INVESTIGATING TEACHER’S DIGITAL TECHNOLOGY USE THROUGH A MODIFIED TECHNOLOGY ACCEPTANCE MODEL FRAMEWORK: A SURVEY IN INDONESIA CAPITAL CITY BUFFER AREAS

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ABSTRACT

Objective: This study is to investigate the influence of innovative leadership and technology readiness on digital technology use with technology acceptance model as research framework.

Theoretical Framework: The study is designed to construct a comprehensive digital technology use model attributing innovative leadership, technology readiness and the main predictors in technology acceptance model namely perceived usefulness and perceived ease of use to predict digital technology use by teachers.

Method: The proposed model was investigated with quantitative method conducted by delivering a questionnaire to the teachers in transformational schools. The smart PLS 3.0 was used to analyze the data collected.

Results and Conclusion: Technology readiness, perceived usefulness and perceived ease of use have significant direct effect on digital technology use whereas innovative leadership has been proven to have no direct effect on digital technology use. Prominently, both innovative leadership and technology readiness have significant indirect effect towards digital technology use. Perceived usefulness and perceived ease of use are proven to positively moderate both innovative leadership and technology readiness towards teacher’s digital technology use.

Originality/Value: First, this study emphasizes the updated modified TAM as conceptual research framework in predicting teachers’ digital technology use. Second, it offers empirical data showing new insight on factors influencing teacher’s digital technology use both directly and indirectly. Third, the unique research location also provides demographical attributes that rarely found in previous research. Last but not least, theoretically, it contributes more proof on TAM parsimony as a theory.

Keywords: Digital Technology Use, Innovative Leadership, Technology Readiness, Technology Acceptance Model, Teachers, Transformational School Program.
INVESTIGANDO O USO DA TECNOLOGIA DIGITAL DO PROFESSOR POR MEIO DE UM MODELO DE ACEITAÇÃO DE TECNOLOGIA MODIFICADA: UMA PESQUISA NAS ÁREAS DE RESERVA DA CAPITAL DA INDONÉSIA

RESUMO

Objetivo: Este estudo tem como objetivo investigar a influência da liderança inovadora e da prontidão tecnológica no uso da tecnologia digital, tendo o modelo de aceitação tecnológica como estrutura de pesquisa.

Estrutura Teórica: O estudo é projetado para construir um modelo abrangente de uso de tecnologia digital atribuindo liderança inovadora, prontidão tecnológica e os principais preditores no modelo de aceitação de tecnologia, nomeadamente a percepção de utilidade e a percepção da facilidade de uso para prever o uso de tecnologia digital por professores.

Método: O modelo proposto foi investigado com método quantitativo realizado através da entrega de um questionário aos professores em escolas transformacionais. O smart PLS 3.0 foi utilizado para analisar os dados coletados.

Resultados e Conclusão: A prontidão tecnológica, a utilidade percebida e a facilidade de uso percebida têm um efeito direto significativo no uso da tecnologia digital, enquanto a liderança inovadora provou não ter efeito direto no uso da tecnologia digital. Destacadamente, tanto a liderança inovadora como a prontidão tecnológica têm um efeito indireto significativo na utilização da tecnologia digital. A percepção da utilidade e da facilidade de uso demonstram moderar positivamente tanto a liderança inovadora quanto a prontidão tecnológica para o uso da tecnologia digital do professor.

Originalidade/valor: Em primeiro lugar, este estudo enfatiza a TAM modificada atualizada como estrutura de pesquisa conceitual na previsão do uso da tecnologia digital por parte dos professores. Em segundo lugar, oferece dados empíricos que mostram uma nova percepção dos fatores que influenciam o uso da tecnologia digital do professor, tanto direta como indiretamente. Terceiro, o local único de pesquisa também fornece atributos demográficos que raramente foram encontrados em pesquisas anteriores. Por último, mas não menos importante, teoricamente, contribui com mais prova sobre a parcimônia da TAM como uma teoria.


INVESTIGACIÓN DEL USO DE LA TECNOLOGÍA DIGITAL POR PARTE DE LOS PROFESORES A TRAVÉS DE UN MARCO MODIFICADO DEL MODELO DE ACEPTACIÓN TECNOLÓGICA: UNA ENCUESTA EN LAS ZONAS DE AMORTIGUACIÓN DE LA CAPITAL INDONESIA

RESUMEN

Objetivo: Este estudio tiene como objetivo investigar la influencia del liderazgo innovador y la preparación tecnológica en el uso de la tecnología digital con el modelo de aceptación de la tecnología como marco de investigación.

