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THE EMERGING ROLE OF TECHNOLOGY READINESS IN FORMING TEACHER'S DIGITAL TECHNOLOGY ACTUAL USE: ELABORATING THE TRAM FRAMEWORK

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Abstract

Technology readiness (TR) is seen as prominent factor in influencing one's digital technology acceptance. In general context, many have proven TR's significant influence on one's acceptance towards digital technology. This study focusses on the role of TR in influencing teacher's digital technology actual use. The conceptual framework used in this study combines technology readiness and technology acceptance model. This study is conducted in four cities around Jakarta the capital city of Indonesia. 397 respondents were assigned with random sampling method. This study contributes empirical data that emphasizes the significant role of technology readiness in influencing teacher's digital technology actual use within the TRAM conceptual framework. Furthermore, it is proven that technology readiness has significant indirect effect towards digital technology actual use. The result also signifies the eminent influence of perceived usefulness and perceived ease of use in mediating technology readiness and digital technology actual use. This study also tries to address the government to construct regulatory framework that can support Indonesian teacher's technology readiness training and development.

Keywords: Technology Readiness, Perceived usefulness, Perceived ease of use, Actual Use of Technology, Digital Technology, Teacher, TAM, TRAM.

INTRODUCTION

The industry 4.0 era presents a massive leap in the number of digital technologies. This certainly has a significant impact in transforming the field of education. As a result, this phenomenon provides teachers a considerate challenge in how to utilize a variety of digital technologies. Even though digital technologies are said to be potential to improve the quality of learning and advance the education development goals and visions (Butler et al., 2018), many still see them as inconvenient to handle (Dorfsman & Horenczyk, 2022).

Notably, there are many factors influence the acceptance or the rejection of digital technology. Technology readiness is one of the prominent factors that support the technology acceptance among users (Peng & Yan, 2022). It is also proven that technology readiness becomes very importance in predicting the actual use of digital technology in schools (Kampa, 2023). In

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addition, technology readiness is also proven to be one factor that can support the behavioural intention to use the latest technology (Rahim et al., 2022).

Profoundly, technology readiness refers to the stage of development and maturity of a particular technology or system. It assesses how close a technology is to being deployed in a real-world operational environment. For Indonesia, the TRI (technology readiness index) score is 50.26, placing it 59th out of 134 economies (TRI, 2023). The TRI is part of the broader Network Readiness Index (NRI), which includes assessments across four main pillars: technology, people, governance, and impact.

Having ranked in 59th place, consequently suggests that there are areas needing improvement, particularly in digital skills and readiness among the population. This includes education and training to ensure the workforce can leverage new technologies effectively. Accordingly, this research is emphasized to gain empirical proof on the importance of technology readiness in building Indonesian teacher's actual use of digital technology. More importantly, it investigates the factors that predicts teacher's digital technology actual use through technology readiness and acceptance model framework (TRAM).

LITERATURE REVIEW

Technology Readiness

The combination of technology readiness and technology acceptance model (TRAM) are employed to be the framework of this study. Clearly, a vast number of studies have been conducted using TRAM in order to predict the technology actual usage behavior among users. As aforementioned, this study emphasizes on combining technology readiness and acceptance model theory.

Technology readiness (TR) or technology readiness refers to society's tendency to embrace and use new technologies to achieve goals in life at home and at work (Parasuraman and Colby 2015). Parasuraman further explained that TR includes four dimensions, namely: (1) optimism or a positive view of technology and confidence that offers a person increased control, efficiency, and flexibility in his life; (2) innovation or the tendency to be the first user of technology and to be an opinion leader; (3) discomfort or perceived inability to control technology and feeling overwhelmed by technology; (4) insecurity or suspicion of technology and doubt about the working ability of technology (Parasuraman, 2000).

Evidently, two out of the four technology readiness dimensions, optimism and innovation are contributors to technological readiness, while two others, discomfort and insecurity are inhibitors or something that prevents the growth of technological readiness (Womb *et al*. 2022). Profoundly, people who are optimistic and innovative as well as comfortable and safe are more likely to accept and use technology. The measurement on technology readiness is conducted through technology readiness index or so called by TRI.

