READINESS AND ACCEPTANCE OF ELECTRONIC MEDICAL RECORDS AMONG HEALTH PROFESSIONALS IN INDONESIA

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ABSTRACT

With the launch of Indonesia Health Services (IHS) as a platform for the digitization and data integration of the country's various healthcare systems, the implementation of electronic medical records (EMR) has become inevitable. Ministry of Health also urged health service facilities to run an electronic patient medical history recording system until December 31, 2023. EMR can assist practitioners in performing routine duties and assignments records-keeping more efficiently and effectively. However, implementation of EMRs is typically accompanied by concerns of additional burden due to data entry, disruptions in productivity, apprehension of shifting from paper records to computerized records, and modifications in organizational culture necessary to use EMRs efficiently. Technology's perceived ease of use and usefulness are considered by people when deciding whether or not to adopt new technology. This study aimed to assess health professional readiness and intention toward EMR implementation in Indonesia based on Technology Acceptance Model (TAM) and Technology Readiness Index (TRI). This cross-sectional study used an online questionnaire to gather data. We used convenient sampling since the population is infinite and unknown. At the end of the study, we managed to get 124 responses from all over Indonesia. Most of the participants were specialists and experienced for more than fifteen years. Data were analyzed using SEM-PLS. Our analysis found that optimism, innovativeness, discomfort, and insecurity simultaneously explained 69.9% of perceived usefulness (PU), while perceived ease of use (PEU) was explained by 63.4% of the variance. Further, the model explained 67.2% of behavioral intention. Optimism and innovativeness significantly influenced PU. Optimism also significantly influenced PEU. Insecurity influenced PEU in a negative role. Therefore, all influential factors in EMR adoption must be considered for improving and developing EMR in Indonesia.

Keywords: electronic medical record (EMR), health professionals, Technology acceptance model (TAM), Technology readiness index (TRI)

1. INTRODUCTION

Various electronic medical records (EMR) have been discussed, created, and adopted throughout the past two decades because of the numerous improvements in information technology, notably in the healthcare industry. Institutions in certain countries are preparing to create a nationwide electronic health record system, while others have already adopted EMR. Current EMR research focuses on optimizing patient outcomes, enhancing healthcare delivery, and exchanging patient data in underdeveloped countries (Ayaad et al., 2019; Gopidasan et al., 2022; Neves et al., 2020). Due to its efficiency, EMR is also garnering significant investment from publicly and privately funded healthcare organizations (IOM, 2000).

The national e-health strategy is deemed a comprehensive approach to planning, developing, implementing, and information and communication technology evaluation in the health sector nationally (Peraturan Menteri Kesehatan Nomor 46 Tahun 2017 Tentang Strategi E-Kesehatan Nasional, 2017). The Ministry of Health's Strategic Plan for 2020-2024 also stated that Timeliness and accuracy in the exchange of health data are two areas where the health information system expects to make strides. Therefore, the Ministry of Health launched Indonesia Health Services (IHS) as a platform for the digitization and data integration of the country's various healthcare systems called 'SATUSEHAT' (Cabinet Secretariat of the Republic of Indonesia, 2022). This platform aims to transform health services in Indonesia towards a

robust, resilient, and integrated health system (Ministry of Health, 2022b). Moreover, the issuance of The Minister of Health Regulation number 24 of 2022 concerning Medical Records requires health service facilities to run an electronic patient medical history recording system until no later than December 31, 2023 (Ministry of Health, 2022a). Due to this, the implementation of EMR becomes inevitable.

EMR can assist practitioners in performing their duties and record-keeping tasks more efficiently and effectively. The quality of treatment provided to hospitals for critically ill patients has also been shown to increase with the implementation of electronic medical records (Lin et al., 2020). Digital health records (EMRs) have the potential to improve healthcare delivery by enabling more timely and effective diagnosis, treatment, and administrative tasks, safer, and more cost-effective decision-making. Additionally, it can strengthen the groundwork for value-based care and lead to more person-centered treatment.

However, EMR necessitates significant capital investment and advanced wireless network architectural configuration. Furthermore, Health Information Technologies (HITs) are necessary for their performance-enhancing benefits to accrue to an organization. Yet, HITs are frequently impeded by healthcare workers who are supposed to gain from their use. To maximize the benefits of EMR, hospitals must understand the motivations influencing users' intention to use EMR.

