.31101/jhes.3052

Lee, A. T., Ramasamy, R. K., & Subbarao, A. (2025). Understanding Psychosocial Barriers to Healthcare Technology Adoption : A Review of TAM Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology and UTAUT Frameworks. *Healthcare, 13*(3), 250. https://doi.org/10.3390/healthcare13030250

McCarthy, B., Fitzgerald, S., O'Shea, M., Condon, C., Hartnett-Collins, G., Clancy, M., Sheehy, A., Denieffe, S., Bergin, M., & Savage, E. (2019). Electronic nursing documentation interventions to promote or improve patient safety and quality care: A systematic review. J*ournal of Nursing Management, 27*(3), 491–501. https://doi.org/10.1111/jonm.12727

Németh, G. (2025). Impact of digital tools on patient assessment and documentation accuracy in nursing practice. *Journal of Patient Care and Nursing Practice, 2*(1), 40–44. https://doi.org/10.33545/30789087.2025.v2.i1.A.11

Rahayu, E. P., & Ariyanti, R. (2025). Evaluasi penerapan rekam medis elektronik pada fasilitas pelayanan kesehatan di Indonesia: A systematic review [Evaluation of the implementation of electronic medical records in health care facilities in Indonesia: A systematic review]. *Jurnal Manajemen Pelayanan Kesehatan, 28*(4), 131–138. https://doi.org/10.22146/jmpk.v28i04.20034

Reierson, I. Å., Mofossbakke, R. G., & Solli, H. (2025). Nursing students ' perspectives on learning electronic health record documentation in an academic setting and during clinical placement : A qualitative study. *BMC Nursing, 24*(764), 1–11. https://doi.org/10.1186/s12912-025-03320-5

Saraswasta, I. W. G., & Hariyati, R. T. S. (2018). The implementation of electronic-based nursing care documentation on quality of nursing care: A literature review. *International Journal of Nursing and Health Services (IJNHS), 1*(2), 19-31. https://doi.org/10.35654/ijnhs.v1i2.23

Shafiee, M., Shanbehzadeh, M., Nassari, Z., & Kazemi-Arpanahi, H. (2022). Development and evaluation of an electronic nursing documentation system. *BMC Nursing, 21*(1), 15. https://doi.org/10.1186/s12912-021-00790-1

Wahyuni, E., Nursalam, N., Dewi, Y. S., Arifin, H., & Benjamin, L. (2024). Electronic nursing documentation for patient safety, quality of nursing care, and documentation: a systematic review . JPMA. *The Journal of the Pakistan Medical Association, 74*(9), 1669–1677. https://doi.org/10.47391/jpma.9996

Wang, N. (2021). Electronic nursing documentation. In D. Gu & M. E. Dupre (Eds.), *Encyclopedia of gerontology and population aging* (pp. 1614–1618). Springer. https://doi.org/10.1007/978-3-030-22009-9_443

Zaharany, T. A., & Hariyati, R. (2020). Developments in Electronic Nursing Logbooks in Health Service Areas: Literatur Review. 4, 38–44. https://doi.org/10.31983/jnj.v4i1.5415

Zaman, N., Goldberg, D. M., Kelly, S., Russell, R. S., & Drye, S. L. (2021). The relationship between nurses' training and perceptions of electronic documentation systems. *Nursing Reports, 11*(1), 12–27. https://doi.org/10.3390/nursrep11010002