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TECHNOLOGY ACCEPTANCE MODEL AND ONLINE LEARNING MEDIA: AN EMPIRICAL STUDY OF ONLINE LEARNING APPLICATION IN A PRIVATE INDONESIAN UNIVERSITY

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ABSTRACT

Flexible learning is an online learning media that reshapes the roles of lecturers and students and provides information required for teaching/ learning activities. Indeed, various factors influence the extent of users' participation in adopting flexible learning. Therefore, it is necessary to investigate what factors affect the extent of users' participation in accepting and adopting flexible learning. Consequently, this article uses Technology Acceptance Model (TAM) as the theoretical base to understand the factors that influence the acceptance and adoption of flexible learning by lecturers and students as users of the system. In order to make the empirical analysis, we distribute questionnaire topurposively selected 100 students and lecturers from a private Indonesian university (Satya Wacana Christian University) who have fully used flexible learning system in the university (the so-called F-Learn). Using Structural Equation Modeling (SEM) to analyze the data, we find that perceived usefulness, perceived ease of use,and attitude on use of flexible learning significantly affect the extent of flexible learning usage in online learning activities.

Keywords: *Online Learning, Technology Acceptance Model, Purposive Sampling, Structural Equation Modeling.*

1. INTRODUCTION

The use of IT has extensively reshaped the learning and teaching strategy and process, especially in higher education. Many universities begin to complement face-to-face learning environment with the online one [1]. Online learning using the Internet as a primary medium, is able to make the students to be independent and active in the learning process.

Satya Wacana Christian University (SWCU) is not an exception since it has implemented online learning system that is called Flexible Learning (F-Learn). At SWCU, F-Learn enables students and lecturers to more easily access information that is necessary for their academic activities. Online learning media such as the F-Learn in SWCU is expected to improve the quality of higher education, improving data management and information system or service.

Indeed, users of F-Learn react differently to the implementation of new technology due to various reasons. It is therefore important to understand the readiness of users in accepting new technology and the acceptance level of users to new technology. Technology Acceptance Model (TAM) is an approach that is commonly used to empirically test the acceptance level of technology users [2]. TAM is the theoretical basis to analyze the factors that influence users acceptance level of new technology and consequently to support adoption process of new technology. According to TAM, there are two important factors that explain attitudes and behavior of users in adopting new technology, i.e. perceived usefulness and perceived ease of use [3].

Based on the previous argument, this article aims to investigate factors that influence users perception on the implementation of F-Learn to facilitate online learning environment. It is expected that the results help decision makers at SWCU and the users to increase the adoption of F-Learn in learning or teaching activities, based on perceived usefulness and perceived ease of use.

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2. LITERATURE REVIEW

2.1 Technology Acceptance Model (TAM)

TAM is based on Theory of Reasoned Action (TRA) that was first developed by Fishbein and Ajzen in 1975. TRA itself aims to predict users performance by assuming that users always have certain reasons when behaving [4]. Introduced by Fred D. Davis, TAM then adopted TRA model to model adoption of information system and also developed in response of the changing conditions. TAM is used very commonly in information technology adoption literature because of its simplicity and ease [5]. According to TAM, there are two important variables that affect users' decision to adopt information system, i.e. perceived usefulness and perceived ease of use.

Perceived usefulness refers to what extent one is certain that using new technology will improve her performance. Perceived ease of use can be interpreted as to what extent users perceive using the new technology is easy. Perceived usefulness and perceived ease of use can affect users' attitude toward using (new technology). Attitude toward using can be defined as users (positive or negative) evaluation as a consequence of using certain technology in her occupational activities [2]. Other scholar posits that attitude is important in explaining individual behavior [6].

Other variable that is instrumental in explaining users' decision to adopt new technology is actual system use. Actual system use is frequency and duration of using new technology [2]. A user is arguably more certain about the usefulness and ease of new technology when they use the new technology more frequently and longer.

2.2 Previous Research

Novita [7] analyzes variables that explain acceptance level of open-source object-oriented programming language (Java language). She demonstrates that the easier IT, the higher the usefulness. When ones perceive that new technology provides benefits to them, they will perceive the new technology more positively. Consequently, they will intensify the usage of new technology.