Assessing a staff's level of preparedness before using EMR technology has been identified as a crucial step in implementing EMR. This process will provide a complete overview of current conditions and the readiness of health institutions and health professionals to implement the new approach (Ghazisaeidi et al., 2014). Many pre-implementation studies, however, have primarily focused on organizational preparedness, technical readiness, leadership, infrastructure, and financial readiness (Dönmez et al., 2020; Durrani et al., 2012; Pujani et al., 2019; Vaishnavi & Suresh, 2022). Studies have been conducted to assess healthcare workers' readiness before EMR deployment. The success or failure of EMR is heavily dependent on healthcare providers' readiness to transition from paper-based records to digital/electronic records.

The readiness of health institutions and health professionals to accept changes brought about by the use of computerized systems has been identified as a significant success element in the introduction of electronic systems (Khoja et al., 2007; Najaftorkaman et al., 2013). From the user's perspective, implementing electronic health records is typically accompanied by concerns of additional burden due to data entry, productivity disruptions regarding lack of computer skills, and insufficient training support (Jimma & Enyew, 2022). Conducting a readiness assessment can alleviate these concerns and lower the possibility of significant financial loss, minimize delays and disappointments among staff and service users, reduce the chance of patient harm, and encourage staff to embrace approaches (Mauco et al., 2021).

Traditionally, technology adoption has been studied using usefulness and ease of use as predictors of personal acceptance of technologies (Davis, 1989). However, this perspective may not acknowledge us to comprehend and clarify an individual technology adoption. Consequently, further research may be required to investigate this topic to offer more effective interventions to increase people's acceptance and utilization of technology.

Individual internal characteristics (i.e., personality traits) are frequently explored among the many antecedents. The Technology Readiness Index (TRI) is acknowledged as a trait, a reasonably consistent description of a person among the other personality qualities (Parasuraman, 2000a). Therefore, this research investigates the technological readiness traits and perceptions of EMR that influence practitioners' intentions regarding EMR usage. This

research may add to our understanding of novel adoption by incorporating the Technology Acceptance Model (TAM) with the users' technology readiness

1.1 Research framework

Electronic Medical Records (EMR)

Electronic Medical Records (EMR) are Medical Records created using an electronic system intended to administer Medical Records (Permenkes 24 Tahun 2022 Tentang Rekam Medis, 2022). The widespread adoption of EMRs has the potential to improve healthcare delivery by permitting more timely and effective patient treatment (World Health Organization, 2012). Health service institutions have the option of using these technologies independently or integrating them with their existing IT infrastructure. They serve as the patient's official documentation of their medical treatment.

Technology acceptance model (TAM)

Most researchers use TAM (Davis, 1989) in assessing technology adoption. The Technology Acceptance Model (TAM) is a theory that was developed from Ajzen and Fishbein's Theory of Reason and Action (TRA) to explain the relationship between how people feel about technology and how they utilize it (e.g., its usefulness and its ease of use), attitude and actual technology adoption (Davis, 1989). Both perceived usefulness and perceived ease of use are crucial to the TAM model because of their connections to beliefs. An individual's propensity to adopt a new knowledge or computer system is referred to as their "perceived usefulness" (PU), and when confirmed, this can lead to enhanced performance. Perceived ease of use (PEOU) is the second key concept in the TAM model, and it relates to the expectation that a user will have to spend the less mental or physical effort to complete a task using a given system or piece of technology.

Technology readiness index (TRI)

Parasuraman (2000a) then developed the Technology readiness index (TRI), which summarizes the stimulators or inhibitors of technology readiness referencing these eight identified paradoxes of Mick and Fournier (1998). Technology readiness (TR) refers to "people's propensity to embrace and use new technologies to accomplish goals in their home life and at work (Parasuraman, 2000a). The term "technology readiness" is used here to describe a person's perspective on and preparedness for the use of technological products and services (Parasuraman & Colby, 2001). An individual's inclination to adopt and utilize cutting-edge technology is determined by a combination of psychological factors known as "enablers" and "inhibitors" (Parasuraman, 2000b). Two traits were identified as enablers of innovation in technology, whereas the other two were identified as inhibitors (Rojas-Méndez et al., 2017). TRI indicates a person's perceptions about technology but does not indicate their competency with it (Walczuch et al., 2007). TRI classifies users into four categories based on their dominant personality attribute, with two elements serving as drivers and two others as brakes on their adoption of emerging technologies.

