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FACTOR ANALYSIS OF E-LEARNING ACCEPTANCE IN SMK SORE TULUNGAGUNG USING TECHNOLOGY ACCEPTANCE MODEL (TAM)

Rhohmah Indah Mekar Sari[-1], Eristya Maya Safitri[-2], Tri Puspa Rinjeni[-3]

Information System
Universitas Pembangunan Nasional "Veteran" Jawa Timur
rohmahindah738@gmail.com[-1], maya.si@upnjatim.ac.id[-2], pupsa.rinjeni.fasilkom@upnjatim.ac.id[-3]

Abstract

Although the use of E-Learning has been expanded as a modern learning solution, its implementation at SMK SORE Tulungagung still faces obstacles such as low student participation, difficulty in accessing E-Learning features, and delays in submitting assignments. This indicates that there are obstacles in the acceptance of learning technology by students. This study aims to analyze the factors that influence the acceptance of E-Learning using the Technology Acceptance Model (TAM) framework with the main variables: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Using (ATU), Behavioral Intention to Use (BIU), and Actual Use (AU). The method used is quantitative with a predictive approach, data was obtained by distributing questionnaires to students majoring in Computer and Network Engineering, Data analysis was carried out using validity, reliability, and structural modeling (SEM-PLS) tests. The results showed that PU and PEOU significantly influenced students' attitudes and intentions in using E-Learning. In addition, BIU contributed to the use of the actual system and external factors such as complexity and voluntariness were also analyzed to determine the indirect effect on technology acceptance.

***Keywords**: E-learning, Technology Acceptance Model, TAM, Vocational School, Technology Acceptance*

Abstrak

Meskipun penggunaan *E-Learning* telah diperluas sebagai solusi pembelajaran modern, pelaksanaannya di SMK SORE Tulungagung masih menghadapi kendala seperti rendahnya partisipasi siswa, kesulitan mengakses fitur *E-Learning*, serta keterlambatan dalam pengumpulan tugas. Hal ini menunjukkan adanya hambatan dalam penerimaan teknologi pembelajaran oleh siswa. Penelitian ini bertujuan untuk menganalisis faktor – faktor yang memengaruhi penerimaan E-Learning menggunakan kerangka Technology Acceptance Model (TAM) dengan variabel utama: *Perceived Usefulness* (PU), *Perceived Ease of Use* (PEOU), *Attitude Toward Using* (ATU), *Behavioral Intention to Use* (BIU), dan *Actual Use* (AU). Metode yang digunakan adalah kuantitatif dengan pendekatan prediktif, data diperoleh melalui penyebaran kuesioner kepada siswa jurusan Teknik Komputer dan Jaringan, Analisis data dilakukan menggunakan uji validitas, reliabilitas, dan pemodelan structural (SEM-PLS). Hasil penelitian menunjukkan bahwa PU dan PEOU secara signifikan memengaruhi sikap dan niat siswa dalam menggunakan *E-E-Learning*. Selain itu, BIU berkontribusi terhadap penggunaan actual system serta faktor – faktor eksternal seperti kompleksitas dan kesukarelaan juga di analisis untuk mengetahui pengaruh tidak langsung terhadap penerimaan teknologi.

Kata Kunci: E-learning, Technology Acceptance Model, TAM, SMK, Penerimaan Teknologi

INTRODUCTION

The development of information and communication technology (ICT) has significantly transformed various aspects of life, including the education sector. One of the key innovations emerging from this progress is e-learning, which has become a primary solution for supporting modern learning by leveraging digital technology. E-learning platforms offer flexibility and efficiency in the learning process. Al-Hamdany (2021) emphasizes that the need to adapt to technology is

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a major driving factor behind the increasing use of e-learning across educational institutions. In vocational education, for instance, e-learning allows learning activities to continue through various applications such as Google Classroom, Zoom, and school websites.