Marco teórico: El estudio está diseñado para construir un modelo integral de uso de la tecnología digital que atribuya liderazgo innovador, preparación tecnológica y los principales predictores en el modelo de aceptación de la tecnología, a saber, la utilidad percibida y la facilidad percibida de uso para predecir el uso de la tecnología digital por parte de los maestros.

Método: El modelo propuesto se investigó con el método cuantitativo realizado mediante la entrega de un cuestionario a los docentes en escuelas transformacionales. Se utilizó el smart PLS 3.0 para analizar los datos recogidos.

Resultados y conclusión: La preparación tecnológica, la utilidad percibida y la facilidad percibida de uso tienen un efecto directo significativo en el uso de la tecnología digital, mientras que el liderazgo innovador ha demostrado no tener un efecto directo en el uso de la tecnología digital. De manera destacada, tanto el liderazgo innovador como la preparación tecnológica tienen un efecto indirecto significativo hacia el uso de la tecnología digital. Se ha demostrado que la utilidad percibida y la facilidad percibida de uso moderan positivamente tanto el liderazgo innovador como la preparación tecnológica hacia el uso de la tecnología digital por parte del maestro.
1 INTRODUCTION

One biggest challenge that teachers are coping today is how to keep pace with the rapid development of digital technology and prepare to integrate it into learning (Sato et al., 2024). Indonesia is one of the countries that encourages the massive use of digital technology considering its benefits for human resource development. Digital technology is also believed to be a positive catalyst for the fulfillment of SDGs (sustainable development goals) achievement targets in various sectors (Aparicio-Gómez et al., 2024).

One of the fundamental components of the SDGs agenda is to create quality and equal education for all. Nowadays, digital technology is presented as an intermediary to achieve quality education, evenmore, its positive impact on education has been proven through many studies. Haleem added that digital technology had changed the paradigm in the education system. Not only as a provider of knowledge, digital technology also plays a role as information co-creator, mentors, and also assessors. In addition, digital technology plays an important role in the world of education to open access to quality information, learning, and increase opportunities for skills training (Haleem et al., 2022).

The role of digital technology in the education sector can certainly be more optimal if the elements in it consciously utilize digital technology to develop quality education (Matos et al., 2019). One actor who plays a major role in leading the transformation of learning from the traditional classroom to the modern classroom is the teacher. According to Reinius, one form of transformational action that teachers can take is their role in the use of technology in schools (Reinius et al., 2022). Although it should be underlined, the lack of improvement in digital competence results in a widening digital divide, lack of participation and worsening equity in innovation (Barron, 2004).
However, it needs to be realized, that the level of Indonesia's innovation readiness is still low. Indonesia is ranked 73 out of 139 countries in the world for its network readiness index. In addition, the results of Indonesia ministry of education and culture survey (2020) showed that 60% of Indonesian teachers still have a low level of digital technology use. This reminds us of the condition of the digital divide in terms of the use of technology that Dijk conveys in his book The Digital Divide (Jan van Dijk 2020).

Various efforts to increase the teachers’ digital technology use have been made. Digital socialization and trainings were intensified, stimuli in the form of digital devices were distributed, various digital learning resource platforms were launched, but in the Ministry of Education and Culture's technology impact report, it was stated that the gap in technology use in teaching and learning was still high (OliverWyman, 2023). Consequently it increases the awareness on how it would impact the students’ readiness to compete in the global arena in the future (Whitman & Whitman, 2020).

Referring to these conditions, and reflecting on previous research, this study is presented as an effort to investigate the influence of innovative leadership and technology readiness on digital technology use. Respectably, digital technology use in this study is referred to the use of a digital teaching platform called platform merdeka mengajar (PMM) which was launched by the Indonesian Ministry of Education and Culture (Monec) in 2022. It was developed as an integrated empowerment and competency improvement solution for teachers in Indonesia. PMM was also launched as a digital initiative to encourage behavior change in technology adoption in educators, facilitate teaching tasks and provide broad access to independent training (OliverWyman, 2023).

Previous research reviews showed that there is still very limited research analyzing the factors that affect digital technology use by Indonesian teachers. Moreover, this study combines innovative leadership and technology readiness factors in predicting the use of digital technology by teachers through the mediation of the technology acceptance model theory (TAM). The results of this study can provide recommendations for optimizing the use of digital technology especially digital learning platforms for teachers and related parties. In addition, the results of this study can strengthen the basis for policy formulation that favors the digital needs of teachers in the educational context.
2 THEORETICAL FRAMEWORK

Technology acceptance model (TAM) was employed to be the framework of this study. Inevitably, vast number of studies have been conducted using TAM in order to predict the technology usage behavior among users. Technology acceptance model or TAM is a theory that discusses behavioural models of how information and communication technology was accepted by users. This model provides a theoretical basis for exploring the factors that explain technology use and correlating them to user performance. TAM focuses on attitudes towards the use of information technology by users by developing it based on the perceived usefulness and ease of use of information technology.