- Optimism: a positive perspective favoring technological advancement. confidence in one's ability to direct one's own life with more ease and effectiveness related to new technologies;
- Innovativeness: predisposition toward pioneering the adoption of novel technological solutions;
- Discomfort: desperate for order and feeling overburdened; and
- Insecurity: doubting the reliability of digital privacy and security measures.

1.2 Hypothesis development

Optimism is a key component of TR and a major motivator for TR. It's linked to an optimistic perspective on technology and the belief that it empowers and streamlines the lives of its users. Therefore, optimists consider a given technology more valuable because they are less concerned with potential adverse effects (Walczuch et al., 2007). A confident expectation (optimism) that advances in technology will improve people's quality of life by increasing their productivity, independence, and authority (Parasuraman, 2000a). Furthermore, early adopters, who typically possess a higher level of innovativeness, hold fewer complex beliefs about new technology. However, specific, clear barriers to technology adoption were brought on by security and privacy concerns. The perceived utility of a particular technology is lowered when there is a high level of personal insecurity and discomfort with it.

In particular, more innovative and optimistic people are more likely to assume that EMR is simple to use. Contrarily, persons who score higher on the insecurity and discomfort traits believe technology to be more difficult, which reduces their belief that it is simple to use. Low perceived ease of use of a particular technology is caused by high personal uncertainty and uneasiness with technology in general (Walczuch et al., 2007). Figure 1 displays the proposed framework and hypotheses. The proposed hypothesis for this study was:

H_{1a}: Optimism has a positive influence on the perceived usefulness of EMR.
H_{1b}: Optimism has a positive influence on the perceived ease of use of EMR
H_{2a}: Innovativeness has a positive influence on the perceived usefulness of EMR.
H_{2b}: Innovativeness positively influences the perceived ease of use of EMR.
H_{3a}: Discomfort has a negative influence on the perceived usefulness of EMR.
H_{3b}: Discomfort negatively influences the perceived ease of use of EMR.
H_{4a}: Insecurity has a negative influence on the perceived usefulness of EMR.
H_{4b}: Insecurity negatively influences the perceived ease of use of EMR.
H_5: The perceived usefulness positively influences the intention to use EMR.
H_6: The perceived ease of use positively influences the intention to use EMR.
H_7: The perceived ease of use positively influences the perceived usefulness of EMR.

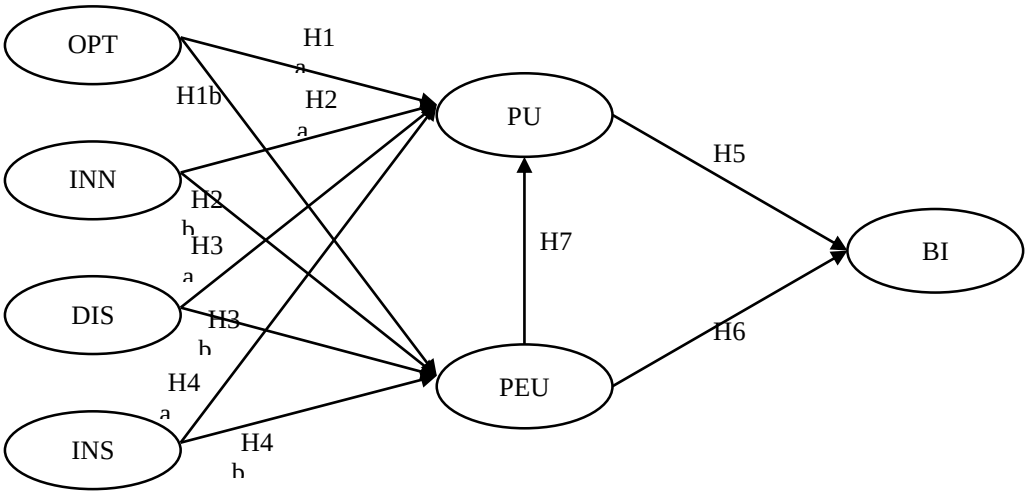


Figure 1: The research framework
(OPT = Optimism; INN = Innovativeness; DIS = Discomfort; INS = Insecurity; PU = Perceived Usefulness; PEU = Perceived ease of use; BI = Behavioral Intention)

2 METHOD

The current study is focused on the readiness and adoption of EMR among health professionals in Indonesia. This cross-sectional study used a survey method for data collection. We used online structured self-completion questionnaires to collect data. A structured questionnaire is a prepared list of inquiries designed to gather data from participants (Hair et al., 2020; p.219). Since the large population, we used a convenient sampling approach for this study. While the minimum SmartPLS 2.0 M3 requires is five times the most significant number of indicators of any given construct, the sample size employed in this study (n=124) comfortably exceeds this threshold (Joseph F. Hair et al., 2017).