Although e-learning has gained popularity at various levels of education, its implementation still faces significant challenges, particularly in vocational high schools (SMKs). The shift from face-to-face to online learning presents obstacles such as limited internet access, low digital literacy, and inadequate infrastructure. Ariyanti and Yuliani (2021) found that while flexibility in time and location is a key advantage recognized by both teachers and students, technical issues remain a major barrier. Furthermore, Rizaq and Sarmini (2021) argue that the sustainability of e-learning heavily depends on the availability of resources and infrastructure, encouraging the adoption of blended learning as a long-term solution. Similar challenges are reported in developing countries such as Pakistan (Sharif & A-Aklhaq, 2024) and Indonesia (Agustina & Charisma, 2022), where poor infrastructure, network issues, and lack of training hinder the effective adoption of e-learning.

This issue is also evident in SMK SORE Tulungagung, where the adoption of e-learning among teachers and students remains suboptimal. Observations show that the use of e-learning for assignment submission is currently limited to students in the Computer and Network Engineering (TKJ) department, with low participation in online classes and difficulties in both submitting and assigning tasks. These challenges highlight the importance of this research, which aims to analyze the factors influencing e-learning acceptance using the Technology Acceptance Model (TAM). The TAM framework includes variables such as Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Using (ATU), Behavioral Intention to Use (BIU), and Actual Use (AU). This study is expected to provide concrete data and practical insights for school leaders and stakeholders to enhance the adoption of e-learning. Moreover, it contributes both practically—by informing decision-making regarding infrastructure, training, and policy—and theoretically, by enriching academic literature on technology acceptance in vocational education, particularly in small-city contexts like Tulungagung.

To explore this gap, the current study adopts the Technology Acceptance Model (TAM), which provides a theoretical framework for understanding how individuals accept and use new technologies. This research specifically aims to examine the influence of perceived usefulness (PU) and perceived ease of use (PEOU) on students' attitudes (ATU) toward e-learning. Additionally, the study investigates how PEOU affects PU, how ATU contributes to students' behavioral intention to use (BIU) e-learning platforms, and how BIU leads to actual usage (AU). By analyzing these variables, the study seeks to generate empirical insights and practical recommendations that can support school stakeholders in improving the adoption of e-learning at SMK SORE Tulungagung. Furthermore, the findings are expected to contribute to the broader academic discussion on technology acceptance in secondary vocational education settings.

RESEARCH METHODS

This research uses a quantitative approach with a modified Technology Acceptance Model (TAM) framework through the addition of external variables, namely Complexity and Voluntariness. Respondents are all 200 active students majoring in Computer and Network Engineering (TKJ) at SMK SORE Tulungagung who have used the e-learning platform, with total sampling technique. Data collection was conducted through a structured questionnaire based on TAM variables and measured using a 5-point Likert scale. Validity was tested with Pearson correlation, and reliability with Cronbach's Alpha (≥ 0.7). Data analysis was performed with descriptive and inferential statistics using SmartPLS and SPSS.

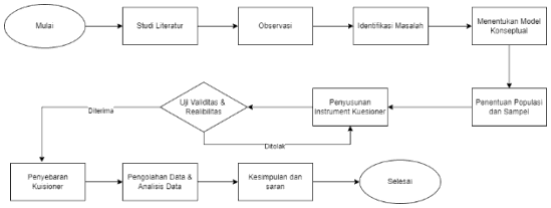

Figure 1. Research stages diagram

Types of research

This study uses a quantitative research approach with an explanatory design. It aims to test hypotheses regarding the factors that influence e-learning acceptance using the Technology Acceptance Model (TAM). The research integrates core TAM variables with additional external factors—Complexity and Voluntariness—to suit the context of vocational education.

Time and Place of Research

The research was conducted during the 2023/2024 academic year at SMK SORE Tulungagung, located in Tulungagung, East Java, Indonesia. Data collection took place over a one-month period during the second semester.

Research Target / Subject

The population in this study consisted of all active students in the Computer and Network Engineering (TKJ) department at SMK SORE Tulungagung. Since the total number of students was relatively small and they all had prior experience using the school's e-learning platform, the study employed a **saturated sampling technique** (*total sampling*). A total of **200 students** were involved as respondents.