Furthermore, the technology readiness index (TRI) is described as a framework related to technology in general, meaning that the readiness index is calculated based on how a

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technology is utilized by users (Parasuraman & Colby, 2015) . TRI is used to measure user readiness to use new technology with indicators of four personality variables: optimism, innovation, discomfort, and insecurity. Parasuraman identified that someone who is optimistic and innovative, and has less discomfort and insecurity will be better prepared to use new technology.

The dimensions in technological readiness are divided into 4, as follows:

1. Optimism, a person's belief that technology offers control, flexibility, and efficiency in life.
2. Innovativeness, the ability to be at the forefront of the use of technology.
3. Discomfort, feeling of lack of mastery of technology and being overwhelmed over it.
4. Insecurity, distrust of technology and doubts about its ability to use technology.

The above dimensions refer to the concept of technology readiness (Parasuraman, 2000), which has been used in a variety of studies that examine the readiness in implementing learning technologies such as those conducted by (Peng & Yan, 2022), and (Prasad et al., 2021). It is strongly proven that technology readiness in the setting of educational context can provide an increase innovation in teacher work performance (Artemova et al., 2021). Furthermore, teacher who has global competence is expected to be able to prepare themselves with latest technology, able to apply it, in order to produce the expected innovative performance (Wu et al., 2022).

Contributively, the role of technology readiness on the digital technology actual use was further studied by Kampa by combining technology readiness variables into technology acceptance models (TAM) to predict the usage of digital learning technology by educators. The results show that integrating technology readiness with technology acceptance models has proven to be beneficial and has a significant effect on the use of digital technology in educators in top-tier schools in India (Kampa, 2023). In addition, more research prominently proves that technology readiness has significant indirect effects on actual use of digital technology when mediated by perceived usefulness and perceived ease of use (Akram et al., 2021; Mamat et al., 2015; Rafdinal & Senalasari, 2021).

Technology Acceptance Model

Technology acceptance model or TAM is a theory on how information and communication technology was accepted. This model offers a theoretical framework for examining the factors influencing technology use and linking them to user performance. The Technology Acceptance Model (TAM) emphasizes users' attitudes towards information technology, grounded in the concepts of perceived usefulness and ease of use.

As previously mentioned, the Technology Acceptance Model (TAM) is widely utilized to predict user acceptance levels and describe technology use based on the perceived ease of use and perceived usefulness of information technology (Davis, 1989). Fred D. Davis from the University of Minnesota introduced TAM in 1989. He presented this theory in an information management journal article titled "Perceived Usefulness, Perceived Ease of Use, and User

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Acceptance of Information Technology." TAM predicts technology acceptance based on the impact of two cognitive factors: perceived usefulness and perceived ease of use. It incorporates the causal sequence of beliefs, attitudes, intentions, and behaviours as outlined by social psychologists Fishbein and Ajzen in 1975 (Holzmann et al., 2020) in their well-known Theory of Reasoned Action (TRA). According to this model, specific beliefs shape an individual's attitude toward an object, which subsequently influences their intention to act concerning that object.

Davis adapted TRA by developing two specific beliefs in the use of technology as described in figure 1.

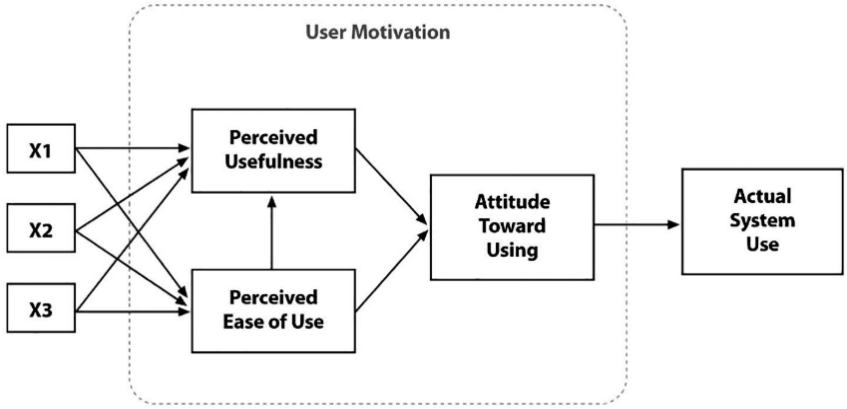

Figure 1: ***Technology Acceptance Model (Davis, 1986)***

The Technology Acceptance Model (TAM) has evolved into a widely trusted framework for understanding the predictors of users' acceptance or rejection of technology. Over time, the model has been refined to include additional variables and to modify the initially proposed relationships. New influential factors continue to be identified, strengthening the model. Numerous studies confirm the robustness and broad applicability of the modified TAM across various technologies and contexts (Matias & Timosan, 2021; Qaisar et al., 2020).

