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Research Paper

Analysis of Teachers' Intentions to Adopt Adaptive Learning Using the TAM Model: The Role of Social Influence and Digital Self-Efficacy Moderation

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Abstract The push for digitalization in education has positioned AI-based adaptive learning technology as a strategic innovation. However, the adoption of this technology faces significant challenges related to teacher readiness and perception. This study aims to analyze the factors influencing teachers' intentions to adopt adaptive learning technology in West Sumatra, using the Extended Technology Acceptance Model (TAM) framework. This study uses a quantitative approach with a correlational survey design. Data will be collected through a Likert-scale questionnaire to measure the variables of Perceived Usefulness, Perceived Ease of Use, Social Influence, Digital Self-Efficacy, and Adoption Intentions in a sample of teachers including junior high school (SMP), Islamic junior high school (MTS), senior high school, Islamic senior high school, and vocational high school teachers in West Sumatra Province. Data analysis will use Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. The results of the analysis indicate that social influence has a positive and significant relationship with technology adoption intentions, while perceived usefulness and perceived benefits do not have a significant influence. Furthermore, digital self-efficacy does not moderate the relationship between these variables and the intention to adopt technology. These findings suggest that social support from the school environment is a key factor in motivating teachers to use technology, while factors related to digital perceptions and self-efficacy require further attention. The implications of this research emphasize the importance of strengthening social support and enhancing teachers' digital competence through training and supportive policies.
Keywords: Curriculum materials, science learning experience, Textbook

INTRODUCTION

Technological developments require the global education sector to undergo fundamental transformation to remain relevant. The conventional learning paradigm, which tends to be one-size-fits-all, is no longer considered adequate to address the diversity of needs and learning speeds of everyone (Akbar et al., 2023). In response, the idea of personalized adaptive learning supported by Artificial Intelligence (AI) has emerged as a theoretical necessity (Isdayani et al., 2024; Liriwati, 2023; Rifky, 2024). This technology promises a learning ecosystem that can diagnose student needs in real-time, providing appropriate materials, and giving instant feedback, thereby potentially optimizing learning outcomes more efficiently and evenly (Arnadi et al., 2024; Kusumaningtyas, 2025; Putri et al., 2025; Widodo, 2024). This condition will certainly be more efficient and make the world of education always keep up with the latest technological developments.

However, in practice, this ideal concept faces various complex and layered challenges. There is a digital competency gap among teachers, not only between developed and underdeveloped regions, but also within a single school between senior and junior teachers (Subroto et al., 2023). (Sulaimon et al., 2025). In addition, many teachers remain skeptical about the usefulness of advanced technology

and feel that the conventional methods that have been applied so far are sufficient to achieve curriculum targets (Maelasari & Lusiana, 2025). Furthermore, unpleasant experiences with the implementation of previous administrative digital platforms, which were often considered complicated and burdensome, have contributed to the negative perception that any new technology will be difficult to use and will only add to their workload (Haeri & Afriansyah, 2024). These three layers of challenges, namely competency, perceived value, and perceived ease of use, are the main barriers to the adoption of new innovations.

To understand the complexity of rejection and acceptance, academic studies often rely on the Technology Acceptance Model (TAM), which consistently proves that Perceived Usefulness and Perceived Ease of Use are the main predictors for predicting the intention to use technology (Adewale et al., 2024). More recent research shows that the classic TAM model needs to be expanded with external variables to explain more complex phenomena. For example, environmental factors such as Social Influence from superiors and coworkers have been shown to play an important role in encouraging the adoption of digital platforms by teachers in Indonesia (Sopian et al., 2024). At the individual level, Digital Self-Efficacy is a determining factor in the successful integration of technology in the classroom (Ngoma et al., 2024; Suparyono & Paling, 2025). Although these variables are often studied separately, research that integrates them into a moderation model for the adaptive learning context is still very limited.

Departing from the gap between the ideal vision of technology and the reality of challenges in the field, this study aims to analyze the factors that influence teachers' intentions in West Sumatra to adopt adaptive learning technology. More specifically, the objectives of this study are: first, to examine the simultaneous effects of Perceived Benefits, Perceived Ease of Use, and Social Influence on Adoption Intentions. Second, this study aims to examine the role of Digital Self-Efficacy as a moderating variable that strengthens or weakens the effect of Perceived Benefits on teachers' Adoption Intentions.

