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MODEL OF TECHNOLOGY ACCEPTANCE USING ONLINE LEARNING SYSTEMS AND ITS IMPACT ON LEARNING EFFECTIVENESS

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Abstract

This research aims to build a model of technology readiness and technology acceptance for information systems in universities in Indonesia. This research used descriptive and verification methods. The participants of the research were 300 university lecturers in Indonesia with the status of civil servants and university permanent employees that were picked through a simple random sampling technique. A structural Equation Model (SEM) was applied for the data analysis technique. The findings revealed that (1) the level of technology readiness is influenced positively by the level of e-learning material, service quality, interaction, and learners' characteristics. Where Interaction has the highest influence on technology readiness, while the variable that has the lowest influence on technology readiness is the learner's characteristics. (2) perceived ease of use is positively influenced by technology readiness, (3) perceived usefulness is positively influenced by technology readiness, (4) reuse intention is positively influenced by technological readiness, perceived ease of use, and perceived usefulness where perceived ease of use has the highest influence on reuse intention, while the variable that has the lowest influence on reuse intention is technological readiness, and (5) the level of e-learning effectiveness is positively affected by the level of technological readiness, perceived ease of use, perceived usefulness, and reuse intention where reuse intention has the most influence on the e-learning effectiveness while the variable that has the least influence on the effectiveness of e-learning is technological readiness.

Keywords: Learning effectiveness, Reuse intention, Technological readiness.

1. Introduction

The incoming of the industry 4.0 era impacts greatly on the development of technology which influenced many aspects [1]. It is significantly including the teaching and learning process. The quality of education has improved significantly due to the ease of access to technology. The development of technology influences the application of the educational process [2].

Information technology is regarded as a tool to assist the process of teaching and learning activities [3-10], which also includes the process of seeking references and sources of information [11].

The implementation of information technology gives many benefits to the learning process, especially after the Covid-19 pandemic. In 2020, almost all countries in the world are faced with disease outbreaks that threaten global health. This outbreak is caused by Corona Virus Disease commonly known as Covid-19. World Health Organization (WHO) declared the emergence of the Covid-19 pandemic as an international threat to public health because it poses a high risk to all countries [12, 13], especially to countries that have low healthcare systems.

The Covid-19 pandemic has become the biggest disruptor in the 21st century which was never expected before. The impact of the Covid-19 virus is not limited to the aspects of health, but also various sectors of life. The Institute of Chartered Accountants of England and Wales (ICAEW, 2020) reports that the impact of COVID-19 does not limit only to the health sector, but also to the economic sector [14, 15]. Due to the pandemic, the world experienced the largest global recession in history where a third or more of the global population in 2020 was economically impacted. Indonesia itself is the second country on the Asian continent that has the most cases after India, namely with 999,256 cases of Covid-19 infection and 153,587 deaths getting the extraordinary impact of this Covid-19 pandemic.

Education has been affected quite a lot by the existence of Covid-19. More than 200 universities in the United States changed the learning process from face-to-face classes to virtual learning. Many countries in Asia also experienced a similar trend. Some schools in Southeast Asia stop any types of face-to-face activities temporarily. Many universities have also shifted face-to-face classes to virtual classes to limit the transmission of Covid-19. This is supported by many reports regarding this condition [16-33].

Based on data from Central Bureau Statistics Indonesia for 2020, it is currently estimated that around 3,251 tertiary institutions are under the auspices of the Ministry of Research, Technology and Higher Education and the Ministry of Education and Culture, and 826 under the Ministry of Religion. The number of lecturers includes 261,827 who teach in general education institutions and 40,762 in religious education institutions. While the number of students under the Ministry of Research, Technology and Higher Education and the Ministry of Education and Culture are 7,339,164 people, and in the Ministry of Religion 1,151,262 people. By looking at the number of educators, educational staff, and students, the outbreak has caused disruption, and one of them is the learning process.

On March 24, 2020, the Minister of Education and Culture of the Republic of Indonesia issued Circular Number 4 of 2020 Concerning the Implementation of Education Policies in the Emergency Period of the Spread of COVID-19. This action is taken. Thus, students can attend school from home through distance learning. They can study in a safe environment. The learning process at home can cover a variety of life skills education and one of the topics includes Covid-19. All education levels from elementary to tertiary level, both under the Ministry of Education and Culture of the Republic of Indonesia and the Ministry of Religion of the Republic of Indonesia, are negatively impacted due to the change in the learning process. Students are "forced" to study at their homes to keep themselves from the risk of COVID-19. However, some students are not accustomed to the process of online learning. Through the virtual session, several problems arise, not only in terms of students, and teaching staff but also the educational staff. According to the Policy Brief: Education during COVID-19 and beyond published by the United Nation in August 2020, higher education is very vulnerable because of the low level of digitalization and the weakness of an organizational structure that can support changes in administrative challenges and teaching modalities from face-to-face teaching to online and hybrid teaching. There are many cases where tertiary institutions stop teaching due to low access to information technology and the unavailability of a connection to the internet. A report by the World Bank estimates that COVID-19 impacts the process of learning and earning in Indonesia: How to Turn the Tide where more people own cell phones/smartphones and TV compared to TV and the internet.