Researchers have explored new factors influencing technology acceptance, including the mediating role of TAM in the relationship between innovativeness and actual technology use (Akour et al., 2021; Bai et al., 2021). In other contexts, researchers have combined the technology readiness construct with the predictive power of TAM (Prasad et al., 2021). Furthermore, technology readiness factors, such as optimism, innovativeness, discomfort, and insecurity, have been shown to affect technology acceptance (Kaushik & Agrawal, 2021). These findings indicate that TAM's core variables, perceived ease of use and perceived usefulness, are significant antecedents to the actual use of technology (Granić & Marangunić, 2019).

Profoundly, Venkatesh (1996) conducted TAM-based research to further investigate the factors influencing technology acceptance or rejection. According to Davis, two primary factors are crucial. First, perceived usefulness, which is the belief that using a particular system will

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enhance job performance, drives technology use. Second, perceived ease of use, which is the belief that a system is easy to use, affects the likelihood of its adoption. Even if a system is perceived as useful, it may not be adopted if it is considered too difficult to use (Davis & Venkatesh, 1996). Basically, TAM predicts the acceptance of technology based on the influence of two cognitive factors, perceived usefulness and perceived ease of use.

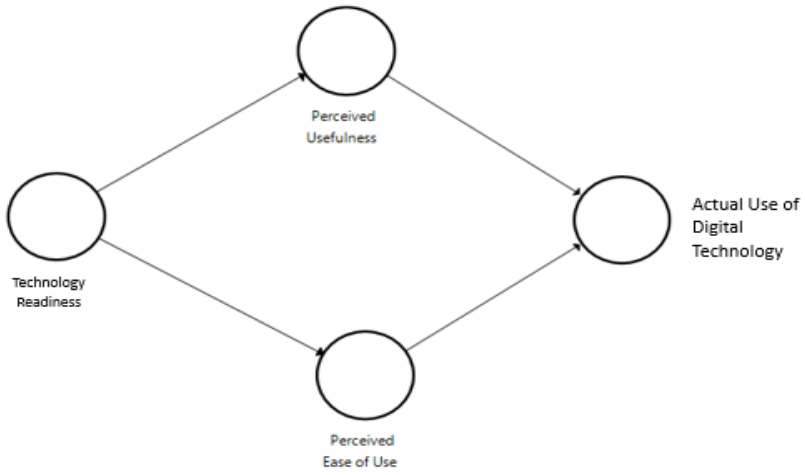

Figure 2: ***Indonesian Teacher's Technology Readiness and Acceptance Model (TRAM) Conceptual Framework***

Reflectively, the hypotheses built for this research with TRAM as the conceptual framework are as following:

H1 Technology readiness has significant direct effect on perceived usefulness.

H2 Technology readiness has significat direct effect on perceived ease of use.

H3 Technology readiness significantly has indirect influence on actual use of digital technology

when mediated by perceived usefulness.

H4 Technology readiness significantly has indirect inluence on actual use of digital technology

when mediated by perceived ease of use.

METHODOLOGY

This research was designed as a quantitative study. This research was conducted in four cities surrounding the capital city of Indonesia. Three cities are located in West Java province, one city in Banten Province. The research locations and respondents were considerately selected considering the site must be located in the capital city's buffer areas. The respondents were carried out by simple random sampling method and 397 teachers were chosen. The unit of

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analysis is individual. Questionnaires are adopted and modified from previous studies and were tested for its validity and reliability. The statistical test of the structural relationship between several variables used Structural Equation Model (SEM) analysis with Smart PLS version 3.0 software.