The main argument proposed in this study is that a teacher's intention to adopt complex learning technology is not only determined by their perception of the technology itself but is shaped by the dynamic interaction between external factors (social environment) and internal factors (self-confidence). Specifically, it is hypothesized that perceived usefulness, ease of use, and social influence have a positive and significant effect on adoption intention. Furthermore, an innovative argument is proposed that the strength of the influence of perceived usefulness on adoption intention is not linear but will be significantly stronger for teachers who have a high level of digital self-efficacy compared to those who have low digital self-efficacy.

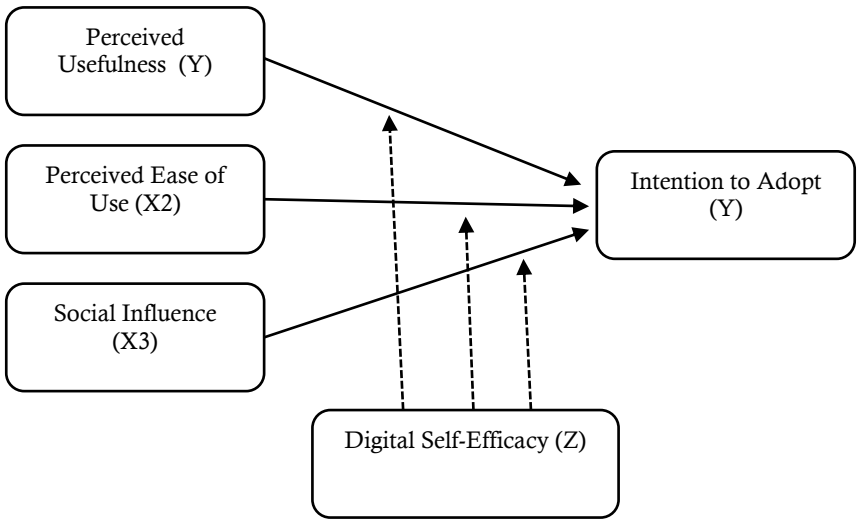
METHODOLOGY

This study uses a quantitative approach with a cross-sectional survey design to analyze predictive factors for teachers' intention to adopt technology. The research population includes junior high school, Islamic junior high school, senior high school, Islamic senior high school, and vocational high school teachers in West Sumatra Province. Purposive area sampling was used to obtain a geographical representation of urban (Padang City), suburban (Payakumbuh City), and rural (Pasaman Regency) areas. This study was conducted over a period of one month, namely July 2025. Data collection was conducted offline and online using a 5-point Likert questionnaire that had undergone pilot testing to ensure the clarity and validity of the instrument. This instrument was developed based on research conceptual framework and used to measure teachers' perceptions and intentions toward technology adoption. Prior to widespread use, the questionnaire underwent pilot testing to ensure item clarity, validity, and reliability. The pilot test results served as the basis for refining the instrument to ensure its suitability for use in primary data collection.

The minimum sample size was determined based on Hair et al.'s recommendation for PLS-

SEM analysis, which is 5–10 times the number of indicators (15 indicators x 7 = 105 respondents) (Hair, F., J., Risher, J. J., Sarstedt, M., & Ringle, 2019). The conceptual framework refers to the Extended Technology Acceptance Model (TAM) with variables: Intention to Adopt (dependent), Perceived Usefulness, Perceived Ease of Use, and Social Influence (independent), as well as Digital Self-Efficacy as a moderator. The research instrument was adapted from previous studies (Acosta-Enriquez et al., 2025; Jere & Mpeta, 2024; Peng et al., 2024; Venkatesh & Davis, 2000), and data analysis was performed using SmartPLS software through two stages, namely measurement model evaluation (validity and reliability) and structural model evaluation to test the relationship between variables through the bootstrapping procedure. To make the research more focused, it is important to design a conceptual framework as follows:

Figure 1.1 Framework



RESULTS AND DISCUSSION

Outer Loading Results

The measurement model testing was conducted in four stages, which included testing the reliability of individual items, internal consistency reliability, average variance extracted (AVE), and discriminant validity. Individual item reliability tests aim to assess the extent to which each indicator consistently reflects the construct being measured. Internal consistency reliability is used to ensure that all indicators within a construct are highly correlated and consistently measure the same concept. The AVE value is used to assess convergent validity, which is the extent to which indicators within a construct correlate with each other and truly represent the same latent variable. Discriminant validity, meanwhile, examines the differences between one construct and another to ensure that each variable is unique and that there is no overlap between constructs.

