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User Readiness and Acceptance of Electronic Medical Record: A Partial Least Square Approach

Reni Chairunnisah[1*], Nurul Khatimah Ismatullah[2], Helmina Andriani[3]
[1]Medical Record & Health Information, Politeknik Medica Farma Husada Mataram, Mataram, Indonesia
[2]Health Information Management, Politeknik Medica Farma Husada Mataram, Mataram, Indonesia
[3]Statistics, Universitas Mataram, Mataram, Indonesia
renichairunnisah.fkm@gmail.com

Abstract— Electronic medical records (EMR) are increasingly popular in global healthcare to enhance service quality. However, transitioning to EMR poses challenges, particularly in adapting to the technology. Researchers are therefore interested in exploring the readiness and acceptance of EMR adoption using the Technology Readiness and Acceptance Model (TRAM). This study employs quantitative analytical methods and involves a sample size of 30 healthcare professionals responsible for medical record keeping. Total sampling was utilized to select participants. The variables examined in this research include Optimism (OPT), Innovativeness (INN), Discomfort (DIS), Insecurity (INS), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Use Intention (USI). The study's findings, analyzed through Partial Least Squares (PLS), reveal that Innovativeness (INN) exerts the strongest influence on Perceived Ease of Use (PEOU) with a β-value of 0.434. Additionally, PEOU shows the most significant impact on Intention to Use (USI) with a β-value of 1.106. Approximately 71.8% of the variability in the USI variable is accounted for by Optimism (OPT), Innovativeness (INN), Discomfort (DIS), Insecurity (INS), Perceived Ease of Use (PEOU), and Perceived Usefulness (PU). At the same time, other factors outside the scope of this study explain the remaining variation.
Keywords— Electronic Health Record, EMR, Readiness Index, Technology Readiness and Acceptance Model, TRAM

I. BACKGROUND

The Community Health Center (Puskesmas) plays a crucial role in Indonesia's healthcare system, serving as a primary hub for both community health efforts (UKM) and individual health services (UKP) [1]. Within the Community Health Center, effective management of the medical records unit is essential to ensure the generation of high-quality information. This, in turn, enhances the quality and utility of health services, thereby aiding management in decision-making processes. Each patient interaction at the Community Health Center necessitates the creation of a medical record file [2]. Recently, there has been a significant shift towards electronic medical records following the issuance of Minister of Health Regulation Number 24 of 2022 concerning Medical Records. This policy mandates health facilities to adopt electronic systems for recording patient medical histories. The transition to electronic records is slated to be completed by December 31, 2023 [3].

Electronic medical records (EMR) technology offers health service facilities a more robust tool for enhancing quality compared to traditional paper-based medical records. Implementing EMR has the potential to yield significant advantages for healthcare services, especially in basic healthcare facilities. One notable benefit observed with EMR adoption is the improved accessibility of electronic patient records, which enhances efficiency in healthcare delivery [4]. Additionally, EMR systems facilitate easier retrieval of patient information for administrative staff, thereby enabling healthcare workers to access patient data more efficiently [5] and ultimately improving overall patient care [6].

However, there are several challenges that will be encountered when switching to RME [7]. Achieving quality improvement through the use of RME is not cheap and not easy [8]. Based on various studies, there are 25 things that become obstacles in implementing RME, ranging from time constraints, and cost constraints, to wireless connectivity problems [9]. According to Samadbeik et al (2020) implementing RME is a complex process, involving many stakeholders and requiring consideration of many organizational aspects, including clinical, structural, administrative, and cultural factors [10]. It takes time to convert paper records into RME as there is a need to standardize procedures to ensure all staff adhere to the same processes when carrying out their respective tasks [11].

The many challenges that will be faced in efforts to implement RME are the basis for the need to assess user readiness and acceptance in efforts to implement RME. One model that can be used to assess readiness to implement RME is the Technology Readiness and Acceptance Model (TRAM). TRAM tries to explain how people adopt new technologies. This model describes a person's tendency to embrace new technology in achieving goals in daily life and at work. TRAM will predict technology acceptance which in turn will influence individual behavior and intentions to use technology. TRAM findings emphasize the impact of (individual) users and user experience [12]. The impact of use and ease of use will dominate adoption behavior decision-making techniques [13]. TRAM can explain and connect from the perspective of personal opinion (optimism, innovativeness, discomfort, insecurity) and how a technology works (perceived usefulness and perceived ease of use) to its adoption in the user's life (intention to use) [14].

