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Measurement of Technology Acceptance Model (TAM) in Using E-Learning in Higher Education

Arum Buana[1*], Utaminingsih Linarti[2]
[12]Teknik Industri, Universitas Ahmad Dahlan

*Corresponding Author: arum1700019007@webmail.uad.ac.id2,

INTISARI

Universitas Ahmad Dahlan (UAD) selama ini sudah memanfaatkan e-*learning* yang dimulai sejak tahun 2009. Saat ini sistem e-learning sangat dibutuhkan dalam melakukan proses pembelajaran online. Tim pengembang e-learning UAD membuat pengembangan sistem new e-learning untuk mengatasi pendidikan jarak jauh pada masa pandemic. Kajian ini dijalankan dengan maksud untuk mengukur TAM pada pemakaian new e-learning UAD. Faktor yang digunakan berdasarkan pada penelitian sebelumnya dengan menggunakan dua faktor dasar dari TAM yakni *perceived usefulness* dan *perceived ease of use* dengan menambahkan aspek lain (1) *instructor characteristic,* (2) *habit,* (3) *computer self efficacy* dan (4) *system quality.* Jumlah sampel ditentukan menggunakan metode slovin dengan hasil 86 orang dan teknik penentuan responden menggunakan *purposive sampling*. Metode pengolahan data pada kajian ini dijalankan dengan memakai aplikasi SPSS 20. Hasil analisanya memperlihatkan jika *habit, computer self efficacy*, *system quality* serta *perceived ease of use* mempunyai hubungan yang signifikan pada *perceived usefulness* sedangkan *instructor characteristic* tidak mempunyai hubungan yang signifikan pada *perceived usefulness*. Besar kontribusi pengaruh faktor *instructor characteristic* dan *habit* pada *perceived usefulness* secara bersamaan sebesar 45,8%, untuk faktor *computer self efficacy* serta *system quality* terhadap *perceived ease of use* sebesar 41,3% serta untuk faktor *perceived ease of use* pada *perceived usefulness* sebesar 33,2% dan selebihnya diberikan pengaruh oleh variabel lainnya.

Kata Kunci: *E-learning, Learning Management System, Technology Acceptance Model, Regresi*

ABSTRAK

Information and Communication Technology (ICT) growth triggers various educational institutions, especially universities, to use technology in their learning. The learning model with ICT is known as e-learning which is designed using a Learning Management System (LMS). Ahmad Dahlan University (UAD) has been using e-learning since 2009. Currently, an e-learning system is very much needed in the online learning process. The UAD e-learning development team developed a new e-learning system to overcome distance education during the pandemic. This study was carried out to measure TAM in the use of UAD's new e-learning. The factors used are based on previous research using two primary factors from TAM, namely perceived usefulness and perceived ease of use by adding other aspects (1) instructor characteristic, (2) habit, (3) computer self-efficacy, and (4) system quality. The number of samples was determined using the slovin method with the results of 86 people, and the technique of deciding respondents was using purposive sampling. The data processing method in this study was carried out using the SPSS 20 application. The analysis results showed that habit, computer self-efficacy, system quality, and perceived ease of use significantly correlated with perceived usefulness. In contrast, instructor characteristics had no significant relationship with perceived usefulness. The immense contribution of the influence of instructor characteristic and habit factors on perceived usefulness simultaneously is 45.8%, for computer self-efficacy and system quality factors on perceived ease of use are 41.3% and for perceived ease of use factors on perceived usefulness is other variables influence 33, 2% and the rest.

***Keywords*:** *E-*learning, *Learning Management System, Technology Acceptance Model, Regresi*

INTRODUCTION

The development of Information and Communication Technology (ICT) encourages various educational institutions, especially universities, to use the internet in their learning. Information and Communication Technology (ICT) is a general term that covers all technological devices that can be used as a tool to process, store and present information with the help of the internet [1]. Based on the latest We Are Social report, in early 2021, it was stated that the number of internet users in Indonesia was 202.6 million. In 2021 there will be an increase of 15.5% or 27 million people compared to January 2020 [2]. Information exchange is becoming more accessible, faster, and no longer limited by the internet, so that education in Indonesia will slowly change due to technological developments that trigger electronic learning.