Factor loading test

Table 1. Outer loading test results

	Digital Self-Efficacy	Intention to Adopt	Social Influence	Perceived Usefulness	Perceived Ease of Use
EDD1	0,947				
EDD2	0,903				
EDD3	0,944				
IM1		0,826			
IM2		0,941			
IM3		0,859			
PK1				0,884	

	Digital Self-Efficacy	Intention to Adopt	Social Influence	Perceived Usefulness	Perceived Ease of Use
PK2				0,740	
PK3				0,813	
PM1					0,933
PM2					0,942
PM3					0,915
PS1			0,810		
PS2			0,906		
PS3			0,855		

Source: Data processed by SMART-PLS, 2025.

The results of the outer loading test indicate that all indicators obtained loading values greater than 0.50. This finding suggests that each indicator has a strong correlation with its corresponding latent construct and contributes significantly to its measurement. Therefore, it can be concluded that the indicators used are quite representative in explaining and forming the measured variable construct, demonstrating acceptable levels of indicator reliability and construct validity. Discriminant Validity Test

Discriminant validity is established when the square root of the Average Variance Extracted (AVE) for a construct is greater than the correlations between that construct and any other constructs in the model. This condition indicates that the construct shares more variance with its own indicators than with other constructs, thereby confirming that each variable is empirically distinct and measures a unique conceptual dimension within the model.

Table 2. Results of the Fornell-Larcker Criterion test

	Digital Self-Efficacy	Intention to Adopt	Social Influence	Perceived Usefulness	Perceived Ease of Use
Digital Self-Efficacy	0,932				
Intention to Adopt	0,194	0,877			
Social Influence	0,069	0,647	0,858		
Perceived Usefulness	0,159	0,343	0,452	0,814	
Perceived Ease of Use	0,219	0,441	0,637	0,493	0,930

Source: Data processed by SMART-PLS, 2025.

Based on the AVE test results presented in Table 2, all variables with reflective indicators exhibit AVE values exceeding 0.50. This indicates that more than half of the variance in each indicator is explained by the corresponding latent construct. Therefore, it can be concluded that all indicators possess adequate convergent validity, demonstrating that they effectively represent and measure their respective constructs within the model.Internal Consistency Reliability Test

This reliability assessment was carried out using the Composite Reliability (CR) coefficient, with a threshold value of 0.70 as the minimum acceptable criterion. A CR value above this threshold indicates that the indicators within a construct demonstrate satisfactory internal consistency, meaning they reliably measure the same underlying latent variable.

Table 3. Composite Reliability (CR) test results

	Cronbach's Alpha	rho_A	Composite Reliability
Digital Self-Efficacy	0,925	0,957	0,952

	Cronbach's Alpha	rho_A	Composite Reliability
Intention to Adopt	0,848	0,859	0,909
Social Influence	0,823	0,850	0,893
Perceived Usefulness	0,753	0,812	0,854
Perceived Ease of Use	0,922	0,928	0,951

Source: Data processed by SMART-PLS, 2025.

Based on the results presented in Table 3, all Composite Reliability (CR) values exceed the threshold of 0.70. This finding indicates that each construct exhibits satisfactory internal consistency, meaning the indicators within each variable are highly correlated and consistently measure the same underlying concept. Therefore, it can be concluded that there are no issues related to internal consistency reliability in the measurement model.

Average Variance Extracted (AVE) Test

A minimum AVE value of 0.50 indicates that the convergent validity measure has met the criteria.

Table 4. AVE test results

	Average Variance Extracted (AVE)
Efikasi Diri Digital	0,868
Intensi Mengadopsi	0,769
Pengaruh Sosial	0,736
Persepsi Kemudahan	0,663
Persepsi Manfaat	0,865

Source: Data processed by SMART-PLS, 2025.

The test results show that all AVE values are above 0.50, so it can be concluded that there are no problems with the average variance extracted test.

Structural Model Analysis Results (Inner Model)

This analysis was conducted through several stages of testing, including path coefficient (β) testing, coefficient of determination (R^2) testing, and t-testing using the bootstrapping method.