Based on the results of an initial survey conducted in March 2023, the results showed that all Community Health Centers in the Mataram City area had not implemented Electronic Medical Records. Even several Community Health Centers stated that they were not ready to implement Electronic Medical Records. This is due to understanding the many obstacles and challenges that will be encountered in the preparation and implementation of electronic medical records. Meanwhile, based on Minister of Health Regulation Number 24 of 2022, Puskesmas as first-level health service facilities are required to immediately implement Electronic Medical Records no later than 31 December 2023.

This issue highlights the significance of assessing the Community Health Center’s preparedness for implementing electronic medical records (EMR) to determine their respective readiness categories. This study aims to analyze the readiness and user acceptance in meeting the challenges of EMR implementation at the Karang Pule Health Center in the Mataram City Region, using the Technology Readiness and Acceptance Model (TRAM).

II. METHOD

The type of this research is quantitative research with analytical research design. The population in this study were all employees of the Puskesmas Karang Pule who participated in medical record filling, totaling 30 people. The sampling technique used in this study was total sampling.

Primary data of this study were obtained directly by distributing instruments in the form of questionnaires. The study used a questionnaire that adopts 16-item TRI 2.0 from Parasuraman and Colby (2015) [15] to measure the TR variable. Moreover, other variables (perceived usefulness, perceived ease of use, and use intention) were adapted from Davis (1989) [16]. Data were collected through online questionnaires using the Google Form application. The previous questionnaire was tested to determine its validity and reliability. The data analysis used in this research is Partial Least Square (PLS) using the SMARTPLS application. The hypothesis in this study are:

H1: Optimism has a positive influence on the perceived usefulness
H2: Optimism has a positive influence on perceived ease of use
H3: Innovativeness has a positive influence on the perceived usefulness
H4: Innovativeness has a positive influence on perceived ease of use.
H5: Discomfort has a negative influence on the perceived usefulness.
H6: Discomfort has a negative influence on perceived ease of use
H7: Insecurity has a negative influence on the perceived usefulness.
H8: Insecurity has a negative influence on perceived ease of use.
H9: The perceived ease of use has a positive influence on perceived usefulness.
H10: The perceived usefulness has a positive influence on use intention.
H11: The perceived ease of use has a positive influence on use intention.

III. RESULTS AND DISCUSSION

TRAM model testing is carried out using the PLS method with the help of SmartPLS software. Testing is carried out on the outer model and inner model.

Outer Model

Outer model testing is carried out to determine the reliability and validity of latent variables. Reliability testing is carried out by looking at the criteria for indicator reliability and internal consistency reliability, while validity testing is carried out by looking at the requirements for convergent validity and discriminant validity.

a. Indicator reliability

This value shows how much of the indicator variance can be explained by the latent variable by considering the outer loading value. The ideal outer loading value is ≥0,70. If the research conducted is explanatory, then the ideal outer loading value is ≥0,40 [17].

Table 1. Outer Loadings Value

	DISS	INN	INS	OPT	PEOU	PU	USI
DIS1	0,861						
DIS2	0,888						
DIS3	0,697						
DIS4	0,793						
INN1		0,727					
INN2		0,837					
INN3		0,543					
INN4		0,877					
INS1			0,727				
INS2			0,776				
INS3			0,844				
INS4			0,916				
OPT1				0,874			
OPT2				0,600			
OPT3				0,887			
OPT4				0,939			
POU1					0,771		
PEOU2					0,853		
PEOU3					0,862		
PEOU4					0,818		
PU1						0,982	
PU2						0,918	
PU3						0,917	
PU4						0,939	
USI							1,000

Table 1 provides information that there are several indicators with outer loading values of less than 0,7, meaning that these indicators have poor reliability so that they cannot be good measures for latent variables. Thus, indicators that have outer loading values <0,7 are removed from the model so that the modified model becomes:

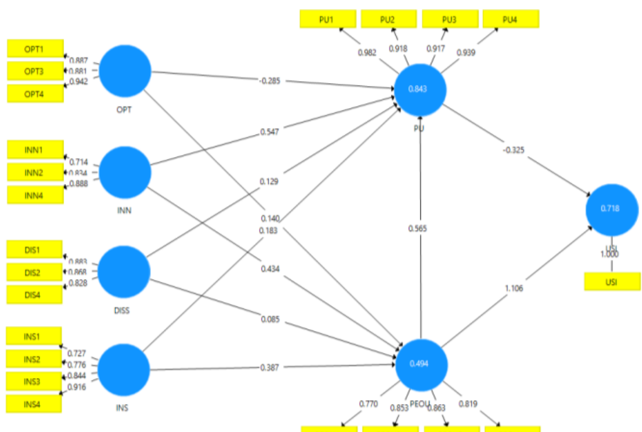

Fig. 1 Overview of Results

So that, the outer loading value is (see Table 2):

Table 2. Outer Loading Value for TRAM Model Modification

	DISS	INN	INS	OPT	PEOU	PU	USI
DIS1	0,883						
DIS2	0,868						
DIS4	0,828						
INN1		0,714					
INN2		0,834					
INN4		0,888					
INS1			0,727				
INS2			0,776				
INS3			0,844				
INS4			0,916				
OPT1				0,887			
OPT3				0,881			
OPT4				0,942			
PEOU1					0,770		
PEOU2					0,853		
PEOU3					0,863		
PEOU4					0,819		
PU1						0,982	
PU2						0,918	
PU3						0,917	
PU4						0,939	
USI							1,000

b. Internal Consistency Reliability

The internal consistency reliability value can be calculated through the composite reliability value. The ideal composite reliability value is ≥0,70. If the research conducted is explanatory, the ideal composite reliability value is ≥0,60.

Table 3. Composite Reliability Value

Latent Variable	*Composite Reliability*
USI	1,000
PU	0,968
OPT	0,930
PEOU	0,896
DISS	0,895
INS	0,890
INN	0,855

Table 3 provides information that all latent variables have a composite reliability value greater than 0,6. This means that the indicators in the modified model can measure each latent variable well or it can be said that all latent variables are reliable

c. Convergent Validity

In general, convergent validity is indicated by the Average Variance Extracted (AVE) value. The ideal AVE value is ≥ 0,5.

Table 4. AVE Value

Latent Variable	AVE
USI	1,000
PU	0,883
OPT	0,816
PEOU	0,684
DISS	0,739
INS	0,671
INN	0,665

Table 4 indicates that the AVE values for each latent variable are more than 0,50, so it can be said that each latent variable can explain more than half of the variance of its indicators. It can be concluded that all latent variables are valid.

d. Discriminant Validity

One way to measure the discriminant validity criteria is to look at the cross-loading value [18].

Table 5. Cross Loading Value

	DISS	INN	INS	OPT	PEOU	PU	USI
DIS1	**0,883**	-0,049	0,533	-0,094	0,167	0,318	0,141
DIS2	**0,868**	-0,109	0,217	-0,100	0,171	0,280	0,27
DIS4	**0,828**	-0,028	0,478	-0,018	0,251	0,253	0,346
INN1	-0,057	**0,714**	-0,230	0,753	0,367	0,207	0,474
INN2	-0,151	**0,834**	0,058	0,580	0,451	0,496	0,320
INN4	0,012	**0,888**	0,136	0,817	0,534	0,672	0,273
INS1	0,200	-0,173	**0,727**	-0,238	0,375	0,336	0,369
INS2	0,524	-0,117	**0,776**	-0,155	0,268	0,318	0,343
INS3	0,401	0,275	**0,844**	0,067	0,394	0,558	0,320
INS4	0,467	0,030	**0,916**	-0,173	0,344	0,511	0,261
OPT1	0,012	0,843	0,072	**0,887**	0,434	0,468	0,273
OPT3	-0,104	0,693	-0,317	**0,881**	0,368	0,226	0,389
OPT4	-0,147	0,783	-0,190	**0,942**	0,423	0,375	0,353
PEOU1	0,238	0,600	0,467	0,490	**0,770**	0,848	0,610
PEOU2	0,175	0,358	0,314	0,358	**0,853**	0,563	0,866
PEOU3	0,228	0,413	0,339	0,283	**0,863**	0,704	0,773
PEOU4	0,093	0,477	0,259	0,363	**0,819**	0,667	0,463
PU1	0,292	0,587	0,518	0,410	0,817	**0,982**	0,562
PU2	0,238	0,657	0,512	0,490	0,807	**0,918**	0,610
PU3	0,374	0,485	0,487	0,296	0,807	**0,917**	0,610