Procedure

This research uses a non-experimental quantitative approach with a survey design. It began with a literature study to formulate a conceptual framework based on the Technology Acceptance Model (TAM) modified with two external variables: Complexity and Voluntariness. A total of seven variables were analyzed: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitude Toward Using (ATU), Behavioral Intention to Use (BIU), Actual Use (AU), Complexity, and Voluntariness.

Initial observations and interviews were conducted with students and e-learning system developers to identify user challenges and behaviors. Based on the preliminary findings and model framework, a questionnaire was developed that had been tested for validity and reliability (30 respondents pilot test), then distributed online to all TKJ students.

Data analysis was conducted in two stages: descriptive analysis to describe user perceptions, and inferential analysis using PLS-SEM through SmartPLS to test the measurement model (*outer model*), structural model (*inner model*), and hypothesis testing.

The conceptual model in this study maps the relationship between TAM variables, where PEOU affects PU (H2) and ATU (H4); PU affects ATU (H3) and BIU (H6); ATU affects BIU (H7); BIU affects AU (H9). Complexity affects PU (H1) and Voluntariness (H10), while Voluntariness affects PU (H5) and BIU (H8). The model is adapted for the context of vocational education, where technology adoption is situational and not always mandatory.

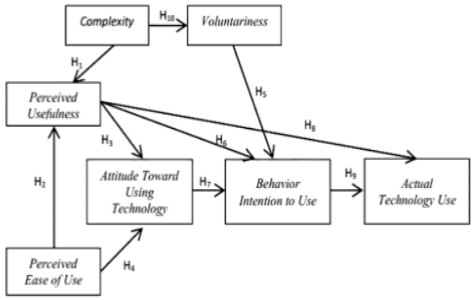

Figure 2. Conceptual Model

Data, Instruments, and Data Collection Techniques

Each construct was operationalized into 3–4 statements or indicators, yielding a total of 22 items, all measured using a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree". The instrument was validated through a pilot test with 30 students to ensure its validity (using Pearson correlation) and reliability (using Cronbach's Alpha, with ≥ 0.7 considered acceptable).

The final questionnaire was distributed using Google Forms and shared via WhatsApp class groups to reach all 200 active students of the Computer and Network Engineering (TKJ) department at SMK SORE Tulungagung. This technique ensured broad and convenient access for respondents in a school environment with mixed technology readiness levels.

Table 1. Research Instruments.

Variabel	Pertanyaan
Complexity	C1 Saya tidak membutuhkan banyak waktu saat melakukan kegiatan pada penggunaan e-learning C1 Saya tidak merasa kesulitan dalam melakukan pembelajaran pada e-learning C3 Saya berusaha menggunakan *e-learning* meskipun terkadang terdapat kendala
Voluntariness	V1 Saya membutuhkan *e-learning* karena untuk pembelajaran daring V2 Tidak ada paksaan bagi saya untuk menggunakan *e-learning* dalam pembelajaran daring

