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Implementation of Technology Acceptance Model and DeLone & McLean Model for ChatGPT User Acceptance

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Keywords

Exploration of Success Factors; ChatGPT; TAM; DeLone & McLean Model

Abstract

The learning style approach significantly impacts education, particularly in the Education 4.0 era, where both educators and institutions must innovate to enhance student outcomes. This study explores the use of artificial intelligence, particularly ChatGPT, in education. It integrates the Technology Acceptance Model (TAM) and DeLone & McLean models to examine how System Quality, Information Quality, and Service Quality influence Perceived Usefulness, Perceived Ease of Use, and technology acceptance. Data from 100 respondents analyzed using SmartPLS shows that System, Information, and Service Quality positively affect Perceived Usefulness and Perceived Ease of Use. Service Quality, however, does not influence Perceived Ease of Use. Perceived Usefulness and Ease of Use positively affect Attitude Toward Using, which in turn influences Behavioral Intention to Use. Finally, Behavioral Intention positively impacts Actual System Use. The model achieved an accuracy of 54.9%.

Introduction

The learning style applied to education greatly affects the educational environment [1]. The era of education 4.0 provides new ways for all elements of education, both educators and educational institutions to improve learning experiences and student learning outcomes [2] . One of them is the use of AI (*Artificial intelligence*) among students who can help do

assignments and be able to provide answers to complex problems [3]. AI that has recently been in the spotlight is ChatGPT (*Generative Pre-Training Transformer*), an artificial intelligence in conversational text format that can respond to student commands in *real-time* and is commonly used to find assignment references, do assignments instantly, and vent [4]. This technology is a breakthrough with its extraordinary capabilities and potential in the world of education because it can provide a personalized learning experience [5]. Its sophistication is capable of generating potentially biased responses to various topics and should be carefully reconsidered [6]. There is a need to validate and supplement the information provided by this technology, such as books, articles or interactions in the cognitive process during learning [7]. ChatGPT may present a new threat to education, raising concerns of possible AI-assisted cheating [8]. There is a need to consider the benefits and risks that may hinder students' understanding of diverse perspectives [9]. It is important to understand factors related to the potential of ChatGPT and its integration in educational settings. [10]

The Technology Acceptance Model (TAM) is known as a scientific paradigm for evaluating technology acceptance that is able to understand predictors of user behavior [11]. This model has two main factors that underlie user intention towards technology use, namely perceived user-friendliness and perceived usefulness [12]. TAM has been used in many areas of research and is known for its simplicity so that it can be modified or expanded [13]. In evaluating user acceptance of *flowgoritm* with variable convenience affecting the benefits obtained, these benefits have an influence on user attitudes and intention to use, where the two variables, namely user attitudes and intentions, influence each other, intention to use also has a significant effect on use [14]. In the evaluation of the acceptance of the Guru Room system, ease of use has a positive effect on the user attitude variable [15]. *Perceived Usefulness* and *Perceived Ease of Use* depend not only on technology, but also on the user's ability to interact with the system [16]. Usability has an influence on user attitudes through belief in the benefits of a system that can fulfill the characteristics of a job. [17] The relationship between user attitudes and intentions on the application of ChatGPT in education shows a significant influence, user experience increases confidence so that they feel enthusiastic about always using the system. [18]

Experts suggest the integration of theoretical models in order to better understand the adoption of a technology, a framework or model of variables referring to the TAM model, such as PU, PEOU, ATT, BI, USE and the DM ISS model, such as SQ, SRQ, and IQ with the results of SRQ having no effect on PEOU [19] . The integration of the *TAM-DeLone & McLean* model, TAM focuses on the beliefs of technology users while *DeLone & McLean* on the quality aspect as a success factor for the adoption of a system, where this integration tries to explain the picture behind the continuous use of technology [20]. *DeLone & McLean'*s success model was significantly updated to analyze its influence on various aspects, such as task performance and organizational behavior that play an important role in task effectiveness and completion [21]. This model evaluates system implementation based on three aspects, namely, system quality, service, and information, all of which affect user satisfaction and desire to use the system [22]. Previous research evaluating the success of ChatGPT using

the integration of these two models, found that the *System Quality* variable affects *Perceived Ease of Use*, where system quality includes *interface design*, *interaction mode*, and functional performance that makes it easy for users to operate without obstacles or confusion [23]. *System Quality* and *Information Quality* have an influence on PU and PEOU variables because users feel the system used has reliability, convenience, and information obtained [24]. In evaluating the success of the *waste bank application*, *Service Quality* has no effect on *Perceived Ease of Use* [25] . This insignificant relationship can be explained that the quality of the system depends on the user's ability to get benefits and ease of use.[26] This study aims to explore the factors that influence the successful use of ChatGPT by students by integrating the *Technology Acceptance Model* (TAM) and *DeLone & McLean* models.