PU4	0,341	0,589	0,531	0,348	0,762	**0,939**	0,530
USI	0,295	0,397	0,386	0,366	0,830	0,616	**1,000**

Table 5 shows that the model has good discriminant validity because the cross-loading value of the latent variable with its constituent indicators is greater than the cross-loading value of the latent variable with indicators from other latent variables.

Inner Model

Inner model testing is conducted to determine the relationship between latent variables in the PLS model. This inner model is tested using the path coefficient and R2 values.

The strength of the influence of variables on the dependent variable is assessed using the path coefficient or β value. A structural model is considered acceptable if all β values are above 0,1. A higher β value indicates a stronger impact of the independent variable predictor on the dependent variable. At the same time, path coefficients have standardized values between -1 and +1, where the estimated path coefficient close to +1 represents a strong positive relationship (and vice versa for negative values) which is almost always statistically significant. The closer the estimated coefficients are to 0, the weaker the relationship. And the very low values approaching 0 are usually not significant. The sign of the β value, whether positive or negative, is not a concern because the impact of the path is the absolute value of the β value[19].

Table 6. Path Coefficients Value

	Hypotheses	*Path Coefficients*	Decision
H1	OPT → PU	-0,285	Not Significant
H2	OPT → PEOU	0,140	Significant
H3	INN → PU	0,547	Significant
H4	INN → PEOU	0,434	Significant
H5	DISS → PU	0,129	Significant
H6	DISS → PEOU	0,085	Not Significant
H7	INS → PU	0,183	Significant
H8	INS → PEOU	0,387	Significant
H9	PEOU → PU	0,565	Significant
H10	PU → USI	-0,325	Not Significant
H11	PEOU → USI	1,106	Significant

Table 6 summarizes the results of the hypotheses. Hypothesis H1, H6, and H10 are rejected because the correlation is not statistically significant. INN has a significant positive effect on PU (a positive relationship means if INN increases, the PU value also increases) or has a fairly strong positive relationship with PU. Meanwhile, DISS and INS each have a significant negative effect on PU or have a small negative relationship with PU (a negative relationship means if DISS increases, the PU value decreases).

Furthermore, it is also necessary to pay attention to the R2 value, which is a value used to see how much the endogenous variable (Y) can be explained by the exogenous (X) (Table 7).

Table 7. R^2 Value

Variable	R^2
PEOU	0,494
PU	0,843
USI	0,718

The Thus, it can be concluded that:

- The PEOU variable can be explained by the OPT, INN, DIS, and INS variables by 49.4% while the rest is explained by other variables outside the variables studied.

- The PU variable can be explained by the OPT, INN, DIS, INS, and PEOU variables by 84.3%, while the rest is explained by other variables outside the variables studied.
- The USI variable can be explained by the OPT, INN, DIS, INS, PEOU, and PU variables by 71.8%, while the rest is explained by other variables outside the variables studied.

IV. CONCLUSIONS AND SUGGESTIONS

Innovativeness (INN) exerts the strongest influence on Perceived Ease of Use (PEOU) with a β-value of 0,434. Additionally, PEOU shows the most significant impact on Intention to Use (USI) with a β-value of 1,106. Approximately 71,8% of the variability in the USI variable is accounted for by Optimism (OPT), Innovativeness (INN), Discomfort (DIS), Insecurity (INS), Perceived Ease of Use (PEOU), and Perceived Usefulness (PU). At the same time, other factors outside the scope of this study explain the remaining variation.

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