Perceived Usefulness	PU1 Saya bisa menghemat waktu dalam pengumpulan tugas PU2 Saya terampil dalam menggunakan *e-learning* dengan mudah PU3 Saya dapat menggunakan *e-learning* untuk mempermudah kegiatan serta efektivitas pembelajaran daring PU4 Saya merasa *e-learning* sangat berguna untuk membantu dalam kelas daring dan pembelajaran daring
Perceived Ease of Use	PEOU1 Saya merasa bahwa *e-learning* pengumpulan tugas di SMK SORE Tulungagung sudah fleksibel dalam penggunaanya PEOU2 Saya merasa *e-learning* Di SMK SORE Tulungagung mudah dipahami dalam penggunaanya. PEOU3 Saya meraasa *e-learning* memberikan petunjuk yang jelas dan mudah dipahami untuk melakukan pembelajaran daring
Attitude Toward Using	ATU1 Saya merasa senang menggunakan *e-learning* karena memberikan kemudahan dalam pembelajaran daring ATU2 Saya merasa senang berinteraksi dengan *e-learning* SMK SORE Tulungagung ATU3 Saya percaya dengan *e-learning* untuk pengumpulan tugas secara daring ATU 4 Saya menyukai *e-learning* pengumpulan tugas di SMK SORE Tulungagung
Behavioral Intention to Use	BIU1 Saya mencoba mengoperasikan setiap fitur yang ada pada *e-learning* untuk memaksimalkan penggunaanya. BIU2 Saya memanfaatkan *e-learning* untuk kegiatan pembelajaran BIU3 Saya berencana untuk menggunakan *e-learning* dalam melakukan pembelajaran daring hingga masa mendatang guna memudahkan aktivitas pembelajaran BIU4 Saya berharap di masa depan dapat menggunakan *e-learning* pengumpulan tugas yang lebih efektif
Actual Technology Use	AU1 Saya sering menggunakan *e-learning* untuk pengumpulan tugas dan pembelajaran daring AU2 Saya merasa dengan adanya *e-learning* ini sangat membantu dalam menyelesaikan pembelajaran daring di waktu yang ditentukan AU3 Saya merasa bahwa *e-learning* di SMK SORE Tulungagung adalah salah satu bentuk teknologi canggih untuk mendukung efektivitas pengumpulan tugas. AU4 Meskipun ada teknologi yang lebih canggih, saya akan tetap menggunakan *e-learning* ini

Data analysis technique

Data analysis techniques in this study were carried out through two approaches, namely descriptive analysis and inferential analysis. Descriptive analysis was used to describe student perceptions of each variable in the modified TAM model, such as Perceived Ease of Use, Perceived Usefulness, Attitude Toward Using, Behavioral Intention to Use, Actual Use, Complexity, and Voluntariness. Each statement item in the questionnaire was measured using a five-point Likert scale, then analyzed based on the average value and frequency distribution to determine the tendency of respondents' attitudes. Furthermore, inferential analysis was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method using SmartPLS software.

This analysis includes testing the measurement model (outer model) to assess construct validity (convergent and discriminant validity) and instrument reliability through composite reliability and Cronbach's Alpha values. In addition, testing the structural model (inner model) is carried out to evaluate the relationship between latent variables based on the path coefficient value, p-value, and coefficient of determination (R^2) to see the predictive power between variables.

Prior to the main analysis, the research instruments were tested for validity using the Pearson correlation test and reliability through Cronbach's Alpha, with a minimum eligibility value of 0.7. The data processing process starts from data cleaning, tabulation, to analysis using SPSS and SmartPLS.

RESULTS AND DISCUSSION

The descriptive analysis indicates a generally high level of e-learning acceptance among students, as reflected in responses such as 47.5% agreeing and 38% strongly agreeing that the system helps save time (C1), and over 85% of students using the system voluntarily (V1, V2). Furthermore, the system was perceived as both useful (PU1) and easy to use (PEOU2, PEOU3), which aligns with the core constructs of the Technology Acceptance Model (TAM). However, beyond this descriptive finding, the inferential analysis confirms deeper structural relationships. The hypothesis testing validated all ten proposed relationships with p-values < 0.05, affirming that PU and PEOU significantly influence students' attitudes (ATU) and intentions (BIU) to use e-learning. This suggests that when

students perceive the system as beneficial and easy to navigate, their likelihood of engaging with it increases.

These results are in line with Nurfaizal & Wahyudi (2022), who also found that PU and PEOU significantly affect ATU and BIU, reinforcing that positive perceptions foster acceptance. Additionally, the influence of voluntariness and complexity was notable. Voluntariness had a positive impact on behavioral intention, indicating that when students feel autonomous in using e-learning, their engagement improves. Conversely, perceived complexity had a negative effect on ease of use, echoing findings by Agustina & Charisma (2022), where system difficulty led to reduced motivation and performance. These dynamics highlight that external factors play an indirect but substantial role in shaping technology adoption. Overall, the study validates the extended TAM model in the context of vocational education and underlines the need to improve system design, infrastructure, and user training to enhance e-learning adoption.