E-learning is a type of teaching and learning that allows the delivery of learning materials electronically to students using the internet, intranet, or other computer media [3]. The use of the internet provides distance education to be implemented[4]. The teaching and learning process is limited to face-to-face and can be done anytime and anywhere [5]. The utilization of e-learning can improve student understanding which will affect the achievement of educational goals. Educational goals are said to be achieved if the results of the student learning experience develop and improve.

Learning Management System (LMS) can be defined as software that can deliver learning materials. LMS is a multimedia resource with a web-based online way to manage and facilitate learning activities. LMS can be used for communication and collaboration between teachers and students [6]. LMS used by various universities has one advantage. Namely, it is open source so that it can be used for free.

Ahmad Dahlan University is one of the private universities that has created an LMS-based e-learning portal. The UAD e-learning portal was developed to facilitate learning activities when it is impossible to have face-to-face meetings in class. The e-learning system has been designed and manufactured since 2008 with a grant from the ministry.

Ismail is one of the people in charge of the UAD e-learning system. According to [7] since the e-learning system at UAD was formed in 2009, the use of the system has been less attractive to users. According to him, this is because there are still some shortcomings of e-learning that are difficult for lecturers to accept, one of which is the visual appearance of the e-learning system itself.

In March 2020, the government issued a policy to break the spread of COVID in Indonesia with *Work From Home* (WFH). All educational institutions are expected to implement online lectures. Since the beginning of the pandemic in February 2020, the development team has tried to provide learning media tailored to lecturers' needs. The development of the e-learning system was carried out in a hurry to anticipate distance learning problems at UAD during WFH. The concept of the e-learning system is adapted to the previous issues. On July 31, 2020, the official development team announced to all e-learning users that e-learning had shifted to using new e-learning.

During the COVID-19 outbreak, learning changes resulted in sudden behavioral changes. Almost all lecturers experience behavioral changes in the process of adopting online learning technology. The increasing use of technology during the COVID-19 outbreak caused polarization in technology segmentation [8]. The segmentation of technology users is classified into five segments, namely explorers, pioneers, skeptics, paranoids, and laggards [9]. Based on the Technology Readiness (TR) analysis conducted by [8] Ahmad Dahlan, University lecturers were in three groups: Explorers, Pioneers, and Skeptics. This state of technology readiness will affect the behavior of lecturers in conducting online learning with existing new technologies.

The efforts of the e-learning development team to facilitate lecturers in learning the new e-learning system are to provide socialization of the use of new e-learning. However, [7] explained that the case of implementing new e-learning at UAD was still constrained by the primary users of e-learning, namely lecturers. The lecturers are already comfortable using other platforms to support online learning, so that the use of the new e-learning system is not as expected. In Table 1, it can be seen that the situation of new e-learning users in February 2021 can be seen.

Table 1 State of New E-learning Users

Description	Sum
Confirmed User (can log in)	21.013
UAD Lecturer (Lecture Class Maker)	637
Permata Sakti Student	48
RPL students	150

(Source of UAD New e-learning Development Team, 2021)

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Technology Acceptance Model (TAM) is a good research model, popular [10] , and the most widely used to explain and predict technology acceptance [11]. TAM has five aspects: perceived ease of use, usefulness, behavioral interest, attitude, and actual use [12].

The primary constructs possessed by TAM have perceived usefulness and perceived ease of use. The ease of use construct is the ratio of user confidence if the system is not difficult to use [10][11]. Perceived usefulness is influenced by perceived ease of use. Because if technology is easy to use, therefore the technology can be more useful [10][13][14][15].

According to research [10] perceived usefulness and perceived ease of use influence user attitudes. Attitude is a response from the individual, either a positive or negative response. Research from [16] yang menggunakan tiga factor TAM yaitu *perceived usefulness, perceived ease of use* dan *attitude toward using.* uses three TAM factors: perceived usefulness, perceived ease of use, and attitude toward using. The study results show that perceived usefulness and ease of use can influence attitudes toward using the e-list system. The use of e-lists is effective for information management training poses when the level of user acceptance of the system is high.