Method

The stages of this research began with data collection through interviews to explore students' experiences in using ChatGPT, observation by directly seeing users interact with ChatGPT, literature study by collecting and analyzing references from books, scientific articles relevant to the use of ChatGPT, and questionnaires to collect respondent data based on statements that have been designed in accordance with the research variables. The population that became the subject of research was all students of Amikom Purwokerto University, which amounted to 2,000 people from various study programs so as to provide broad coverage to describe the phenomenon under study. This study uses the *Accidental Sampling* technique to obtain accurate and relevant data in supporting the analysis and conclusions made. If the population is less than 100, then the entire population should be sampled. If the population ranges from 1,001 to 5,000, the sample size is calculated by multiplying the total population by a set percentage, which is 5% [27] . Based on the calculation, the minimum sample size required in this study is 100 students to become respondents by filling out a questionnaire using a Likert scale from 1 to 5[18] . The characteristics of the respondents are presented in Table 2. The data that has been collected is then analyzed using SmartPLS 3 software, by testing the *inner model* and *outer model* to evaluate the relationship between variables in this study.

TABLE 1. CHARACTERISTICS OF RESPONDENTS

Characteristics	Frequency	Percentage
Gender		
Female	58	58%
Male	42	42%
Study Program		
Information System	54	54%
Informatics	31	31%
Information Technology	5	5%
Digital Business	5	5%
Communication Science	5	5%

The research concept is shown in Figure 1 by adopting the TAM and *DeLone & McLean frameworks* which are elaborated between the two methods.

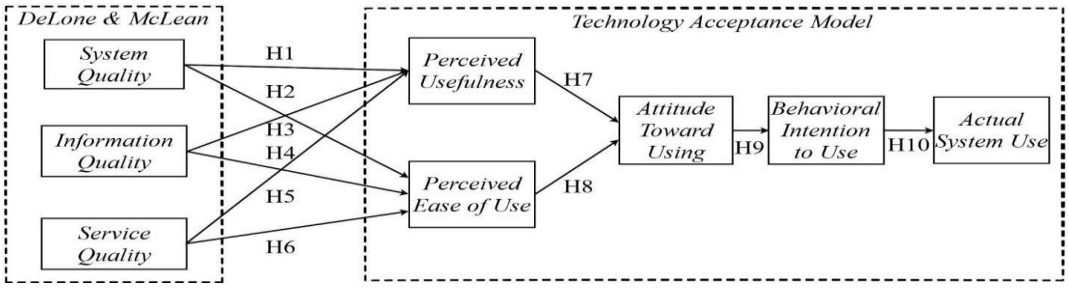

Figure 1. Research Model

A. Evaluation of Measurement Model

Measurement evaluation or *outer model* is a measurement of the relationship between indicators and latent variables which can be done with validity and reliability tests.

Validity test is a test used to show the extent to which the instrument used is able to measure what should be measured. AVE (*Average Variance Extracted*) can be used in convergent validity to determine the validity value of a variable, which can be said to be valid if it has an AVE value of more than 0.5[28] . *Fornell larcker criterion* is used in discriminant validity which is done by comparing the AVE root of each variable to the correlation between one other variable in the research hypothesis model.

TABLE 2. CONVERGENT VALIDITY TEST (AVE)

	AVE
Actual System Use	0.695
Attitude Toward Using	0.672
Behavioral Intention to Use	0.629
Information Quality	0.609
Perceived Ease of Use	0.649
Perceived Usefulness	0.664
Service Quality	0.657
System Quality	0.795

Table 2. shows that all constructs have an AVE value of more than 0 .5, which means that all constructs are valid.

TABLE 3. DISCRIMINANT VALIDITY TEST (FORNELL *LARCKER CRITERION*)

	Actual System Use	*Attitude Toward Using*	*Behavioral Intention to Use*	*Information Quality*	*Perceived Ease of Use*	*Perceived Usefulness*	*Service Quality*	*System Quality*
Actual System Use	0.833							
Attitude Toward Using	0.526	0.820						
Behavioral Intention to Use	0.466	0.708	0.793					
Information Quality	0.569	0.412	0.419	0.780				

Perceived Ease of Use	0.454	0.533	0.554	0.393	0.806			
Perceived Usefulness	0.526	0.597	0.575	0.534	0.298	0.815		
Service Quality	0.486	0.341	0.421	0.568	0.424	0.426	0.811	
System Quality	0.528	0.511	0.643	0.485	0.491	0.550	0.488	0.891

Table 3 shows that the *Fornell Larcker Criterion* value each construct is greater than the correlation value between one construct and another, so the validity of the disparity is declared good.