As aforementioned, TAM theory is widely used to predict the level of user acceptance and describe the use of technology based on perceived ease of use and perceived usefulness of information technology (Fred D. Davis, 2011). Historically, TAM was conveyed as a form of research results in an information management journal with the title perceived usefulness, perceived ease of use and user acceptance of information technology (Fred D. Davis, 1989).

Prominently, TAM predicts acceptance of technology based on the influence of two cognitive factors mentioned previously, perceived usefulness and perceived ease of use. TAM adopts the causal chain of beliefs, attitudes, intentions, and behaviours as proposed by social psychologists Fishbein and Ajzen (1975) through the famous Theory of Reasoned Action (TRA). Based on certain beliefs, a person forms an attitude towards an object on the basis of the intention to behave towards an 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)
TAM has evolved to become the trusted model in understanding the predictors of user’s acceptance or rejection of the technology. During later experimental stages, the model was refined to include other variables and at the same time modifying the relationships that were initially formulated. New factors with significant influence on the core variables of TAM are continuously revealed. The strength of TAM modified model and its many different versions are confirmed by many studies emphasizing its broad applicability to many kinds of technologies and contexts (Akour et al., 2021; Bai et al., 2021).

In search of new factors that significantly influence one’s technology acceptance, some researchers were investigating the mediating role of TAM on innovative leadership towards the actual use of technology (Röhl et al., 2022; Tarrés & Macau, 2021; Tongrugjun et al., 2023). In other research contexts, researchers 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). The results signifies 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). At this point, this research proposed that combining factors as innovative leadership and technology readiness into the TAM construct will result in empirical data on user’s technology acceptance especially in the context of educational studies. Based on previous study results this research is proposing 12 hypotheses to identify the associations between variables as in the next figure.

**Figure 2**
The Conceptual Model
2.1 INNOVATIVE LEADERSHIP

Innovative leadership plays an important role in the context of educational management. It has key attributes that are crucial for the success of any organization, especially educational institutions. These attributes include being visionary, team-oriented, having strong communication skills, and being adaptive to change. One researcher that works comprehensively on innovative leadership highlighted four main factors that reflect innovative leadership. They are visionary, risk taker, relationship builder and team builder (Pagaura, 2020). She also points out that innovative leaders are essential in navigating the complexities of the 21st century, where rapid technological advancements and changing societal needs require adaptive and forwardthinking leadership.

As a concluded, leadership is believed as the process of guiding and motivating the members through the process of persuading to cooperate fully to achieve the organization goals and to drive policy towards success (Tongrugjun et al., 2023). The appropriate leadership to lead the organization to success in this era of change is referring to innovative leadership for innovative leadership is a synthesis of various leadership styles needed to face the challenges in the arousal of digital education era.

For instance, in order to achieve effective technology integration in school, innovative school leaders are to conduct both vision and pro vision on their teachers. Teachers must receive enough support in developing relevant competencies, self-efficacy, pedagogic viewpoints and enabling school culture. These treatment is proven to provides the highest impact on school learning capacity (Kulophas & Kim, 2020).

In addition, innovative leaders are those who can approach complex problems or opportunities, and discover new ways of doing things that have never happened before. Leaders must have Innovative capacities to help them better respond and solve problems in real situations and help create more innovation in the organization (Tongrugjun et al., 2023). Furthermore, innovative leadership mediated by the ease of use of technology can significantly increase the use of technology (Baba et al., 2023; Pagaura, 2020). This reinforces the results of Kaewsaeng’s study which states that innovative leadership roles can encourage school residents to be ready to accept and use technology sustainably (Kaewsaeng-on et al., 2022). Furthermore, some experts believed that innovative leadership had significant influence on perceived usefulness and perceived ease of use as main antecedents of TAM (Baba et al., 2023; Horst et al., 2007). Accordingly, we developed the following hypotheses:

H1 Innovative leadership significantly influences digital technology use.
H2 Innovative leadership significantly influences the perceived usefulness.
H3 Innovative leadership significantly influences the perceived ease of use.

2.2 TECHNOLOGY READINESS

The massive use of digital technology today is also influenced by a factor that determines the level of its utilization. This factor is called by Parasuraman as technological readiness (Parasuraman, 2000). Even in the school environment, innovation will not occur when the education ecosystem is not ready to accept the presence of new technology if digital readiness has not been formed in the ecosystem. In recent years, there are numerous studies examining the effect of technology readiness on user’s technology acceptance. According to Kaushik, technology readiness is one of the determining factors for the adoption of digital technology in the education ecosystem (Kaushik & Agrawal, 2021).