Yuadi uses external variables such as design of library portal, organization of e-resource, and user skills in his research. His findings show that organization of e-resources does not influence perceived usefulness and perceived ease of use does not affect users attitude toward using. He further suggests that organizations improve the quality of information system in providing information to users since it is vital to users perception to information system [8].

Wijayanti confirms the significantly positive effect of perceived ease of use on perceived usefulness. This implies that users will perceive information system useful if it is easy to operate [9]. The results are in in line with Handayani who find that ease of use and usefulness are instrumental in acceptance of IT. In other words, IT can operate effectively if it offers benefits and ease of use to its users [10].

This research takes four constructs of TAM as developed by Davis [3], i.e. perceived ease of use, perceived usefulness, attitude toward using, and actual usage as can be seen from the figure below:

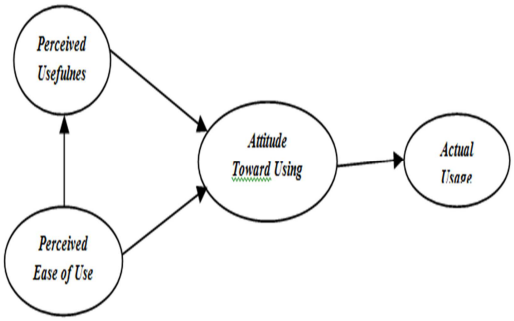

Figure 1: Structural Model Between Constructs

Based on the conceptual model above, we propose the following hypotheses:

1) H1 : perceived ease of use has positive influence on perceived usefulness of F-Learn
2) H2 : perceived ease of use has positive influence on attitude toward using F-Learn
3) H3 : perceived usefulness has positive influence on attitude toward using F-Learn
4) H4 : attitude toward using has positive influence on actual usage of F-Learn

3. RESEARCH METHOD

This research is a quantitative one that emphasizes theory verification by measuring variables and analyzing data using statistical procedure. We obtain our data by distributing questionnaire to our purposively selected respondents. We require that respondents should have fully used F-Learn at Faculty of Information Technology (FIT) SWCU. We use Structural Equation Modeling (SEM) to statistically analyze our data. SEM enables us to test the validity of our

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research instruments, confirm the validity of our model and simultaneously as well as individually test the effect of a variable on another variable [11].

SEM requires sample size at least five times the number of independent variables. It is also recommended that the ideal sample size is 100-200 for Maximum Likelihood Estimation (MLE) technique [11]. Maximum likelihood will produce unbiased estimated parameter if the data satisfies multivariate normality assumption. Since our research uses 20 indicators to measure our variables, it is therefore required to have at least 100 respondents. Every indicator or question is measured with likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). We rely on Lisrel 8.8 (Linear Structural Relationship) software for SEM analysis and SPSS 11.5 for windows for tabulating data. Our analysis model can be seen at Figure 2 below:

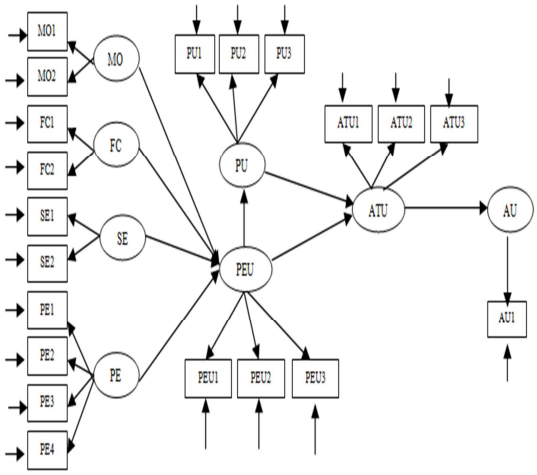

Figure 2: Analysis's Model

Developing well-constructed theory is extremely vitalin SEM modeling. The details of constructs and dimensions are explained as follows:

a. Perceived Usefulness (PU) : easier (PU1), increase performance (PU2) and more effective (PU3).
b. Perceived Ease of Use (PEU) : easy to understand (PEU1), ease to use (PEU2) and ease to learn (PEU3). Perceived ease of use is also measured by supporting indicators from motivation (MO), motivation is a form of prediction of intentions or behavior that is expected to influence the perceived ease of use [12] : perception that the system help learning activities (MO1),experience in using similar system (MO2), self efficacy (SE), self-efficacy is a variable that represents the confidence in the ability to perform a task using a computer [12] : being able to use F-Learn well without assistance of other users (SE1),being able to use F-Learn well if ever saw other users use it (SE2). Facilitating conditions (FC), organizational support as well as adequate infrastructure needed to maximize the role of information technology [13] : good internet connection (FC1), sufficient infrastructure to use F-Learn (computer, human resources) (FC2). and perceived enjoyment (PE), perceived ease of use is expected to reflect the tool of pleasure associated with the system [12] : application display is clear and not confusing (PE1),clear and understandable terms (PE2), well-functioning, fast-response and error-free application (PE3), and number and types of application module that sufficiently satisfies user needs (PE4).
c. Attitude Toward Using (ATU) : being pleased in using (ATU1), enjoyment in using (ATU2), comfort in interacting (ATU3).
d. Actual Usage (AU) : frequency of usage (AU1).

The path diagram of this research explains eight variables, i.e. perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using (ATU),actual usage (AU) and supporting variables of perceived ease of use: motivation (MO), self efficacy (SE), facilitating conditions (FC) and perceived enjoyment (PE). All variables are latent variables or construct (unobserved variables). From the structural equation it can be seen that there are four exogenous (independent) variables: motivation (MO), self efficacy (SE), facilitating conditions (FC) and perceived enjoyment (PE). Perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using (ATU) andactual usage (AU) are endogenous (dependent) variables because they are affected by previous variables. We measure latent variables using manifest indicators (measured by Likert scale). For example, perceived usefulness (PU) is measured by 3 indicators PU1, PU2, PU3 with measurement errors are e1, e2 dan e3, respectively.

SEM is formulated by stating causality relationship between various constructs as can be seen at table 1.

Table 1: Structural Equation Based On Analytical Model

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Endogenous Variable = Exogeneous Variable + Endogeneous Variable + Error
Perceived Ease Of Use = γ_1Motivation + γ_2Self Effcacy + γ_3Facilitating Conditions + γ_4Perceived enjoyment + δ
Perceived Usefulness = β_1Perceived Ease Of Use + δ
Attitude Toward Using = β_1Perceived Ease Of Use + β_2 Perceived Usefulness +δ
Actual Usage = β_3 Attitude Toward Using + δ

SEM only utilizes input data with varians matrix or covarians (correlation matrix) for the whole estimations. In Lisrel, standard estimation model uses Maximum Likelihood (ML) estimation that requires observed variables to satisfy multivariate normality condition.

Considering that our sample size is 100, the number of covarian data can be calculated using the following formula:

$$\frac{p\,(p+1)}{2} \quad \text{..... (1)}$$

where p is the number of observed variables. It is then indicated that our model is under identified, i.e. model with the number of estimated parameters is greater than the known data.

4. RESULTS AND DISCUSSION

This section discuss the empirical results of our study that document the influencing factos of the students and lecturers use of F-Learn at FIT, SWCU. Table 2 below demonstrates the characteristics of our respondents. Students constitute over whelmingly majority of our respondent, with 82% of our respondents are students. The gender distribution of our respondents is relatively balanced.

Table 2: Respondent Characteristics

Respondent	N	Sex	N	Age	N	Education	N	Experience in using internet (year)	N
Students	82	Male	58	17 – 21	46	High School	67	< 2	1
Lecturers	18	Female	42	22 – 26	35	Diploma	-	2, 5 – 5	23
				27 – 31	5	Bachelor	15	> 5	76
				31 –	7	Master	16		
				35					
				35 – 40	5	Doctorate	2		
				> 40	2				
Total	100		100		100		100		100

Source: primary data

Here's the next stage in the use of SEM analysis techniques:

In order to ensure that parameter estimation is not biased, we have to check the normality of our data. There are two indicators of normality in SEM: univariate normality (indicating normality of indicator manifest) and multivariate normality (indicating normality of the whole variables). Normality condition is satisfied when p-value of skewness and kurtosis is > 0.05. In our model, it can be argued that univariate normality condition is satisfied (p >0.05). However, it is not the case for multivariate normality (p<0.05). Consequently, we fix our data using asymptotic covariance matrix (.acm) approach in order to generate data that satisfy multivariate normality requirement.