The TAM model is often modified by adding several external factors. In research [15], the addition of external factors in the form of Habit (H) and System Quality (SQ). Habit (H) is a person's habits in using a system. Meanwhile, System Quality (SQ) is the level of users getting convenience from the system. The findings of this study explain the knowledge and guidelines that are useful in helping to design and develop a Mobile Library Application (MLA) system. This is to improve the experience of using the MLA system.

In the study [14] the addition of external factors in the form of Instructor Characteristics (CH) and Computer Self Efficacy (CSE). Instructor Characteristics are the level of concern of the instructor to his students. Computer Self Efficacy includes the ability of an individual when using a computer to complete a given task. This study shows that computer self-efficacy significantly affects the ease of use, while perceived ease of use has a significant effect on the intention to use electronic learning.

According to the explanation above, which is based on previous studies, this study was carried out to measure the Technology Acceptance Model (TAM) using new e-learning UAD. The object of research in this research is a lecturer at S1 Ahmad Dahlan University.

METHOD

This study includes a quantitative survey with linear regression analysis that is useful for measuring TAM using UAD's new e-learning. The number of samples was determined using the slovin method with the results of 86 people, while the sampling method was carried out using the purposive sampling technique. The data collection techniques in this study were interviews, observations, literature studies, and questionnaires. Before distributing the questionnaire, the researcher conducted face validity by a competent expert. Data collection was carried out from March 29, 2021 - June 12, 2021.

This study was carried out according to the basic TAM model, which has usability and ease of use [11]. Next, the researcher uses modifications by adding variables (1) instructor characteristic, (2) habit, (3) computer self-efficacy, and (4) system quality which refers to the research model [[15]] [[14]].

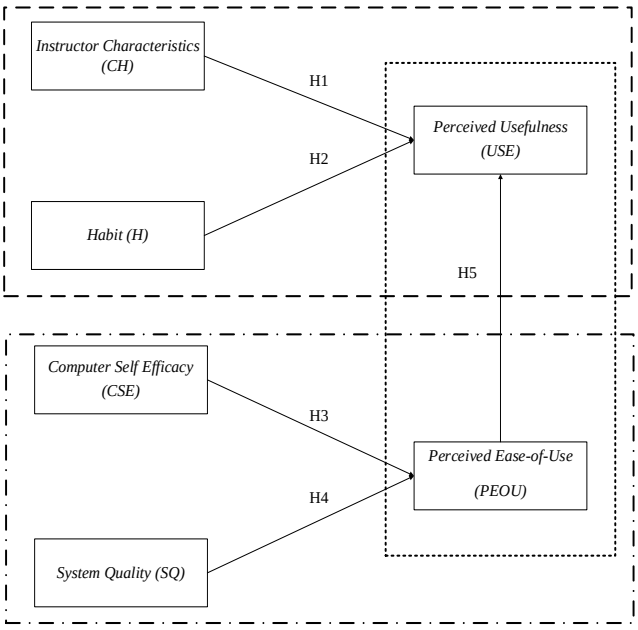

Figure. 1 Konseptual Research Model

Figure 1 description:

Model 1
Model 2
Model 3

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The regression model for the population can be shown in formula one as follows:

$$Y = a + b_1 X_1 + b_2 X_2 + \ldots\ldots + b_n X_n \quad (1)$$

Description of formula 1:
Y = Dependent variabel
X = Independent variabel
a = Constant
b = Regression coefficient value

RESULTS AND DISCUSSION

This study includes four processing stages: reliability, validity, classical assumptions in which there are normality tests, heteroscedasticity, and multicollinearity. Then the next step is to test multiple regression analysis or analysis of the results of the hypothesis. In this study, regression analysis was not carried out simultaneously but partially according to the model described in Figure 1. There were three stages carried out, namely, (1) Measurement of instructor characteristic and habit of Perceived Usefulness in the use of E-learning systems, (2) Measurement of computer self-efficacy and system quality on Perceived Ease-of-Use on the use of the E-learning system, and (3) Measurement of Perceived Ease-of-Use on Perceived Usefulness on the use of E-learning systems.