Reliability test is a measure that shows the level of trust or consistency of a measuring instrument in providing reliable results. Reliability is determined by the *Composite Reliability* and *Cronbach's Alpha* values, where each construction must have a consistency higher than 0.7. [28]

TABLE 4. RELIABILITY TEST (*COMPOSITE RELIABILITY* AND *CRONBACH'S ALPHA*)

	Cronbach's Alpha	*Composite Reliability*
Actual System Use	0.775	0.871
Attitude Toward Using	0.760	0.860
Behavioral Intention to Use	0.708	0.835
Information Quality	0.791	0.861
Perceived Ease of Use	0.729	0.847
Perceived Usefulness	0.747	0.855
Service Quality	0.747	0.852
System Quality	0.870	0.921

Table 4 shows that all constructs produce a *Composite Reliability* value of more than 0.7 so that consistency in the construction of latent variables has been met.

B. Structural Model Evaluation

The measurement of the relationship between the exogenous constructs and the endogenous constructs being evaluated is called the *inner model* [29]. In this study, the evaluation of the inner model includes *R Square* and *Goodness of Fit*. The *R Square* value is used to assess the extent to which the independent variables affect variation in the dependent variable. The *R Square* value is 0.67 strong, 0.33 moderate, and 0.19 weak [30] . The accuracy of a model is evaluated using the *Goodness of Fit* test by observing the *Normed Fit Index* (NFI), which has a range of values between 0 and 1. [30]

TABLE 5. *R SQUARE*

	R Square	Information
Actual System Use	0.218	Weak
Attitude Toward Using	0.495	Moderate
Behavioral Intention to Use	0.501	Moderate
Perceived Ease of Use	0.295	Weak
Perceived Usefulness	0.399	Moderate

Table 5. shows that the *R Square* for *Actual System Use* used is 0.218. This means that the effect of *Attitude Toward Using* is 21.8% and the rest is influenced by other variables. *R Square* for *Attitude Toward Using* is 0.495. This means that *Behavioral Intention to Use* is 49.5% and the rest is influenced by other factors. *R Square* for *Behavioral Intention to Use* is 0.501. This means that the effect of *Perceived Ease of Use* and *Perceived Usefulness* is 50.1% and the rest is influenced by other factors.

TABLE 6. *GOODNESS OF FIT*

	Saturated Model
SRMR	0.092
D_ULS	2.736
D_G	1.177
Chi-Square	640.277
NFI	0.549

Table 6 shows that the proposed research model has good accuracy if its NFI value is *close* to 1. The NFI score is 0.549. This means that the proposed model has an accuracy of 54.9%.

C. Hypothesis Test

Hypothesis testing is used to determine the existence of a significant relationship or difference between certain variables that can be tested using the bootstrapping method. If the *T Statistics* value is greater than 1.96 and the *P Value* is above 0.05, the hypothesis can be said to be accepted. [28]

TABLE 7. HYPOTHESIS TEST RESULTS

	Original Sample (O)	*T Statistics*	*P Values*	Description
Behavioral Intention to Use -> Actual System Use	0.466	4.641	0.000	Accepted
Attitude Toward Using -> Behavioral Intention to Use	0.705	12.732	0.000	Accepted
Perceived Ease of Use -> Attitude Toward Using	0.317	2.826	0.005	Accepted
Perceived Usefulness -> Attitude Toward Using	0.347	2.504	0.013	Accepted
Service Quality -> Perceived Ease of Use	0.174	1.724	0.085	Rejected
Service Quality -> Perceived Usefulness	0.295	3.163	0.002	Accepted
Information Quality -> Perceived Ease of Use	0.298	2.522	0.012	Accepted
Information Quality -> Perceived Usefulness	0.216	2.272	0.024	Accepted
System Quality -> Perceived Ease of Use	0.253	2.193	0.029	Accepted
System Quality -> Perceived Usefulness	0.431	4.969	0.000	Accepted