Path Coefficients Test

Table 5. Path Coefficients Test Results

	Intensi Mengadopsi
Efikasi Diri Digital	0,148
Pengaruh Sosial	0,573
Persepsi Kemudahan_	0,035
Persepsi Manfaat	0,067

Based on Table 5, the path coefficient test results in this study show that all values are positive. This indicates that an increase in variable X by 1 unit will be followed by an increase in variable Y according to the coefficient listed in the table.

Hypothesis Test Results

Hypothesis testing in this study was conducted using the bootstrapping method in SmartPLS with a total of 5,000 sub-samples (Hair et al., 2021). The test results were evaluated based on t-values for a two-tailed test of 1.991 at a significance level of 5%. If the p-value < 0.05, then there

is a significant effect between variables. The following are the results of the bootstrapping data running that has been carried out:

Figure 1. Bootstrapping Test Results

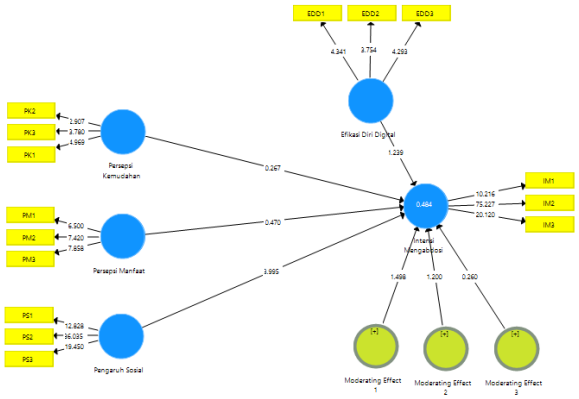


Figure 1 presents the bootstrapping results for the hypotheses proposed in this study. Hypothesis testing was conducted by considering the path coefficient or inner model value, which reflects the significance level of each hypothesis.

Table 6. Results of the t-statistic test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Efikasi Diri Digital -> Intensi Mengabdosi	0,148	0,138	0,119	1,239	**0,216**
Pengaruh Sosial -> Intensi Mengabdosi	0,573	0,539	0,143	3,995	**0,000**
Persepsi Kemudahan_ -> Intensi Mengabdosi	0,035	0,043	0,131	0,267	**0,790**
Persepsi Manfaat -> Intensi Mengabdosi	0,067	0,092	0,142	0,470	**0,639**

Source: Data processed by SMART-PLS, 2025.

Based on the results of the t-test, it is known that most hypotheses do not meet the significance criteria, namely t-statistic > 1.991 and p-value < 0.05. Of all the hypotheses tested, only one relationship was significant, namely the effect of Social Influence on Adoption Intention, with a t-statistic value of 3.995 and a p-value of 0.000, indicating a positive and significant relationship in accordance with the specified significance level.

Moderation Test

Table 7. Moderation Test Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Moderating Effect 1 -> Intensi Mengabdosi	-0,211	-0,192	0,141	1,498	**0,135**
Moderating Effect 2 -> Intensi Mengabdosi	0,198	0,182	0,165	1,200	**0,231**
Moderating Effect 3 -> Intensi Mengabdosi	-0,043	0,005	0,165	0,260	**0,795**

Source: Data processed by SMART-PLS, 2025.

Based on the analysis results, all moderating variables tested did not show a significant effect on the relationship between the independent variables and Adoption Intention. This is evidenced by t-statistic values lower than the threshold of 1.991 and p-values greater than 0.05 for all moderating effects. In detail, Moderating Effect 1 had a t-statistic value of 1.498 (p-value = 0.135), Moderating Effect 2 was 1.200 (p-value = 0.231), and Moderating Effect 3 was 0.260 (p-value = 0.795). These findings indicate that the role of moderating variables in this study was unable to strengthen or weaken the main relationship between variables. Thus, the influence of independent variables on Adoption Intention is direct without being significantly influenced by the tested moderating factors.

Model Goodness and Fit Evaluation

The evaluation of model goodness and fit in SmartPLS is part of the model quality criteria. This assessment is explained through several measures presented in the following section.

F-square (Moderating Effect)

According to Hair et al. (2021), the F-square value for moderation effects can be categorized as 0.005 (low), 0.01 (moderate), and 0.025 (high) (Hair et al., 2021). The following table presents the F-square values for moderation effects in this study:

Table 8. F-square Test Results (Moderating Effect)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Moderating Effect 1 -> Intensi Mengabdosi	0,058	0,075	0,076	0,765	**0,444**
Moderating Effect 2 -> Intensi Mengabdosi	0,038	0,057	0,057	0,667	**0,505**
Moderating Effect 3 -> Intensi Mengabdosi	0,002	0,023	0,034	0,050	**0,960**

Source: Data processed by SMART-PLS, 2025.