Testing the validity of the data is used to measure the validity of a questionnaire. Reliability testing is used to measure the consistency of the results of a measurement. The test results can be displayed in table 2 and table 3

Table 2. Validity Test Results

Variable	Indicator	r count	r table	Note
Perceived Usefulnes	USE1	0,855	0,212	Valid
	USE2	0,874		
	USE3	0,832		
	USE4	0,852		
	USE5	0, 790		
Perceived Ease-of-Use	PEOU1	0,844		
	PEOU2	0,857		
	PEOU3	0,686		
	PEOU4	0,821		
	PEOU5	0,767		
Instructor Characteristic	CH1	0,768		
	CH2	0,816		
	CH3	0,815		
Habit	H1	0,837		
	H2	0,648		
	H3	0,702		
	H4	0,804		
System Quality	SQ1	0,625		
	SQ2	0,838		
	SQ3	0,830		
	SQ4	0,791		
	SQ5	0,785		
Computer Self Efficacy	CSE1	0,789		
	CSE2	0,859		
	CSE3	0,793		
	CSE4	0.843		
	CSE5	0,600		

Table 3 Reability Result Test

Variable	Cronbach Alpha	Critical Value	Note
Perceived Usefulness	0,896	0,60	Reliabel
Perceived Ease-of-Use(PEU)	0,851		
Instructor Characteristic	0,717		
Habit	0,740		
System Quality	0,834		
Computer Self Efficacy	0,837		

The questionnaire is declared valid if $r_{count} > r_{table}$. Based on table 2, all questions have $r_{count} > r_{table}$. Therefore all statements in this questionnaire are proven valid. In reliability testing, the questionnaire is reliable (feasible) if Cronbach's alpha > 0.60 and declared unreliable if Cronbach's alpha < 0.60. In this test, all variables have Cronbach's Alpha calculations > 0.60. Therefore, it can be concluded that the various variables used in this study model can be reliably turned on and suitable to be used as measurement instruments.

The next stage in this study is the classical assumption test, in which there are tests for normality, heteroscedasticity, and multicollinearity. The normality test in this study shows that if sig. > 0.05, therefore it can be concluded that the data has a normal distribution. The heteroscedasticity test indicates no symptoms of heteroscedasticity because the residue is randomly distributed down or up the diagonal line. This is supported by the results of sig > 0.05, which means that no heteroscedasticity appears. The most recent classical assumption test is the multicollinearity test. The effects of data processing show that the tolerance value is 0.10 and the VIF value is, which means that there are no symptoms of multicollinearity in the data.

The last stage in this study is the regression analysis test or the analysis of the results of the hypothesis. The results of the coefficient of determination are presented in table 4. In contrast, the results of the hypothesis analysis are both stages (1) Measurement of instructor characteristic and habit of Perceived Usefulness when using new e-learning (2) Measurement of computer self-efficacy and system quality on Perceived Ease-of-Use at the time of using new e-learning as well as stage (3) The measurement of Perceived Ease-of-Use at the time of Perceived Usefulness in the use of new e-learning is presented in the form of table 5.

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Table 4. Results of the Coefficient of Determination

Model	Variabel		Adjusted R Square
	Dependen	Independen	
1	Perceived Usefulness	Instructor Characteristic Habit	45,8%
2	Perceived Ease-of-Use	System Quality Computer Self Efficacy	41,3%
3	Perceived Usefulness	Perceived Ease-of-Use(PEU)	33,2%

Based on table 4, the contribution of instructor characteristic and habit factors to perceived usefulness simultaneously is 45.8%, for computer self-efficacy and system quality factors to perceived ease of use are 41.3%. For perceived ease of use, an element is perceived usefulness as much as 33.2%, and the rest are given the influence of other variables.

Table 5. Results of Hypothesis Analysis

	Hypothesis	B	t-value	Sig.	Note
H_1	Instructor Characteristic significant effect on Perceived Usefulness in the use of the new e-learning	-.036	-.274	Not significant	Tidak Signifikan
H_2	Habit significant effect on Perceived Usefulness in the use of the new e-learning	.714	5.501	Significant	Signifikan
H_3	System Quality significant effect on Perceived Ease-of-Use in the use of the new e-learning	.179	2.114	Significant	Signifikan
H_4	Computer Self Efficacy significant effect on Perceived Ease-of-Use in the use of the new e-learning	.594	6.999	Significant	Signifikan
H_5	Perceived Ease-of-Use(PEU) significant effect on Perceived Usefulness in the use of the new e-learning	.583	6.577	Significant	Signifikan

Mathematical equations for each model can be written using formula one as follows:

$$Y = -0{,}036\,X_1 + 0{,}714X_2$$
$$Y = 0{,}179X_1 + 0{,}594X_2$$
$$Y = 0{,}583X$$

Overall the coefficient value is positive except for instructor characteristics. A positive coefficient means that if there is an increase of one unit of the independent variable, of course, there will be an increase in the number of dependent variables. This also applies to negative coefficients, and if there is an increase of one unit of the independent variable, there will be a decrease in the number of dependent variables.