We conduct confirmatory factor analysis (CFA) to ensure the validity of our measurement by investigating the value of loading factors of t-values and standardized solution of indicators of variables in our model. Our indicators are valid if the value of loading factor of t-values > 1,96 and the value of standardized solution > 0.5. The results of our validity analysis can be seen at table 3 below.

Table 3: Results Of Validity Analysis Of Measurement Model

Indicator	T-value	Standardized Solution	Information
MO1	0.91	1.16	Notvalid
MO2	0.85	0.16	Notvalid
FC1	3.38	0.58	Valid
FC2	4.93	0.94	Valid
SE1	6.13	0.60	Valid
SE2	6.48	0.60	Valid
PE1	7.16	0.64	Valid
PE2	9.31	0.78	Valid
PE3	2.41	0.29	Not valid
PE4	1.37	0.16	Notvalid
PEU1		0.79	Valid
PEU2	5.79	0.64	Valid
PEU3	4.36	0.53	Valid
PU1		0.63	Valid
PU2	5.37	0.87	Valid
PU3	5.83	0.67	Valid

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Indicator	T-value	Standardized Solution	Information
ATU1		0.85	Valid
ATU2	6.85	0.90	Valid
ATU3	3.71	0.41	Not valid

Source: Primary data, processed

We also test the reliability of measurement model by computing the values of composite (construct) realibility and variance extracted. Cut-off value for composite (construct) realibility should be at least 0.7 while cut-off value for variance extracted should be at least 0.5. The results of reliability test can be seen at table 4 below.

Table 4: Results Of Reliability Test

Variable	CR	VE	Information
Facilitating Conditions	0.75	0.61	Reliable
Self Efficacy	0.53	0.36	Unreliable
Perceived Enjoyment	0.67	0.51	Unreliable
Perceived Ease of Use	0.69	0.44	Unreliable
Perceived Usefulness	0.77	0.53	Reliable
Attitude Toward Using	0.87	0.77	Reliable

Source: primary data, processed

Goodness of Fit test is the main objective of structural equation. This test aims to investigate to what extent the hypothesized model fit with data. The results of goodness of fit test can be seen at table 5 below.

Tabel 5:Results of Goodness of Fit Test

Goodness of Fit Index	Cut of Value	Results	Model Analysis
X^2 Chi Square Statistics	Expectedly small	92.94	Fit
Significance probability	≥ 0.05	0.017	Fit
RFI	≥ 0.90	0.82	marginal
GFI	≥ 0.90	0.89	marginal
AGFI	≥ 0.90	0.83	marjinal
IFI	≥ 0.90	0.98	Fit
CFI	≥ 0.90	0.98	Fit
NFI	≥ 0.90	0.86	marginal
RMSEA	≤ 0.08	0.039	Fit

Data: output result

We then estimate our full structural model by only including indicators of which constructs were already tests. The figure below shows that our model satisfies fit model criteria as indicated by Chi-Square value= 92.94 with p=0.17. Other criteria also show similar results, such as RFI = 0.82; GFI=0.89; AGFI=0.83; IFI =0.98; dan CFI=0.98,NFI= 0.86 and also RMSEA=0.039 indicate that the values are below the required minimum value 0.08. The results of structural equation modeling analysis can be seen at figure 3 below.