Table 2. Loading Factor (Convergent Validity)

Variable	Indicator	Loading Factor
Complexity	C1	0.789
Complexity	C2	0.823
Complexity	C3	0.802
Voluntariness	V1	0.844
Voluntariness	V2	0.826
Perceived Usefulness	PU1	0.783
PU	PU2	0.768
PU	PU3	0.816
PU	PU4	0.804
Perceived Ease of Use	PEOU1	0.812
PEOU	PEOU2	0.825
PEOU	PEOU3	0.837
Attitude Toward Using	ATU1	0.811
ATU	ATU2	0.823
ATU	ATU3	0.839
ATU	ATU4	0.806
Behavioral Intention to Use	BIU1	0.856
BIU	BIU2	0.832
BIU	BIU3	0.848
BIU	BIU4	0.825
Actual Technology Use	AU1	0.861
AU	AU2	0.838
AU	AU3	0.814
AU	AU4	0.829

Presents the loading factor values for each indicator under their respective constructs. All indicators exceed the minimum threshold of 0.70, confirming that each item is strongly correlated with its intended construct. This result indicates that the model meets the criteria for convergent validity.

Table 3. Average Variance Extracted

Variable	Average Variance Extracted (AVE)
Complexity	0.700
Voluntariness	0.698
Perceived Usefulness (PU)	0.651
Perceived Ease of Use (PEOU)	0.685
Attitude Toward Using (ATU)	0.678
Behavioral Intention to Use (BIU)	0.719
Actual Technology Use (AU)	0.731

AVE (Average Variance Extracted) values for each construct in the research model. All AVE values are above 0.5, which means that each construct is able to explain more than 50% of the variance of its indicators. This indicates that all constructs in the model have met the requirements for convergent validity.

Table 4. Cross Loading (Discriminant Validity)

Indicator	Complexity	Voluntariness	PU	PEOU	ATU	BIU	AU
C1	0.789	0.412	0.445	0.421	0.402	0.398	0.410
C2	0.823	0.427	0.433	0.416	0.409	0.421	0.418
C3	0.802	0.439	0.447	0.428	0.416	0.403	0.419
V1	0.419	0.844	0.501	0.462	0.478	0.470	0.465
V2	0.408	0.826	0.488	0.452	0.467	0.462	0.453

PU1	0.436	0.486	0.783	0.512	0.498	0.483	0.497
PU2	0.428	0.474	0.768	0.503	0.482	0.471	0.481
PU3	0.442	0.495	0.816	0.519	0.501	0.488	0.506
PU4	0.421	0.473	0.804	0.507	0.486	0.473	0.490
PEOU1	0.414	0.453	0.503	0.812	0.467	0.452	0.466
PEOU2	0.429	0.464	0.517	0.825	0.472	0.467	0.471
PEOU3	0.437	0.476	0.529	0.837	0.489	0.474	0.486
ATU1	0.404	0.468	0.487	0.478	0.811	0.482	0.475
ATU2	0.417	0.481	0.501	0.491	0.823	0.496	0.489
ATU3	0.426	0.496	0.512	0.502	0.839	0.508	0.499
ATU4	0.412	0.472	0.483	0.473	0.806	0.469	0.458
BIU1	0.398	0.475	0.489	0.464	0.493	0.856	0.491
BIU2	0.421	0.491	0.504	0.472	0.508	0.832	0.504
BIU3	0.403	0.478	0.493	0.459	0.501	0.848	0.497
BIU4	0.416	0.466	0.485	0.453	0.487	0.825	0.489
AU1	0.410	0.467	0.496	0.474	0.481	0.502	0.861
AU2	0.418	0.471	0.501	0.479	0.486	0.507	0.838
AU3	0.419	0.459	0.488	0.466	0.478	0.493	0.814
AU4	0.404	0.463	0.495	0.462	0.473	0.481	0.829