Technology readiness (TR) refers to society's tendency to embrace and use new technologies to achieve goals in life at home and at work (Parasuraman & 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.

Among the four dimensions, optimism and innovation are contributors to technological readiness, while discomfort and insecurity are inhibitors or something that prevents the growth of technological readiness (Womb et al. 2022). Thus, people who are optimistic and innovative as well as comfortable and safe are more likely to accept and use technology. Furthermore, dimensions in the theory of technology readiness have proven to have a significant influence on the use of digital technology through the mediation of technology acceptance model (TAM) or what we know as variables of perceived usefulness and perceived ease of use (Gestiardi et al., 2021).

Technology readiness in educational research setting can provide an increase in teacher work performance in the school environment (Artemova et al., 2021). Especially when leaders practice innovative leadership that can encourage the fulfillment of needed digital facilities. Teachers who have global competence are expected to be able to prepare themselves with stone technology, able to apply it, so as to produce the expected performance (Wu et al., 2022).
The role of technology readiness in the use of digital technology was further studied by Kampa by combining technology readiness variables into technology acceptance models (TAM) to predict utilization M-Learning by educators. The results of his study 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 accordance, one more study is combining technology readiness and technology acceptance model and has signified the influence of technology readiness on perceived usefulness and perceived ease of use to predict the use of mobile payment in Indonesia (Rafdinal & Senalasari, 2021). Therefore, we build hypotheses as follow:

H4 Technology readiness significantly influences digital technology use.
H5 Technology readiness significantly influences the perceived usefulness.
H6 Technology readiness significantly influences the perceived ease of use.

2.3 PERCEIVED USEFULNESS AND PERCEIVED EASE OF USE

Venkatesh conducted TAM-based research in examining the factors that cause someone to accept or reject information technology (Davis & Venkatesh, 1996). Furthermore, of the many variables that can affect the use of a system, there are two factors which are proven very decisive. The first factor, perceived usefulness, is defined by Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance.” This follows the meaning of the word useful as: "capable of being used advantageously.” In an organizational context, people are motivated to perform high because of raises, promotions and other rewards. Systems with high perceived usefulness are believed to have a positive use-performance correlation (Fred D. Davis, 1989).

The second factor, perceived ease of use, in several studies employs as a significant predictor of adoption behavior. Ease of use encapsulates the degree to which a potential adopter views usage of the target system to be relatively free of effort (Davis & Venkatesh, 1996). Profoundly, TAM (Fred D. Davis, 1989) predicts the acceptance of technology based on the influence of two cognitive factors, perceived usefulness and perceived ease of use.

Impactfully, perceived usefulness and perceived ease of use are TAM’s core factors and play the role as notable antecedents. Many studies have proven their power in predicting users’ acceptance of technology. Amron et al. reported the mediating effect of perceived usefulness and perceived ease of use as relevantly positive in understanding why people would accept cloud computing (Amron et al., 2022). Accordingly, TAM also magnifies its successfulness in
predicting users’ adoption in many research contexts such as teachers acceptance on new powerful educational tools (Masril et al., 2021), or predicting the usage of APS on senior high school students in Taiwan (Chang & Chiu, 2021), examining the acceptance of learning management system (Stockless, 2018), and further investigation on technology acceptance on mathematics teachers in Turkey (Gurer, 2021). All studies highlighted TAM’s predictive power on user’s acceptance on technology. Therefore, the hypotheses built for this research with TAM as the core conceptual framework are as following:

H7 Perceived usefulness significantly influences the digital technology use.
H8 Perceived ease of use significantly influences the digital technology use.
H9 Perceived usefulness significantly mediates innovative leadership towards digital technology use.
H10 Perceived usefulness significantly mediates the technology readiness towards digital technology use.
H11 Perceived ease of use significantly mediates innovative leadership towards digital technology use.
H12 Perceived ease of use significantly mediates technology readiness towards digital technology use.

2.4 DIGITAL TECHNOLOGY USE

The urgency of utilizing information and communication technology (ICT) in the learning process is stated in Indonesian education and culture ministerial regulation (number 16, 2016) with the aim to increase the efficiency and effectiveness of learning. Moreover, teacher professionalism in Indonesia is currently also measured through teachers’ digital abilities such as being skilled in designing, managing, and assessing learning using ICT.

UNESCO divides teacher’s ICT frameworks into six main aspects (unesco, 2019) including: understanding ICT in education, understanding of government policies, curriculum and assessment, pedagogy, application of digital skills, organization and administration, and teacher professional learning. Consequently, teacher’s use of ICT has emerged closely with their need to master digital literacy. As Gilster (1997) introduced digital literacy as:

…a set of skills to access the internet, find, manage and edit digital information; join in communications, and otherwise engage with an online information and communication
network. Digital literacy is the ability to properly use and evaluate digital resources, tools and services, and apply it to lifelong learning processes.