According to the research method, questionnaire items were used to assess seven different variables. Exogenous variables were Optimism (OPT), innovativeness (INN), discomfort (DIS), insecurity (INS), perceived ease of use (PEU), perceived usefulness (PU), and behavioral intention (BI) was endogenous. We used TRI 2.0 to measure technology readiness traits. TRI 2.0 were developed in 16-item instruments (Parasuraman & Colby, 2014). Applied, decision-oriented studies in which technological innovation plays a significant role may find TRI 2.0's measurement of technology readiness useful psychographic variable (Parasuraman & Colby, 2014). PU and PEU measurement used a 4-item proposed by Davis (1989), and BI used a 3-item proposed by Venkatesh et al. (2003). We used 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree) for items measurement.

We analyzed the proposed research model with SmartPLS 3.0. Partial least squares (PLS), a variance maximization method, is preferred when the sample size is small to medium since it is less constrained by distributional assumption than the covariance-based SEM (Gefen et al., 2011; Joseph F. Hair et al., 2017). Convergent validity, discriminant validity, composite reliability, and Cronbach's alpha were all utilized in the analysis of the external model. Structural models were analyzed using the R-square value and path coefficient estimates.

3 RESULT

Table 1: Descriptive statistics of respondents

		Freq.	%
Sex	Male	77	62,1%
	Female	47	37,9%
Age	26-30	6	4,8%
	31-35	20	16,1%
	36-40	12	9,7%
	41-45	17	13,7%
	46-50	17	13,7%
	51-55	23	18,5%
	>55	29	23,4%
Level of education	Diploma	21	16,9%
	Bachelor degree	27	21,8%
	Master degree	61	49,2%
	Doctorate	15	12,1%
Profession	Medical specialists	56	45,2%

	General practitioners	20	16,1%
	Nurses	20	16,1%
	Midwives	20	16,1%
	Dentists	5	4,0%
	Dental specialist	1	0,8%
	Pharmacist	1	0,8%
	Other health professions	1	0,8%
Work experience	1-5 years	15	12,1%
	6-10 years	15	12,1%
	11-15 years	22	17,7%
	>15 years	72	58,1%

Source: (Primary data, 2022)

Table 1 shows that most respondents were male (77 cases, 62.1%); regarding age, the largest proportion was older than 55 years old (29 cases, 24.4%); regarding education, the largest proportion was master's degree (61 cases, 49.2%); regarding the profession, medical specialists were the largest proportion (56 cases, 45.2%); and regarding work experience, the largest proportion was more than fifteen years (72 cases, 58.1%).

Evaluation of the measurement model

We removed items OPT3 and DIS1 since they have outer loading below the recommended value (0,7) (Joe F. Hair et al., 2011). Cronbach's alpha and composite reliability are frequently used as reliability assessment criteria (CR) (Henseler, 2017). All of the variables had Cronbach's scores that were more than the minimum threshold of 0.7 (Henseler, 2017). The CR of all the variables was over 0.8, well over the CR of 0.7 which is considered the threshold for statistical significance (Henseler, 2017) (see Table 2). These results indicated sufficient reliability of the measurement.

Table 2. Construct Validity and Reliability

	Cronbach's Alpha	Composite Reliability
BI	0,884	0,928
DIS	0,808	0,886
INN	0,843	0,893
INS	0,842	0,889
OPT	0,888	0,930
PEU	0,932	0,951
PU	0,970	0,978

OPT = Optimism; INN = Innovativeness; DIS = Discomfort; INS = Insecurity; PU = Perceived Usefulness; PEU = Perceived ease of use; BI = Behavioral Intention

Source: (SmartPLS, 2022)

The assessment criteria include convergent and discriminant validity (Henseler, 2017). Convergent validity used the average variance extracted (AVE) criterion (Joseph F Hair et al.,

2019). Hair et. al. (2011) recommended that the maximum squared correlation between any two latent constructs should be less than the AVE of both constructs. The results showed that AVE was higher above the threshold value of 0.5, ranging from 0.670 to 0.917 (Joe F. Hair et al., 2011), suggesting good convergent validity (See Table 3).