RESULTS AND DISCUSSIONS

Respondents

The respondent characteristics based on descriptive analysis showed that 72% of the respondents are female and 28% are male. The age range of respondents is 42,9 % at the age of ≤ 35 years old, 21.6% at the age of 36-45, and 35.4% are at the age of ≥46 years old. For educational background, 0,3 % is graduated from high school, 77,7 % are graduated from university with bachelor degrees, and 22% are graduated from university graduate programs. Within working experience, the respondents were described based on four categories as follow: teachers with < 5 years of teaching experience were found to be 23.3% respondents, 24.5% teachers were having 5-10 years of teaching experience, 29.4% were having 11-20 years of teaching experience, and lastly, 22,7 % were having more than 20 years of teaching experience.

Partial Least Square-Based Structural Equation Modeling Results

Table 1 presents the results of PLS algorithm testing (Structural model). In PLS SEM, this process is very critical in order to see which indicators reflects significant value in forming a construct. Notably, those which has an outer loading value of more than 0,7 is considered significant (Hair et al., 2022).

Table 1: PLS Algorithm Results

Indicators	Digital Technology Use	Perceived Ease of Use	Perceived Usefulness	Technology Readiness
TR1				0,712
TR2				0,883
TR3				-0,695
TR4				-0,464
PE1		0,878		
PE2		0,944		
PE3		0,950		
PE4		0,930		
PE5		0,919		
PT1	0,901			
PT2	0,933			
PT3	0,922			
PT4	0,949			
PT5	0,905			
PT6	0,893			
PT7	0,815			
PU1			0,917	
PU2			0,948	
PU3			0,935	

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Indicators	Digital Technology Use	Perceived Ease of Use	Perceived Usefulness	Technology Readiness
PU4			0,924	
PU5			0,933	
PU6			0,951	

As we can see, on the first running of PLS Algorithm, two indicators of technology readiness show sufficient outer loading value of more than 0,7. In accordance, all other variables indicators are also showing sufficient values of more than 0,7. As we can see in the table, all indicators for perceived usefulness (PU 1, PU2, PU3, PU4, PU5, PU6) result in sufficient value of more than 0,7. So as all indicators for perceived ease of use (PE 1, PE2, PE3, PE4, PE5) show outer loadings value of more than 0,7. In contrast, two indicators of technology readiness (TR3 and TR4) are still showing value < 0,7. As a consequence, these two indicators were omitted in order to proceed to next process in PLS SEM (Hair et al., 2022).

Hypotheses Testing

Table 2: Hypothesis Testing Results

Hypotheses	Sample Mean (M)	Standard Deviation	T Statistics	P Values	Results
Technology Readiness -> Perceived Usefulness	0,358	0,059	5,929	0,000	Supported
Technology Readiness -> Perceived Ease of Use	0,383	0,067	5,645	0,000	Supported
Technology Readiness -> Perceived Usefulness -> Digital Technology Use	0,122	0,031	3,853	0,000	Supported
Technology Readiness -> Perceived Ease of Use -> Digital Technology Use	0,173	0,033	5,110	0,000	Supported

Based on the hypotheses testing results, technology readiness has significant direct effect on both perceived usefulness and perceived ease of use with *pvalue* 0,00 < 0,05, therefore, both hypotheses (H1 and H2) are supported. In line with H1 and H2, it is proven that technology readiness has significant indirect effect on digital technology use. In other words, perceived usefulness has significant moderation effect on the first construct. Evidently, technology readiness also has significant indirect effect on digital technology use when moderated by perceived ease of use. It means that both hypotheses (H3 and H4) are accepted with *pvalue* 0,00 < 0,05.

DISCUSSION

Profoundly, technology readiness is proven to have significant effect on digital technology actual use. The investigation through PLS SEM shows that technology readiness is the only construct that significantly has built digital technology use in both directly and indirectly (*pvalue* < 0,05). This is in line with Parasuraman's research (Parasuraman & Colby, 2015) which suggests and comprises the relationship between technology readiness and technology adoption. He persisted that the higher a person's technological readiness is, the higher the tendency for him to use technology (Parasuraman, 2000). Furthermore, technology readiness

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is also proven to have a direct effect on perceived usefulness. These result corroborates previous research results which stated that there was a significant influence of technology readiness on the perceived usefulness of technology (Anh et al., 2024; Peng & Yan, 2022). In accordance with that, technology readiness also has direct influence on perceived ease of use whish signifies previous research that shows significant influence of technology readiness on perceived ease of use. It highlights the postulate that when a person is technology ready it will increase his mastering of technology easier (Amron et al., 2022; Jeong & Kim, 2023; Rahim et al., 2022).