Likewise, in a digital native era, digital literacy comprises a new conceptualization as the outcomes from teachers’ education programs that resulted in comprehension of digital usage as follow (Janssen et al., 2013):

…more than knowing how to use devices and applications… which is intricately connected with skills to communicate with ICT, as well as information skills. Sensible and healthy use of ICT requires particular knowledge and attitudes regarding legal and ethical aspects, privacy and security, as well as understanding the role of ICT in society and a balanced attitude towards technology.

In accordance to expert’s statements on digital literacy, the success of digital technology use in classroom relies on the capabilities of teachers within each domain, and their capacity for flexibility, willingness to update, and readiness to explore how the domains interrelate to support effective technology use in a range of different situations (Hofer, M. & Harris, 2011). Profoundly, teacher’s capability in using ICT or digital technologies is divided into two big category: usage for personal-ethical competencies (awareness, concern, action) and personal-professional competences (operational) and well known as broadly-based teacher digital competence framework (Falloon, 2020) as shown in figure 3.

**Figure 3**

*Teacher Digital Competence Framework*

Source: Teacher Digital Competency Framework (Falloon, 2020)
As a result, the term digital technology use in this research is described in several aspects including: understanding policy, implementing curriculum, lesson planning, teaching and learning activity, assessment and evaluation, and teacher professional development.

3 METHODOLOGY

This study conducts a quantitative research method. A set of questionnaires is used to deliver a survey in order to analyze relationships between variables and to test hypotheses. The research locations were selected purposively in 4 buffer areas surrounding the capital city of Indonesia. The population consists of teachers who teach in schools that voluntarily assigned for the ministerial transformational school program in these areas. They also represent both urban and rural side of the areas. The sampling method was a simple random sampling and 397 teachers responded to fill in the given questionnaires. The number of samples has exceeded the population representation requirement of at least 349 respondents based on the Issac and Michael table. Analysis of data obtained using Partial Least Square-Structural Equation Model through the SmartPLS version 3.0 with the aim of testing relationships between variables and to obtain relationship estimated on a proposed model (Hair et al., 2022).

Figure 4

*The Research Model*
3.1 SAMPLE

The respondent’s characteristics based on the results of descriptive analysis showed that most of the respondents were female as many as 286 people (72%) and the number of male respondents as many as 111 people (28%). The age range for respondents was described as the following: at the age of ≤ 35 years old as many as 171 people (42.9%), age 36-45 years old as many as 86 people (21.6%), and at the age of ≥46 years old as many as 141 people (35.4%). The educational level of respondents varied with the following details: high school graduate as many as 1 person (0.3%), bachelor degree as many as 307 people (77.7%), and graduate level as many as 87 people (22%). Teachers with < 5 years of teaching experience were 91 people (23.3%), 5-10 years teaching experience were 96 people (24.5%), 11-20 years teaching experience were 115 people (29.4%), and with > 20 years of teaching experience were as many as 89 people (22.7%).

3.2 MEASURES

All items were adapted from previously validated questionnaires to measure the instruments. Innovative leadership items were adopted and modified from Pagaura (Pagaura, 2020), signifying 4 main dimensions to predict innovative leadership such as visionary, relationship builder, team builder and risk taker as main indicators. Technology readiness items were adapted and modified from Parasuraman (Parasuraman, 2000) with 4 dimensions as proven to be reflective variables of technology readiness namely innovativeness, optimism, discomfort and insecurity. Items for perceived usefulness and perceived ease of use were comprehensively adapted and modified from Davis (Fred D. Davis, 2011) and also from Venkatesh (Venkatesh et.al., 2000) with each consists of 12 items for perceived usefulness section, and 11 items for perceived ease of use section. Digital technology use instrument consists of 7 dimensions with 30 items as adapted and modified to the term of educational context derived from the ICT competence framework to fit the conceptual framework on teachers’ digital technology use in this research (unesco, 2019). In the survey, all the items were adopting a five-point Likert scale, which is represented by 1 "strongly disagree," 2 "disagree," 3 "neutral," 4 "agree”, and 5 "strongly agree."
3.3 DATA ANALYSIS

The structural equation analysis of the partial least square (SEM-PLS) model is described in two parts, namely the evaluation of the outer model and the inner model. In the evaluation section, it is explained based on each model. However, in two stages, PLS model criteria are evaluated: (1) measurement model assessment to exhibit reliability and validity of the construct, and (2) structural model assessment in determining the path coefficient and their significance (Hair et al., 2021).