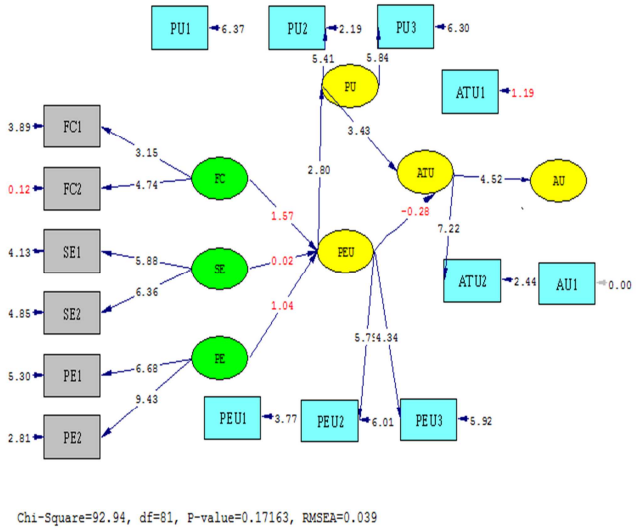

Figure 3:Full Structural Model

If the coefficients between variables are statistically significant (t-value ≥ 1.96), it can be argued that the evaluation produces good results. From the figure above, it can be seen FC does not significantly influence on PEU (t-value 1.57<1.96). This implies that sufficient infrastructure and internet network as supporting infrastructure do not have significant effect on perceived ease of use of F-Learn. Similarly, SE does not significantly affect PEU (t–value 1.04<1.96). This result can be interpreted that self reliance in using the system does not have significance on perceived ease of use of F-Learn. Further, PE does not significantly affect PEU (t-value 1.04<1.96), implying that clear and not confusing application and understandable do not affect perceived ease of use of F-Learn.

On the other hand, PEU significantly affects PU (t-value 2.80 > 1.96), suggesting that F-Learn as an online learning media is easy to understand, learn about, and use and this ease positively affect the perceived usefulness. Further, PU significantly influences ATU with t-value 3.43 > 1.96. The result means that perceived benefits of using F-Learn (such as making learning process easier and more effective and improving academic performance) affect uses attitude toward using F-Learn. The coefficient of PEU has t-value of -0.28, implying

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the insignificance of PEU effect on ATU or perceived ease of use does not affect attitude toward using F-Learn. On the other hand, ATU significantly influences AU (t-value 4.52>1.96). This result can be interpreted that attitude toward using F-Learn is influenced by users satisfaction when using F-Learn and eventually attitude toward using F-Learn affects the use of F-Learn. For those users who have experience the convenience and benefits of the use of F-Learn, it will affect users who consider F-Learn attitude is positive and beneficial for use in teaching and learning.

Table 6 below displays the results of our analysis. Hypotheses with t-value ≤ 1.96 is not supported, implying that the causal relationship is not significant.

Table 6. Results Of Analysis

Hypothesis	Relationship	Value	Explanation
H1	PU ← PEU	2.80	Accepted
H2	ATU ← PEU	-0.28	Rejected
H3	ATU ← PU	3.43	Accepted
H4	AU ← ATU	4.52	Accepted

Source: statistical analysis

Based on table 6 above, PEU does not influence ATU that implies perceived use of ease does not affect users attitude toward using F-Learn. F-Learn characteristics, such as easy to learn, understand, and use do not have impact on users' attitude toward using. Facilitating conditions, such as reliable internet network and other infrastructure, self-reliance to use F-Learn, and clear and understandable terminology and display of F-Learn application do not have significant effect on perceived ease of use of F-Learn. This can be indicated by the t-value (-0.28). In line with insignificance of PEU on ATU, supporting factors of perceived ease of use are also not significant. This study reinforces previous research conducted by Novita [7] and Yaudi [8], which states that the PEU of the ATU is not significant. Where the perceived ease of use does not affect attitudes to the technology. As easy as any system supported by information held without the participation of users will definitely not be the optimal implementation.

Users attitude toward enjoyment and satisfaction when using F-Learn is not affected by perceived ease in using F-Learn. Although F-Learn is easy to operate, it is still not commonly used, as indicated by the fact that lecturers are still not required to utilize F-Learn for their courses as teaching media to supplement the more traditional face-to-face teaching mode. The online learning media as a complement of traditional media can accommodate learning system that reshapes the roles of lecturers and students, evaluation system and learning monitoring. However, not all lecturers of FIT SWCU are interested in using F-Learn.

Some lecturers who do not utilize F-Learn state that face-to-face teaching method is already effective. Others mention that their courses are more practice-oriented that do not fit with F-Learnfeatures.However, lecturers who already utilized F-Learn suggest that using F-Learn provides much benefits such as easier and more effective subjects. Considering insignificance of PEU on ATU, it is necessary to modify the model by deleting the relationship between PEU and ATU and the relationship between FC, SE, and PE on PEU.