In general, the Covid-19 pandemic uncovered the fact that access to higher education institutions, teaching staff, educational staff, and students to educational support facilities that are responsive to the pandemic is uneven. Higher education also still does not fully have the readiness of a pandemic disaster management system both from online teaching tools, and the readiness of lecturers and education staff.

The importance of using information technology is realized by UPI as a demand for the globalization era to be more competitive and competitive, but in practice, there are still many applications that have not been used optimally by educators, students, and education staff. The realization of quality learning is inseparable from the lecturers' role as educators who keep providing meaningful and understandable learning experiences for their students. Lecturers can employ several ways to fulfill the goal of the learning process, one of which is by taking advantage of today's technological sophistication. The learning process can be carried out using the internet through other supporting applications such as e-mail, Zoom, google meet, quiziz, and WhatsApp [34-50].

Using the internet is going to greatly assist lecturers and students to create a meaningful learning process. However, this use is not always effective because face-to-face meetings are of course better. This is done so that students remain productive in learning. This is in line with the literature that the effectiveness of ICT has advantages and limitations in its functions as a learning medium and resource [51-57]. As a result, the use of ICT in education should be done selectively by considering the properties and characteristics of the learning material that is going to be delivered.

To develop an existing system, it is necessary to measure the extent of individual or organizational readiness to adapt, use and utilize technology in their daily activities as well as the level of acceptance of the individual or organization towards technology. Many models examine causal relationships to measure the level of technology readiness and acceptance of information systems by users. Researchers are interested in deploying the Technology Acceptance Model (TAM) to support the research they are conducting. This model was developed by Davis [58] by adapting the framework of the Theory Reasoned Action (TRA) model. This theory was developed by Hill R. and Fishbein [59]. The fundamental difference between TRA and TAM is the placement of attitudes from TRA, where in TAM theory there are two key constructs, namely perceived usefulness, and perceived ease of use. Meanwhile, in TRA, the main factor is the attitude towards behavior. and subjective norms. Based on the background of the research, this research aims to build a model of technology readiness and technology acceptance for information systems in universities in Indonesia.

2. Methods

This study used descriptive and verification methods. This descriptive research aims to describe and provide an independent and systematic description of the values of the variables of technology readiness, technology acceptance, Behavioral intention, usage behavior, and learning effectiveness. While verification research was conducted to test hypotheses and collect data in the field. Hypothesis testing will reveal the nature of a particular relationship or establish differences between groups of two or more factors in a situation. This verification research aims to examine the relationship or influence between technology readiness and technology acceptance, on Behavioral intentions and usage behavior, and its impact on learning effectiveness. The participants of the research were 300 university lecturers in Indonesia with the status of civil servants and university permanent employees who were taken by simple random sampling technique. We used Structural Equation Model (SEM) to conduct the analysis.

3. Computer Programme: Validation and Verification

3.1. Overall model fit

The overall model fit test was an analysis tool to measure the degree of compatibility or Goodness of Fit (GOF) between the data and the model. The results of the Overall Model Fit test can be found in Table 1.

Table 1. Overall model fit.

Unit	Result	Cut off value	Note
Chi-Square **(df=224)**	9901.100	χ^2hit < χ^2tabel (674,848)	Not fit
P-*value*	0.000	≥ 0.05	Not fit
RMSEA	0.025	≤ 0.08	Fit
CFI	0.937	≥ 0.90	Fit
GFI	0.941	≥ 0.90	Fit
AGFI	0.962	≥ 0.90	Fit

The fit test for the Structural Equation model yields df = 616 with a Chi-Square value of 9901.100 > Chi-Squares table which is 674.848, and a P-value of 0.000 <0.05 indicating the model is not fit. The RMSEA value of 0.025 (≤ 0.08) can be interpreted that the model being fitted with the data. Furthermore, the CFI fit index is 0.937, the GFI is 0.941 and the AGFI is 0.962, which has an index that is greater than the criteria, namely ≥0.90, thus indicating a fit model with the data. Even though some of the results are not in line with the recommended value and are greater than the cut-off value, research concludes that the model as a whole is still appropriate because it uses at least 1 absolutely good measure (e.g. GFI, AGFI), 1 absolute bad measure (e.g. Chi-Squares, RMSR, SRMR, RMSEA) and 1 comparative measure (e.g. NFI, NNFI, CFI, TLI, RNI). All measures of Goodness-of-Fit are greater than the cut-off value, so the Structural Equation Model (SEM) can be concluded as fit.