Evaluation outer model is viewed by valuing outer loading each indicator as well as the validity and reliability of the construct. This study used the value of outer loadings of 0.7 (Hair et al., 2022). Testing process outer loadings carried out 2 stages through the process PLS algorithm to find out which indicators do not meet the conditions or have values outer loading below 0.7 (Hair et al., 2022).

**Figure 5**

*Outer Model Measurement*

In the initial pls algorithm test results there are two indicators with values outer loading lower than 0.7. Indicators such as discomfort (-0.737) and insecurity (-0.528) are removed in the next process of measurement for they did not meet the significance value (lower than 0.7). According to Rafdinal, two indicators on the technology readiness variable, namely discomfort and insecurity, have an outer loading value of less than 0.7 (Rafdinal & Senalasari, 2021).
Furthermore, these two dimensions, discomfort and insecurity are proven not to affect the perceived usefulness and perceived ease of use (Amron et al., 2022).

Table 1 presents the result of reliability and construct validity with information that all latent variables have consistency or reliability above 0.70. As stated by Hair (Hair et al., 2022) a construct is considered reliable when value of composite reliability and Cronbach’s Alpha greater than 0.7. In addition, it is good that both values composite reliability and Cronbach’s Alpha create an AVE value of > 0.50.

<table>
<thead>
<tr>
<th>Variabel</th>
<th>Cronbach’s Alpha</th>
<th>Composite Reliability</th>
<th>Average Variance Extracted (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1 (Innovative leadership)</td>
<td>0.958</td>
<td>0.969</td>
<td>0.888</td>
</tr>
<tr>
<td>X2 (Technology readiness)</td>
<td>0.711</td>
<td>0.872</td>
<td>0.774</td>
</tr>
<tr>
<td>Z1 (Perceived usefulness)</td>
<td>0.971</td>
<td>0.976</td>
<td>0.873</td>
</tr>
<tr>
<td>Z2 (Perceived ease of use)</td>
<td>0.957</td>
<td>0.967</td>
<td>0.855</td>
</tr>
<tr>
<td>Y (Digital technology use)</td>
<td>0.967</td>
<td>0.969</td>
<td>0.816</td>
</tr>
</tbody>
</table>

Next, hypotheses testing is carried out to find out whether the conjecture between variables is acceptable if the p-value is < 0.05 (Hair et al., 2022). The bootstrapping results are credential in the process of having hypotheses testing results and become base of direct and indirect effect testing process. The current study used the bootstrapping technique to test the direct effect of innovative leadership, technology readiness, perceived usefulness, and perceived ease of use on digital technology use. Furthermore, the bootstrapping technique is also conducted to reveal the mediation effect of perceived usefulness and perceived ease of use on the association between innovative leadership and digital technology use. It also to investigate its mediating effects between technology readiness and digital technology use. The mediating effect test was done with SmartPLS 3.0 with 397 cases and 5000 subsamples. The model was shown in figure 6.
4 RESULTS AND DISCUSSIONS

4.1 PARTIAL LEAST SQUARE-BASED STRUCTURAL EQUATION MODELING RESULTS

The data in table 2 shows that innovative leadership has no direct effect on the use of technology with $pvalue \ 0.848 > 0.05$. This means that H1 is rejected because it has a significance of $0.848 > 0.05$. In the meantime, innovative leadership significantly affects the perceived usefulness with a $pvalue \ 0.000 < 0.05$ or H2 is accepted. Likewise, H3 is accepted with $pvalue \ 0.000 < 0.05$ which signifies that innovative leadership has significant direct effect on perceived ease of use.

Another result test shows that technology readiness has a significant effect on digital technology use with $pvalue \ 0.018 < 0.05$. This means that H4 is accepted. It is also proven that technology readiness has a significant direct effect on perceived usefulness with $pvalue \ 0.000 < 0.05$. In line with H5, test result on the technology readiness’ influence on perceived ease of use obtains $pvalue \ 0.000 < 0.05$ which means H6 is accepted.

Perceived usefulness profoundly affects digital technology use (H7) indicated by the $pvalue \ 0.000 < 0.05$. Likewise, perceived ease of use has a significant effect on digital technology use (H8) with a $pvalue \ 0.000 < 0.05$. 
Investigating Teacher’s Digital Technology use Through a Modified Technology Acceptance Model Framework: a Survey In Indonesia Capital City Buffer Areas