After modifying our model, the results of path analysis significance test can be seen at figure 4 below:

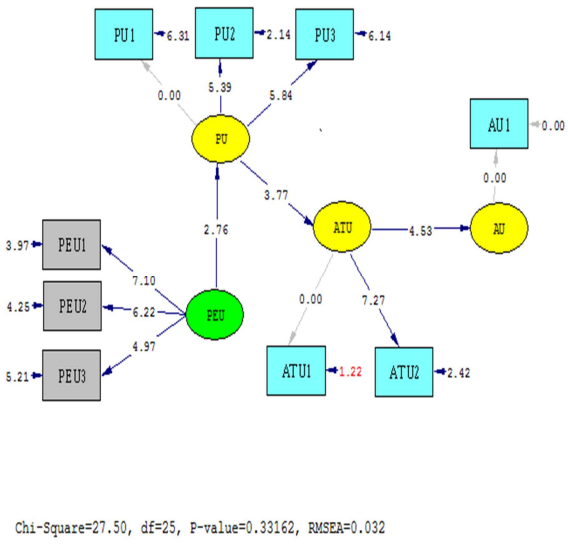

Figure 4:The Final Model

The final model demonstrates that perceived ease of use positively affects perceived usefulness of F-Learn, as indicated by t-value of 2.76. The result suggests that our first hypothesis is supported. This finding is in line with Wijayanti [9] and Yuadi [8] who find the positive effect of perceived ease of use on perceived usefulness. The ease of use will be able to significantly influence the perception of the user. The existence of the system to be something that needs to be known by potential users because of the known existence of the system will increase the perception to use it more easily than before knowing [8].

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The finding also indicatest that users perception on the benefits of F-Learn will be affected by ease of use F-Learn. In other words, users will consider using F-Learn beneficial if they can use it easily or the easier F-Learn to operate the more benefits F-Learn offers. It means that users perceive F-Learn easy to understand, use, and learn.

Perceived usefulness has significantly positive effect on attitude toward using F-Learn, as indicated by t-value of 3.77. This demonstrates that our third hypothesis that suggests that perceived ease of use and perceived usefeulness have positive effect on attitude toward using F-Learn is supported. The finding is in line with Handayani [10] who show that perceived usefulness is a variable that is instrumental in information system acceptance

The finding also indicates that the higher the benefits of using F-Learn, the more positive attitude toward using F-Learn. This indicates that F-Learn provides benefits such as making learning process easier and more effective and improving academic performance. Attitude toward using F-Learn indicates that F-Learn is well accepted by users.

Attitude toward using has significantly positive effect on actual usage of F-Learn at SWCU, as shown by t-value of 4.53. The result suggests that our fourth hypothesis is supported. The result confirms that users attitude toward using F-Learn are positive. Attitudes toward using F-Learn is the consequences of perceived ease and benefits. Eventually, the attitude will significantly affect use of F-Learn. One will be satisfied with the system if they are certain that the system improve their productivity and is easy to operate. The satisfaction itself is reflected by their actual use of the system [8].

5. CONCLUSION

This study aims to investigate factors that influence the users adoption of on-line flexible learning at SWCU. We use both lecturers and students as our respondents. The results suggest that perceived ease of use, perceived usefulness, and attitude toward using F-Learn are significant in explaining acceptance of F-Learn. More specifically, perceived ease of use influences perceived usefulness and eventually both variables influence attitude toward using F-Learn while attitude itself affects actual use of F-Learn. The easier F-Learn to operate, the more benefits F-Learn will provide to users. Afterwards, users' attitude toward using F-Learn will be more positive and actual usage of F-Learn will increase.

The direct contribution of this study can be used to improve the quality of higher education, improving data management and information system or service in learning activities. The factors of ease of use and perceived usefullness influences the acceptance of online learning. the results of this study also provide input for TAM-related research.

This study has several limitations that may affect the results of the research, such as respondents in this study used only the students of Faculty of Information Technology that they are familiar to use internet. So to further research can be developed into a broader scope and research models used can be developed, by adding another constructs factors that will affect the implementation of online learning media. This will add to the obvious results of each research construct.

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