Based on table 5, habit variables, computer self-efficacy, system quality, and perceived ease of use partially give a significant influence on perceived usefulness. These results are relevant to the research hypotheses (H2, H3, H4, and H5). The results of sig. <0.05 means that the independent variable has a significant and positive effect on the dependent variable. This means that lecturers can get used to and can feel all the facilities of the new e-learning quickly and easily. This can make their job easier so that each variable affects its use. This statement is following the opinions of experts in similar studies.

According to research [15], habit is a person's habit in using a system. Users who already have the habit of using a system will affect the use of the system. Habit is considered a strong indicator that influences the intention to use mobile applications with the internet [17][18]. Research [15][19][17] states that habit has a significant and positive relationship with perceived usefulness..

According to research [15], System Quality is the level of users getting convenience from the system. System Quality refers to how the results of innovation can be accessed and communicated to others [20]. System Quality is the only variable that is strong and influences perceived usefulness and ease of use [15][20]. Research [20] revealed that the results obtained can produce positive perceptions about the usefulness of e-library and the ease of use.

Computer self-efficacy is the ability[11], confidence [10][13][21] and comfort [11] of individuals using computers in completing tasks. The individual's ability to use a computer has a positive relationship to the use of the system through ease of use [22]. Using computers will be more accessible when students can access teaching and learning activities in good conditions and continuously [11]. Research [10][11][11] found that computer self-efficacy influences the perception of the ease of using technology. This is following this study.

While the results obtained for Instructor Characteristics are negative and have no significant relationship. This deviates from the research hypothesis (H1). The results of sig. > 0.05, which means that the independent variable has no significant effect on the dependent variable. Beta results show negative consequences. It can be interpreted that Instructor Characteristics have a negative influence.

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The results obtained deviate from the opinion of experts, which in the study [22] Instructor Characteristics it was written that the instructor's attitude towards technology is an important thing, referring to the extent to which the trainer will care and help accommodate system users. Instructor characteristics are believed to influence perceived benefits [11]. Instructors should encourage students to interact online and act as a guide for their students [23]. The teaching enthusiasm attitude of the instructor can affect students' motivation to take online learning [11].

Research [11] reveals that the institution's role is also essential in designing, managing, and maintaining the system. So that between instructors and institutions must both have the will to use the system. Therefore, this study reveals that any effort made by the instructor if the user does not have the choice of himself to use a strategy is useless. So it is stated that Instructor Characteristics are not related to the use of New e-learning.

Perceived ease of use includes a form of someone's perception that shows the ease of using the system, while perceived usefulness can be used to describe a person's perception of using a technology system. This follows the opinion of [5][22] , which states that the perceived ease of use of technology is explained as a ratio of the amount an individual can trust if the computer can be easily understood and used. The perception of the usefulness of technology is defined as a measure of one's belief in e-learning that will benefit everyone who uses it. In his research [5][10][11][14] revealed that the perception of user convenience has a positive effect on the perception of system usability.

CONCLUSION

Instructor Characteristic variable has a negative influence and doesn't have a significant relationship to perceived usefulness in the use of new E-learning, so the research results deviate from the first hypothesis (H1). However, this result is relevant to the second hypothesis (H2), which means that the habit variable has a positive and significant effect on perceived usefulness in the use of new E-learning. The results of this research also relevant to the third hypothesis (H3) which means System Quality has a significant effect on perceived ease of use. The computer self-efficacy has a significant effect on perceived ease of use, so the research result is relevant to the fourth hypothesis (H4). In addition, the fifth hypothesis (H5) is also relevant to the results of this research which means perceived ease of use variable has a significant effect on perceived usefulness in the use of new E-learning.

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