Table 2

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>t-Statistics</th>
<th>P-Values</th>
<th>Significance (p&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Innovative Leadership -&gt; Digital Technology Use</td>
<td>0.183</td>
<td>0.855</td>
<td>NS</td>
</tr>
<tr>
<td>H2: Innovative Leadership -&gt; Perceived Ease of Use</td>
<td>4.734</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H3: Innovative Leadership -&gt; Perceived Usefulness</td>
<td>5.367</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H7: Perceived Ease of Use -&gt; Digital Technology Use</td>
<td>7.746</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H8: Perceived Usefulness -&gt; Digital Technology Use</td>
<td>5.270</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H4: Technology Readiness -&gt; Digital Technology Use</td>
<td>2.341</td>
<td>0.020</td>
<td>Supported</td>
</tr>
<tr>
<td>H5: Technology Readiness -&gt; Perceived Ease of Use</td>
<td>4.392</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H6: Technology Readiness -&gt; Perceived Usefulness</td>
<td>3.859</td>
<td>0.000</td>
<td>Supported</td>
</tr>
</tbody>
</table>

4.2 MODERATION EFFECTS

Based on the results of data processing as presented in table 3, it can be concluded that the perceived usefulness of technology significantly mediates the influence of innovative leadership on digital technology use with a p-value 0.000 < 0.05 or H9 is accepted. Perceived ease of use also significantly mediates the influence of innovative leadership on teacher’s digital technology use with a p-value 0.000 < 0.05 or H10 is also supported.

Furthermore, the result of the specific indirect effect test on perceived ease of use in mediating the influence of innovative leadership on digital technology use shows a p-value 0.000 < 0.05 which means hypothesis (H11) is accepted. Likewise, moderation effect of perceived ease of use is also proven to be significant when it mediates technology readiness and digital technology use with a p-value 0.000 < 0.05. It also means the hypothesis (H12) is accepted.

Table 3

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>t-Statistics</th>
<th>P Values</th>
<th>Significance (p&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H11: Innovative Leadership -&gt; Perceived Ease of Use -&gt; Digital Technology Use</td>
<td>4.316</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H12: Technology Readiness -&gt; Perceived Ease of Use -&gt; Digital Technology Use</td>
<td>3.964</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H9: Innovative Leadership -&gt; Perceived Usefulness -&gt; Digital Technology Use</td>
<td>3.782</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H10: Technology Readiness -&gt; Perceived Usefulness -&gt; Digital Technology Use</td>
<td>3.282</td>
<td>0.001</td>
<td>Supported</td>
</tr>
</tbody>
</table>
4.3 DISCUSSIONS

At the beginning of hypotheses testing results, the data shows us that the principals’ innovative leadership which perceived by the teachers has no significant direct effect on the teacher’s digital technology use. It verifies previous study result that it is not only the principal’s innovative behavior that impacts the teacher’s technology use but it is also influenced by the support he provides such as delivering vision and direct mentoring on teachers. Principals who accompany teacher development program continuously have significant effect on teacher innovation behavior, conversely, principals who do not convey a clear vision and direct mentoring do not have an impact on behavior of using digital technology (Kulophas & Kim, 2020).

In contrast to previous hypotheses testing result, innovative leadership significantly affects the perceived usefulness. These findings corroborate the results of previous research that revealed the significant influence of innovative leadership on perceived usefulness (Baba et al., 2023; Horst et al., 2007; Leong et al., 2017; Mou et al., 2017). In accordance with this finding, innovative leadership is also proven to have significant influence on perceived ease of use. It signifies previous studies that show the significant influence of innovative leadership on perceived ease of use (Baba et al., 2023; Kuo & Lee, 2011; Martins et al., 2014).

Profoundly, technology readiness is proven to have significant effect on digital technology use. The investigation result technology readiness is the only construct that significantly has built digital technology use in both directly and indirectly. 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 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 line that, technology readiness also has direct influence on perceived ease of use which 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).

Another significant influence is shown by perceived usefulness on teacher’s digital technology use. This result is in line with Legris (2003) who stated that perceived usefulness
has direct impact on the behavioral intention to use technology (Wong, 2016). Furthermore, another main antecedent of TAM, perceived ease of use, also shows a significant effect on teacher’s digital technology use. These results signify how both perceived usefulness and perceived ease of use are 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).

Furthermore, based on the results of data processing as presented in table 3, it can be concluded that the perceived usefulness of technology significantly mediates the influence of innovative leadership on digital technology use by teachers with a p-value 0.000 < 0.05. Impactfully, in addition to the importance of persuasion from a principle to use technology, it still needs to be accompanied by the perceived usefulness obtained from using the technology. The more useful a technology is, the greater the tendency for someone to use the technology (Agarwal & Prasad, 1997). Moreover, the technology was introduced by leaders with significant social influence on teachers (Kulophas & Kim, 2020).

In addition, it is also proven that perceived ease of use significantly mediates the influence of innovative leadership digital technology use with a p-value 0.000 < 0.05. This result is in line with Baba's research which suggests that the ease of use of technology mediates innovative leadership towards users’ adoption of innovative technology (Baba et al., 2023). The findings also emphasize the importance of ease of use so that teachers are willing to use the technology introduced by their leaders. So a leader needs to emphasize the benefits, as well as the ease of access and use of the technology he presents (Kuo & Lee, 2011).