1. *System Quality*

The *reliability* of the system in providing precise and fast information according to student needs increases comfort and ease of use. The system provided by ChatGPT is very *user-friendly*, with optimal response time, and easily accessible by students.[31]

H1: *System Quality* has a positive impact on *Perceived*

H2: *System Quality* has a positive impact on *Perceived Ease of Use*

The test value shows that *System Quality* has a positive effect on *Perceived* Usefulness, obtained a *T Statistics* value of 4.969> 1.96, and a *P Value of* 0.000 <0.05 with an *Original Sample* value of 0.431. The hypothesis is in line with research conducted by [26] [32] thus meaning that H1 is accepted. The test value shows that *System Quality* has a positive effect on *Perceived Ease of Use,* obtained a *T Statistics* value of 2.193> 1.96 and a *P Value* value of 0.029 <0.05 with an *Original Sample* value of 0.253. The hypothesis is in line with research conducted by [26] [32] thus meaning that H2 is accepted. Students feel that ChatGPT is reliable for finding information and providing accurate and relevant information, with the use of ChatGPT students are faster in finding information to support learning activities. ChatGPT is an application that is very useful for learning so that students feel the direct benefits of using ChatGPT, with a clear and intuitive interface that makes it easier for students to use ChatGPT. If ChatGPT provides relevant functions that are easily accessible, students will feel more comfortable and confident using it for various purposes, thereby increasing the perception that ChatGPT is easy to use.

2. *Information Quality*

High quality information on ChatGPT, such as being able to provide accurate answers, *relevant* to questions, and provide complete and clear explanations according to student needs. The presentation of quality information plays an important role in shaping the perception that ChatGPT is easy to use.[33]

H3: *Information Quality* has a positive impact on *Perceived Usefulness*

H4: *Information Quality* has a positive impact on *Perceived Ease of Use*

The test value shows that *Information Quality* has a positive effect on *Perceived Usefulness*, obtained a *T Statistics* value of 2.272,> 1.96 and a *P Value* value of 0.024 <0.05 with an Original *Sample* value of 0.216. The hypothesis is in line with research conducted by [32] [34] thus meaning that H3 is accepted. The test value shows that *Information Quality* has a positive effect on *Perceived Ease of Use,* obtained a *T Statistics* value of 2.522> 1.96 and a *P Value of* 0.012 <0.05 with an *Original Sample* value of 0.298. The hypothesis is in line with research conducted by [32] [34] thus meaning that H4 is accepted. Students feel more efficient in learning because the information provided by ChatGPT is appropriate and relevant so that it is easy to complete academic assignments and explore lecture material. This positive learning experience will encourage students to use ChatGPT more often, students consider ChatGPT very useful to support the teaching and learning process. Good information quality reduces confusion and allows students to get quick answers without difficulty, making interaction with ChatGPT smoother and more efficient. This increases perceived ease of use as students feel more comfortable and can rely on ChatGPT without being distracted.

3. *Service Quality*

Good *Service Quality* such as responsiveness in answering questions, empathy in understanding the context, provision of clear guidance, as well as good privacy protection, directly contributes to increased usage and ease of use of the system, as students can easily access and utilize information to effectively meet their needs .[33]

H5: Service *Quality* has a positive impact on *Perceived*

H6: *Service* Quality has a positive impact on *Perceived Ease of Use*

The test value shows that *Service Quality* has a positive effect on *Perceived* Usefulness, obtained a *T Statistics* value of 3.163> 1.96 and a *P Value* value of 0.002 <0.05 with an *Original Sample* value of 0.295. The hypothesis is in line with research conducted by[32] , thus meaning that H5 is accepted. The test value shows that *Service Quality* has no effect on *Perceived Ease of Use,* obtained a *T Statistics* value of 1.724> 1.96 and a *P Value of* 0.085> 0.05 with an *Original Sample* value of 0.174. The hypothesis is in line with research conducted by[35] , thus meaning that H6 is rejected. Students feel ChatGPT provides quality services, they consider ChatGPT as a useful application for academic tasks, finding information, or understanding material. Effective support, timely response, and availability of ChatGPT will increase its perceived usefulness in education. Service quality can improve perceived usefulness, but it does not directly affect ease of use which is more influenced by interface design and technical aspects. Students already feel comfortable using ChatGPT, so service quality is not enough to influence perceived ease of use.