Discriminant validity through cross-loadings and Fornell-Larcker criterion. No multicollinearity was detected (VIF < 3.0 for all items)

Table 5. Path Coefficients and Significance

Path	Path Coefficient	T-Statistic	P-Value	Conclusion
Complexity → PU	0.289	5.122	0.000	Significant
Complexity → Voluntariness	0.647	13.314	0.000	Significant
Voluntariness → PU	0.178	3.032	0.003	Significant
Voluntariness → BIU	0.347	5.505	0.000	Significant
PEOU → PU	0.541	9.554	0.000	Significant
PU → ATU	0.247	4.154	0.000	Significant
PEOU → ATU	0.613	10.832	0.000	Significant
PU → BIU	0.133	2.415	0.016	Significant
ATU → BIU	0.263	4.356	0.000	Significant
BIU → AU	0.605	13.658	0.000	Significant

In the inner model, the R^2 value for Actual Use (AU) was the highest at 0.709, indicating that 70.9% of the variance in students' actual use of e-learning can be explained by the model, particularly by their behavioral intention to use (BIU). The strongest path coefficient was observed between BIU → AU ($\beta = 0.605$, $p < 0.000$), confirming that behavioral intention is the most powerful predictor of actual system usage. This strong relationship can be theoretically justified through the core logic of the Technology Acceptance Model (TAM), which posits that intention is the most proximal determinant of actual behavior.

In the context of SMK students, this means that once students form a clear and

favorable intention—rooted in their perceptions of usefulness and ease—they are highly likely to translate that intention into consistent and observable usage behavior. Moreover, the voluntary nature of e-learning at SMK SORE Tulungagung (as reflected in high responses on voluntariness indicators) likely enhances this conversion from intention to action. When students are not forced but rather choose to engage with e-learning platforms, their behavior is guided by internal motivation, which tends to result in more committed and sustained use.

This finding is consistent with previous studies (e.g., Agustina & Charisma, 2022; Mailizar & Almanthari, 2021), which emphasize that high behavioral intention—especially when supported by positive perceptions and low system complexity—leads to strong actual usage. Thus, improving students' attitudes and motivation should remain a key strategy in boosting long-term adoption of e-learning technologies.

CONCLUSIONS AND SUGGESTIONS

Conclusion

This study shows that all variables in the modified Technology Acceptance Model (TAM) significantly affect the acceptance of e-learning at SMK SORE Tulungagung. The main finding shows that Behavioral Intention to Use (BIU) is the strongest predictor of Actual Use (AU), which indicates that students' intention to use the system largely determines its actual use. In addition, Perceived Ease of Use (PEOU) was shown to influence Perceived Usefulness (PU) and Attitude Toward Using (ATU), suggesting that the easier a system is to use, the greater the perceived usefulness and positive attitude toward its use. External variables such as Complexity and Voluntariness also play an important role, where Complexity is not an obstacle, but instead contributes to increasing perceived usefulness and students' sense of autonomy.

Overall, the model has strong explanatory power, as indicated by the high R^2 values on the dependent variables. These results confirm that modifying TAM by adding contextual variables such as complexity and voluntariness can provide a deeper understanding of the factors influencing e-learning adoption in SMKs. The practical implication of this research is the need to improve system quality, user training, and infrastructure support to encourage wider and more effective e-learning adoption.

Suggestion

Based on the findings of this study, it is recommended that schools, especially SMK SORE Tulungagung, be more proactive in improving the quality of e-learning implementation by focusing on aspects of ease of use and technical support. Periodic training for students and teachers should be conducted to improve digital skills and reduce the perception of system complexity. In addition, the development of a more intuitive and responsive e-learning interface can encourage positive user attitudes and strengthen the intention to continue using the platform. Given the importance of the voluntariness factor in influencing usage intention, a more flexible and user choice-based approach should also be considered, so that students feel more intrinsically motivated to use the system. Finally, strengthening the digital infrastructure and technical support in the school environment is necessary to ensure smooth access and continuous use of e-learning.

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