As shown in the earlier section, investigation on the moderating effects of TAM’s core variables resulted in significant results. In educational context for instance, Tongrugjun (2023) highlighted the significant mediating roles of perceived usefulness and perceived ease of use on innovative leadership towards digital technology adoption in schools in line with some other studies’ results on technology adoption (Röhl et al., 2022; Tarrés & Macau, 2021; Tongrugjun et al., 2023). Even more, a study by Hu et al. (2003) signifies the role of perceived usefulness and perceived ease of use as prominent factors influencing the acceptance of technology in teaching as the study investigating 134 public school teachers in Hongkong resulted in strong moderating effects on external variables towards learning technology acceptance in schools.
Accordingly, this study result is signifying what previous studies investigated that perceived usefulness and perceived ease of use have significant moderating effect on innovative leadership towards the teacher’s digital technology use with p-value 0.000 < 0.05 for both constructs as shown in table 3.

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). 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 use. The results of moderating effect testing shows that both have strong mediating effects at p-value 0.000 < 0.05. Undoubtedly, this result reflects the prominent role of TAM in moderating technology readiness towards technology use in educational context.

As expected, investigation on mediating role of perceived ease of use on innovative leadership towards digital technology use shows a strong effect. This result reinforces Baba's (2023) result study that the easier to use a technology is, and the stronger the leader's recommendation is, the higher a person's tendency to use it (Baba et al., 2023). Likewise, the influence of technological readiness on the use of digital technology mediated by perceived ease of use has a p-value 0.000 < 0.05 and strengthens the statement that perceived ease of use encourages one's readiness to utilize digital technology (Kaushik & Agrawal, 2021).

4.4 IMPLICATIONS

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 construct of innovative leadership and technology readiness with the framework of the technology acceptance model theory. It means that this research provides the basis for further research development to a thorough investigation about the role of innovative leadership in driving technology adoption initiatives at the school level.
Furthermore, this study presents a conceptual framework that shows new relationships in investigating the use of digital technology by teachers. This certainly contributes to novelty in the world of research. This study emphasizes at the relationship between innovative leadership and digital technology use through the mediation of perceived usefulness, and to investigate the relationship between innovative leadership and digital technology use through the mediation of perceived ease of use. This certainly enriches the repertoire of the parsimonious level of TAM in predicting technology acceptance and adoption.

This study also conducted to bridge the research gap that specifically investigates the mediating role of TAM on the role of teacher technology readiness in encouraging the teacher’s digital technology use. This can be the basis for further investigations to see how far technology readiness can drive technology adoption in learning. The power of TAM’s mediating role is certainly always interesting to explore, but as reported, there are still very limited studies that examine the level of technology acceptance from the teacher population (only 6%), even most studies (83%) make students as their sample (Granić & Marangunić, 2019). Moreover, this study was conducted to investigate teacher’s behaviour within buffer zones surrounding capital city of Indonesia, somehow the researchers managed to contribute more research settings to enrich the demographic attributes to the study.

Last but not least, this study is focusing on actual use of digital technology by teachers. As highlighted in Granic’s TAM systematic literature review (Granić & Marangunić, 2019), there is still very few measures for actual usage of learning technologies within TAM modified research. Therefore, this research underlines real use of digital technology by teachers with AM as research framework.

5 CONCLUSION

This study produces a constructed model for teacher’s digital technology use built upon innovative leadership variables (X1), technology readiness (X2) and mediated by perceived usefulness (Z1) and perceived ease of use (Z2) on teacher’s digital technology use (Y1). Innovative leadership is not proven to have a direct influence on teacher’s digital technology use. In contrast, through the mediating role of perceived usefulness and perceived ease of use, innovative leadership has resulted in significant influence on teacher’s digital technology use. Furthermore, technology readiness has also been proven to have significant direct and indirect effects on teacher’s digital technology 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 innovative leadership and technology readiness on teacher’s digital technology use.

This study owns limitations. Therefore, we strongly suggest future researchers to investigate deeper as to examine more about factors influencing teacher’s digital technology use. If possible, the upcoming research should be deploying more external factors that will predict teacher’s digital technology use more comprehensively. We also encourage more modification in the future to comprise modified TAM in order to enrich empirical data investigating educational sectors in regional and international context.

REFERENCES


Investigating Teacher's Digital Technology Use Through a Modified Technology Acceptance Model Framework: A Survey in Indonesia Capital City Buffer Areas


Investigating Teacher’s Digital Technology use Through a Modified Technology Acceptance Model Framework: a Survey In Indonesia Capital City Buffer Areas