4. *Perceived*

Adequate *Perceived Usefulness* on ChatGPT can support student behavior in using the system. ChatGPT is flexible in a variety of situations, both for professional and personal purposes, with a user-friendly interface and intuitive interaction process. [36]

H7: Perceived *Usefulness* has a positive impact on *Attitude Toward Using*

The test value shows that *Perceived Usefulness* has a positive effect on *Attitude* Toward *Using,* obtained a *T Statistics* value of 3.163> 1.96 and a *P Value of* 0.002 <0.05 with an *Original Sample* value of 0.295. The hypothesis is in line with research conducted by [18] , thus meaning that H7 is accepted. Students feel ChatGPT helps them complete tasks, understand material, and find information more effectively, students tend to have a positive attitude towards its use. students have the perception that ChatGPT can save time and support academic goals strengthening their confidence and motivation to use it more often in the learning process.

5. *Perceived Ease of*

Adequate *Perceived Ease of Use* in education supports the ease of use of the system and increases student behavior using ChatGPT, so that the ease of accessing and using the available features makes the experience of using ChatGPT efficient and comfortable. [37]

H8: *Perceived Ease of Use* has a positive impact on *Attitude Toward Using*.

The test value shows that *Perceived Ease of Use* has a positive effect on *Attitude Toward Using,* obtained a *T Statistics* value of 3.163> 1.96 and a *P Value of* 0.002 <0.05 with an *Original* Sample value of 0.295. The hypothesis is in line with research conducted by [38] , thus meaning that H8 is accepted. After students use ChatGPT, they feel a pleasant experience because ChatGPT is easy to use so they feel comfortable and confident when using ChatGPT, this makes students able to obtain information quickly and efficiently. ChatGPT which is easy to operate and produces information quickly and efficiently can increase the perception that ChatGPT is reliable, thus encouraging students to use it more often with a more positive attitude.

6. *Attitude Toward Using*

Easy and pleasant interactions such as comfort in interacting, feeling happy when using, and experiences that are not boring make students feel satisfied and increase students' intention to continue using ChatGPT . [39]

H9: *Attitude Toward Using* has a positive impact on *Behavioral Intention to*

The test value shows that *Attitude Toward Using* has a positive effect on *Behavioral Intention to Use,* obtained a *T Statistics* value of 3.163> 1.96 and a *P Value of* 0.002 <0.05 with an *Original Sample* value of 0.295. The hypothesis is in line with research conducted by[18] , thus meaning that H9 is accepted. Students feel that using ChatGPT is very useful and easy to use, making students feel happy when using, thus creating students' intention to continue using it in academic activities. This positive experience strengthens students' intention to use ChatGPT more often, because they feel ChatGPT supports academic goals. The comfort and confidence in using ChatGPT makes students more open to using it in the future.

7. *Behavioral Intention to*

Students' desire to utilize ChatGPT is supported by the ability of the system to continue to develop and be able to meet student needs. Continuous system development and a commitment to continuously improve performance ensure that students will continue to use ChatGPT in the future [31]

H10: *Behavioral Intention to Use* has a positive impact on *Actual System Use*.

The test value shows that *Perceived Usefulness* has a positive effect on *Attitude Toward Using,* obtained a *T Statistics* value of 3.163> 1.96 and a *P Value of* 0.002 <0.05 with an *Original Sample* value of 0.295. The hypothesis is in line with research conducted by [40] , thus meaning that H10 is accepted. Students with strong intentions to use ChatGPT tend to be more frequent and involved in its use. This intention is influenced by the belief that ChatGPT is beneficial for time efficiency, material understanding, and academic productivity. Positive experiences, convenience, and support from external factors such as friends or lecturers further strengthen their intention to continue using the system. This increases their engagement in learning and encourages more intensive use of ChatGPT.

Conclusion

Research was conducted to create a conceptual model using the elaboration of TAM and *DeLone & McLean* to explore the factors that influence the successful use of ChatGPT on Amikom Purwokerto University students. The research was analyzed by testing the *inner model* and *outer model*. From the results of the *inner model* test, an accuracy value of 54.9% was obtained which gives an idea of the extent to which the quality of the proposed model is in accordance with the data obtained. Based on the model created in this study, *System Quality*, *Information Qualit y*, and *Service Quality* have a positive effect on *Perceived Usefulness* and *Perceived Ease of Use*. *Service Quality* has no effect on *Perceived Ease of Use*. *Perceived Usefulness* and *Perceived Ease of Use* have a positive effect on *Attitude Toward Using*. *Attitude Toward Using* has a positive effect on *Behavioral Intention to Use*. *Behavioral Intention to Use* has a positive effect on *Actual System Use*.

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