Based on the test results, the F-square value for all moderating effects is in the low category. Specifically, Moderating Effect 1 on Adoption Intention has an F-square value of 0.003, Moderating Effect 2 has a value of 0.002, and Moderating Effect 3 has a value of 0.000. These results indicate that the moderating variables only contribute very little to the increase in the model's predictive power.

R Square Test

Table 9. R Square test results

	R Square	R Square Adjusted
Intensi Mengadopsi	0,484	0,432

Source: Data processed by SMART-PLS, 2025.

The Intention to Adopt variable has an R-Square value of 0.484 (48.4%), which indicates that the ability of the independent variables to explain the dependent variable Intention to Adopt is in the moderate category at 41.7%.

F Square Test

Table 10. F Square test results

	Original Sample	Sample Mean	Standard Deviation	T Statistics (|O/STDEV|)	P Values

	(O)	(M)	(STDEV)		
Efikasi Diri Digital -> Intensi Mengabdosi	0,033	0,057	0,061	0,543	**0,587**
Pengaruh Sosial -> Intensi Mengabdosi	0,319	0,334	0,220	1,448	**0,148**
Persepsi Kemudahan_ -> Intensi Mengabdosi	0,002	0,023	0,033	0,047	**0,962**
Persepsi Manfaat -> Intensi Mengabdosi	0,003	0,020	0,032	0,099	**0,921**

Source: Data processed by SMART-PLS, 2025.

Based on the table above, the variables of Social Influence (0.319) and Digital Self-Efficacy (0.033) contribute relatively significantly to improving the model's predictive ability (high F-square), while Perceived Ease (0.002) and Perceived Benefits (0.003) show very small contributions (F-square below 0.005).

DISCUSSION

The effect of perceived ease on adoption intention

The results of this study indicate that perceived ease of use has a positive influence on teachers' intention to adopt technology, although it is not significant. This finding is in line with previous studies showing that although perceived ease of use can influence a person's attitude and intention to adopt technology, its influence may not always be significant in certain contexts. For example, a study by Saidi revealed that although perceived ease of use played a role in technology adoption by teachers during the COVID-19 pandemic, other factors such as social and technical support played a more dominant role (Saidi et al., 2022).

In addition, a study conducted by Rahmawati et al. suggests that perceptions of ease have a positive relationship with the intention to use learning technology, but this is not always significant if it is not supported by internal motivation and school management support (Rahmawati & Narsa, 2019). This indicates that in the context of education, other factors may be more decisive in the adoption of technology by teachers (Bancoro, 2024). Thus, the results of this study reinforce the understanding that perceived ease of use is not the only key factor in adopting learning technology, especially for teachers who may need other motivation and support to be more motivated to integrate technology into their teaching practices.

The influence of perceived benefits on adoption intentions

The results show that teachers perceived benefits of technology have a positive influence on their intentions to adopt technology in learning, but this influence is not statistically significant. This means that even though teachers realize that technology has useful benefits in supporting the teaching and learning process, this is not enough to be a strong determining factor for them to use it actively. This may occur because in the context of education, especially among teachers, perceived benefits alone are not enough to drive behavioral change if they are not supported by other factors such as adequate training, support from the school, and adequate technological readiness. According to Venkatesh et al., the intention to adopt technology is stronger when the perception of benefits is accompanied by a perception of ease and tangible social support (Venkatesh & Davis, 2000).

In addition, challenges such as limited time to learn new technologies or concerns about the effectiveness of using technology in learning can also be obstacles. Thus, the perception of benefits alone is not enough to encourage the intention to adopt technology if these aspects are not considered comprehensively (Rahayuningsih & Hanif, 2024). Overall, although teachers' perceptions of the benefits of technology show a positive direction in encouraging the intention to adopt, the insignificant results underscore the need for a more holistic approach. This means that the development of strategies to increase technology adoption must consider various aspects beyond perceived benefits so that the implementation of technology in the learning process can be effective and sustainable. With a deeper understanding of the supporting and

inhibiting factors, policies and training programs can be designed more precisely to encourage adaptive behavioral change among teachers.