As aforementioned, Indonesia has gained incredible success in increasing the TRI level from previously rank 73rd up to rank 59th (2023) amongst 139 Countries in the world. This success consequentially leads to areas of improvements particularly in digital skills and readiness among the population, specifically, in this research context, teacher's digital skills and readiness.

Consequently, we need to have strategic focus for Indonesia to enhance Indonesian teacher's digital literacy, investing in education and training programs to improve digital skills across the population. Accordingly, all stake holders should be refocussing in strengthening regulatory frameworks. Moreover, developing robust policies and sufficient regulations are eminent while ensuring security and trust in digital systems (Prasetiyo et al., 2021).

Technology readiness is proven to play a significant role in education by giving influence on how educational institutions integrate and utilize new technologies to enhance teaching and learning processes. Furthermore, research also relates technology readiness with assessment of educational tools, curriculum development, professional development, and innovation at school levels. Even nowadays in the post pandemic era, readiness in implementing digital technology is seen as imperative factor in the success of digital technology adoption (Brianza et al., 2024).

Prominently, this study also results in the significance of perceived usefulness and perceived ease of use as strong antecedents for technology acceptance and adoption in educational context (Granić & Marangunić, 2019). This also strengthens Moorhouse's study result about the role of perceived usefulness and perceived ease of use that have significant effect in reinforcing the use of latest learning technologies by teachers (Moorhouse et al., 2021). Signifying the role of perceived ease of use, as aforementioned, it also corroborates the statement that the ease of use felt by users does affect attitudes and volunteerism in using digital technology (Peng & Yan, 2022).

Regarding TAM strong moderation effects, both perceived usefulness and perceived ease of use are proven to have strong moderation between technology readiness and digital technology adoption. In fact, many studies combined the technology readiness construct with the predictive power of technology acceptance model (Prasad et al., 2021; Rahim et al., 2022). Factors that build the technology readiness such as optimism, innovativeness, discomfort and insecurity have been proven to affect one's acceptance towards technology (Parasuraman & Colby, 2015).

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The results of these studies signify that TAM's core variables, perceived ease of use and perceived usefulness, have been proven to be antecedent factors that have significant effects on the actual use of technology (Granić & Marangunić, 2019). As aforementioned, this study results strengthened how strong the role of perceived usefulness and perceived ease of use in moderating technology readiness towards digital technology actual use. The results of moderating effect testing shows that both have strong mediating effects at p*value* 0,00 < 0,05. Undoubtedly, this result reflects the prominent role of TAM in moderating technology readiness towards technology use in educational context.

CONCLUSION

This paper makes an original contribution to the current literatures, especially on the topic of digital learning technology use by teachers. First, this research provides new insights by combining the technology readiness with the framework of the technology acceptance model theory to investigate the teacher's technology readiness and acceptance in educational context. It means that this research provides the basis for further research development to further investigation about the role of technology readiness in driving technology adoption initiatives at the school level.

This study produces a constructed model (TRAM) for teacher's actual use of digital technology use built upon technology readiness (X1) and mediated by perceived usefulness (Z1) and perceived ease of use (Z2) on teacher's digital technology actual use (Y1). Technology readiness has been proven to have significant indirect effects on teacher's digital technology actual use. Accordingly, the results also show the prominent role of TAM's core variables, perceived usefulness and perceived ease of use, to have strong mediating role that emphasize the influence of technology readiness on teacher's digital technology actual use behavior.

This study owns limitations. Adequately, we strongly suggest future researchers to investigate deeper as to examine more about factors influencing teacher's technology readiness and how it affects digital technology use. If possible, the upcoming research should be investigating more on factors that have sufficient effect on school's technology readiness and its role in school innovative environment.

For governance sector, we hope this research would highlight the importance of conducting more trainings to elevate teacher's technology readiness towards the fast developed technology. As this study also tries to arise the critical need to formulate in regulatory frameworks for the broader societal impacts of technology adoption amongst teachers.

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