Table 3. Correlation matrix

	AVE	BI	DIS	INN	INS	OPT	PEU	PU
BI	0,813	**0,901**						
DIS	0,722	-0,137	**0,850**					
INN	0,677	0,565	-0,166	**0,823**				
INS	0,670	-0,280	0,746	-0,213	**0,818**			
OPT	0,817	0,580	-0,208	0,463	-0,131	**0,904**		
PEU	0,831	0,800	-0,162	0,616	-0,220	0,718	**0,911**	
PU	0,917	0,758	-0,184	0,529	-0,249	0,683	0,821	**0,957**

AVE = average variance extracted
OPT = Optimism; INN = Innovativeness; DIS = Discomfort; INS = Insecurity; PU = Perceived Usefulness; PEU = Perceived ease of use; BI = Behavioral Intention

Source: (SmartPLS, 2022)

Evaluation of the structural model

Table 4. Summary of hypothesis testing results

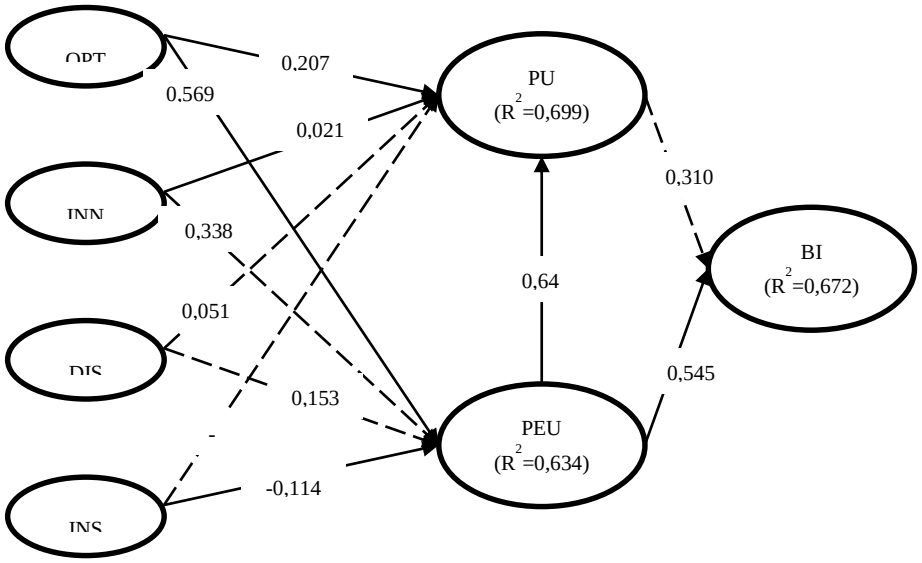
	Hypothesis	*p*-value	Result
H_{1a}	: OPT -> PU	0,028	Supported
H_{1b}	: OPT -> PEU	0,000	Supported
H_{2a}	: INN -> PU	0,003	Supported
H_{2b}	: INN -> PEU	0,793	Failed to support
H_{3a}	: DIS -> PU	0,434	Failed to support
H_{3b}	: DIS -> PEU	0,065	Failed to support
H_{4a}	: INS -> PU	0,105	Failed to support
H_{4b}	: INS -> PEU	0,037	Supported
H_5	: PU -> BI	0,105	Failed to support
H_6	: PEU -> BI	0,001	Supported
H_7	: PEU -> PU	0,000	Supported

OPT = Optimism; INN = Innovativeness; DIS = Discomfort; INS = Insecurity; PU = Perceived Usefulness; PEU = Perceived ease of use; BI = Behavioral Intention

Source: (SmartPLS, 2022)

The structural model's path relationships are the primary focus of the estimations for path coefficients, which take into account their sign, magnitude, and significance (Henseler, 2017). The study used the bootstrapping resampling approach to estimate if the path coefficients were statistically significant. Six of eleven hypotheses were confirmed by the data analysis (H1a, H1b, H2a, H4b, H6, and H7). Roughly 69% of the variance in PU was described by optimism, inventiveness, discomfort, and insecurity, while about 63% of the variance in PEU was explained by these four factors combined. Furthermore, the model accounted for approximately 67.2% of the variation in behavioral intention. Standardized path coefficients and the results of testing hypotheses, among other causal path properties, are shown in Table 4 and Figure 2.