Social influence on adoption intentions

The results of the study show that social influence has a positive and significant relationship with teachers' intentions to adopt technology. This means that the greater the pressure or encouragement from the social environment, such as colleagues, school leaders, and the community to use technology, the higher the teachers' intention to adopt it in the learning process. In the context of education, social influence can take the form of expectations from colleagues or school leaders who encourage teachers to utilize technology in teaching and learning activities. This is in line with the findings of research by Buraimoh et al., which shows that social influence has a significant positive relationship with teachers' intentions to use technology in learning (Buraimoh et al., 2023).

In addition, research by Fitri et al. also found that external factors such as work culture in schools and support from peers have a significant effect on teachers' readiness to adopt educational technology (Fitri et al., 2025). However, even though social influence has a positive and significant relationship, other factors such as perceived benefits, ease of use, and technological readiness also need to be considered to ensure effective technology adoption by teachers. Therefore, it is important for educational institutions to create a supportive and collaborative environment and provide adequate training so that teachers can make optimal use of technology in the learning process.

The influence of perceived usefulness, perceived benefits, and social influence moderated by digital social self-efficacy on adoption intentions

The results show that perceived usefulness, perceived benefits, and social influence contribute positively to teachers' intentions to adopt technology. This confirms that teachers who believe that technology can improve teaching effectiveness and are encouraged by their social environment are more likely to intend to use the technology. These findings are consistent with technology acceptance theories that emphasize the importance of belief and social support in encouraging technology use. However, interestingly, social digital self-efficacy does not play a significant moderating role in strengthening or weakening the relationship between these three variables and the intention to adopt technology.

In other words, teachers' beliefs about their personal ability to use social digital technology does not change how strongly the perception of usefulness, perceived benefits, or social influence affect their intention to use technology. This phenomenon may indicate that, in the context of technology adoption by teachers, the factor of social digital self-efficacy plays less of a role as a key determinant in this relationship. Teachers with varying levels of digital self-confidence remain influenced by perceptions of usefulness, benefits, and existing social pressure. This may be because the institutional environment, school policies, or the availability of training and technological resources play a more central role in encouraging technology adoption.

Research by Suparyono and Paling reinforces these findings, where digital literacy and technology perceptions play an important role in technology-based learning transformation, but social digital self-efficacy does not always function as a strong moderating variable in the context of this (Suparyono & Paling, 2025). Furthermore, Pitaloka et al. also emphasize that although digital self-efficacy is an important element, its influence as a moderator in the relationship between technology variables and adoption intentions may be influenced by other contextual factors such as organizational support and infrastructure readiness (Pitaloka et al., 2024). Thus, the results of this study underscore the need for a more comprehensive approach in encouraging technology adoption by teachers, which not only focuses on increasing social digital self-efficacy but also on providing systemic support such as quality training, adequate technological facilities, and an organizational climate that supports innovation.

CONCLUSION

Based on the results of the study, it can be concluded that social influence has a positive relationship and plays a strong role in teachers' intentions to adopt technology. This shows that encouragement and support from the social environment, such as colleagues and school leaders, are the main factors that motivate teachers to use technology in the learning process. Conversely, perceptions of usefulness and perceptions of benefits have not shown a significant influence on intentions to adopt technology. Furthermore, social digital self-efficacy does not moderate the relationship between these variables and the intention to adopt technology, so that the level of teachers' confidence in their social digital abilities does not affect the strength of the influence of these variables.

The findings of this study underscore the importance of strengthening social influence in encouraging teachers' intentions to adopt technology. A supportive social environment, such as support from peers and school leaders, plays a major motivating role in the technology adoption process. In addition, although perceptions of usefulness and benefits have not made a significant contribution at this time, efforts are needed to increase teachers' understanding of the value and benefits of technology so that it can play a more optimal role in the future. The development of social digital self-efficacy remains important as part of improving teacher competence, which can be done through structured training and mentoring. In addition, the provision of adequate technological facilities and supportive institutional policies are equally important supporting factors in creating a conducive learning ecosystem for the sustainable use of technology.

Further research is recommended to examine other factors that may influence the intention to adopt technology, such as organizational support and teacher motivation. In addition, the use of qualitative or mixed methods can deepen the understanding of teachers' perceptions of technology. New moderating or mediating variables, such as digital literacy or innovation culture, are also worth exploring to strengthen the relationship between variables. Research with a more diverse population and context is also recommended to broaden the generalization of findings. This will enable future research to be more in-depth and yield maximum results.

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