Figure 2. Structural model results (dashed lines denote insignificant influence)



4. DISCUSSION

To a large extent, our findings suggest that optimism affects both PU and PEU. That is to say, PEOU and PU toward EMR are seen as more prominent among health professionals with higher levels of optimism. These findings confirmed the previous study (Walczuch et al., 2007). Optimism regarding technology refers to a propensity that sees the positive aspects of technology, such as its perceived potency, adaptability, ease of use, and productivity (Parasuraman, 2000a). At the same time, it is crucial for individuals to feel confident in their use of technological devices. Technological optimists in healthcare may see using technology as an advantage to improve their professional domain. Optimistic health professionals are more reluctant to embrace new technologies and consider that technology can assist them in accomplishing their duties more efficiently. That is, optimistic health professionals would expect the EMR to facilitate the completion of tasks and will have greater optimism in using the EMR.

Our research also found that innovativeness influenced PU significantly but not PEU. Our study may indicate that health professionals demand more practicality in EMR rather than exploring new features and usage skills. Our analysis may also suggest that more innovative people assume that EMRs lack innovativeness since they do not feel easy to use them. The complexity and lack of customizability of EMR may cause these situations (Jimma & Enyew, 2022).

The relation between insecurity and PEU was also found to be significant, which was expected. It may estimate that more insecurity possessed by health professionals will lead to less perceived ease toward EMR. Health professionals who lack confidence in the reliability of modern technology may be reluctant to adopt electronic medical records (EMR) due to the complexity of the technology or their lack of trust in it. For instance, unskilled health workers using a touch screen, smaller keyboard, and mouse all at once can make mistakes due to the complexity of EMR usage. They may also be concerned that the wireless network would expose patient information or will only keep a subset of records.

We also found that PEU significantly and positively affected the intention to use EMR. People with a positive impression of an EMR's user-friendliness are more likely to use it. Despite previous research suggesting otherwise, this analysis found that attitudes toward EMR's utility did not predict intent to use, while attitudes toward its usability did. This study shows that users' perceptions of an EMR's usability affect their desire to utilize it, even if such users believe that doing so will boost their productivity on the job.

Implementation of EMR may find some barriers, including the complexity of the EMR system, lack of customizability, concern about patient records, and the temporary loss of access if computers crash. Viruses attacks, power failures, lack of time to learn, the problem of time during data entry, more time needed during clinical encounters, and fear of autonomy loss are also barriers (Jimma & Enyew, 2022). Medication, clinical workflow assistance, planning, and more comprehensive overviews are just a few of the areas where previous research has suggested EMR enhancements might be made. System stability, user access, dependability, and clearer documentation of EMR functions are also priorities. Current electronic health record systems require substantial modification to increase efficiency and user satisfaction (Schopf et al., 2019). Increasing EMR functionality is associated with significant hospital operating cost reductions (Rhoades et al., 2022).

5. CONCLUSION

The perceived ease of use of EMR directly influenced the intention to use EMR among health professionals in Indonesia. Although we did not do a mediation test, our result indicated an indirect influence of the users' optimism, innovativeness, and insecurity in the intention to use EMR. By addressing these issues, we can accelerate the adoption of electronic medical records (EMR) in Indonesian hospitals and improve patient care. Practical management implications for EMR idea development, design, and implementation were provided in this study. Organizations must provide strategies to improve EMR acceptance, such as more practice in pilot EMR applications. These pilot apps might still be required following the development and improvement of the established EMR. New feature addition may need further training. Mentoring and assistance during the early phase of implementation, improving the interface of the EMR, especially its consistency and customizability, also providing technical support lines and manuals in plain language are also indispensable. This research has some limitations. Our cross-sectional study only captured short-time responses from participants. A longitudinal study from a different phase of EMR implementation may provide more understanding. Other predictors also can be included in future research since we used only TRI as a predictor of TAM in the study. For example, from an organizational perspective, future research may consist of managerial support, financial and structural readiness, or facilitating conditions like policy issuance.

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