3.2. Measurement model fit

The measurement model on the construct of exogenous variables is carried out to measure the indicators that make up the e-learning material, service quality, interaction, and learner characteristic variables. Meanwhile, the measurement model on the construct of endogenous variables is carried out to measure the indicators that makeup technology readiness, perceived ease of use, perceived usefulness, and learning effectiveness. Loading Factors on indicators must be greater than 0.5, because a high Loading Factors indicator indicates indicators congregate on the same variable and indicates that the indicator is valid and can form variables. Based on Table 2, all Standardized Loading Factors values for each indicator are more than 0.5. Thus, these indicators have good validity in measuring the variable.

Table 2. Measurement model fit.

Sample			Estimate		S.E	C.R.	P	CR	AVE
			RW	SRW					
AT	<--	eLearning Material	1.088	0.982	0.017	63,767	***	0.992	0.970
DE	<--	eLearning Material	0.993	0.972	0.018	55.968	***		
MU	<--	eLearning Material	1.045	0.956	0.022	47.667	***		
NA	<--	eLearning Material	1.000	0.983					
RS	<--	Service Quality	0.894	0.980	0.013	69.374	***	0.996	0.901
AS	<--	Service Quality	1.013	0.987	0.013	79.705	***		
RE	<--	Service Quality	0.998	0.983	0.014	73.200	***		
TA	<--	Service Quality	0.990	0.987	0.012	80.490	***		
EM	<--	Service Quality	1.000	0.990					
LC	<--	Interaction	1.856	0.993	0.048	38.583	***	0.974	0.925
LI	<--	Interaction	2.078	0.971	0.060	34.828	***		
LL	<--	Interaction	1.000	0.919					
SE	<--	Learners Characteristic	1.282	1.001	0.022	58.631	***	0.992	0.985
SD	<--	Learners Characteristic	1.000	0.973					
OPT	<--	Technology Readiness	1.000	0.934				0.993	0.973

Sample			Estimate		S.E	C.R.	P	CR	AVE
			RW	SRW					
INN	<--	Technology Readiness	1.342	0.981	0.033	40.076	***		
DISC	<---	Technology Readiness	1.112	0.964	0.030	36.625	***		
INS	<--	Technology Readiness	1.285	0.938	0.040	32.435	***		
PE1	<--	Perceived Ease of Use	1.000	0.994					
PE2	<--	Perceived Ease of Use	0.991	0.987	0.011	89.027	***		
PE3	<--	Perceived Ease of Use	0.932	0.989	0.010	93.047	***	0.999	0.991
PE4	<--	Perceived Ease of Use	0.884	0.982	0.011	78.656	***		
PE5	<--	Perceived Ease of Use	0.896	0.986	0.010	86.939	***		
PE6	<--	Perceived Ease of Use	0.940	0.990	0.010	95.729	***		
PU1	<--	Perceived Usefulness	1.025	0.989	0.017	61.335	***		
PU2	<--	Perceived Usefulness	1.092	0.997	0.016	69.267	***		
PU3	<--	Perceived Usefulness	0.995	0.974	0.019	51.989	***	0.997	0.986
PU4	<--	Perceived Usefulness	1.067	0.997	0.016	65.580	***		
PU5	<--	Perceived Usefulness	1.000	0.973					
RI1	<--	Reuse Intention	1.000	0.986					
RI2	<--	Reuse Intention	1.008	0.986	0.014	72.372	***		
RI3	<--	Reuse Intention	0.946	0.988	0.013	74.515	***	0.998	0.988
RI4	<--	Reuse Intention	0.957	0.985	0.014	70.183	***		
RI5	<--	Reuse Intention	1.030	0.977	0.017	61.981	***		
EE1	<--	E-Learning Effectiveness	1.000	0.982					
EE2	<--	E-Learning Effectiveness	1.081	0.995	0.014	79.509	***	0.997	0.991
EE3	<--	E-Learning Effectiveness	1.028	0.993	0.013	76.554	***		

3.3. Structural model fit

The structural model analysis is related to parameter evaluation that indicates a causal relationship or the influence of one latent variable on another. Figure 1 is an image of the standardized loading factor estimation parameters as follows.

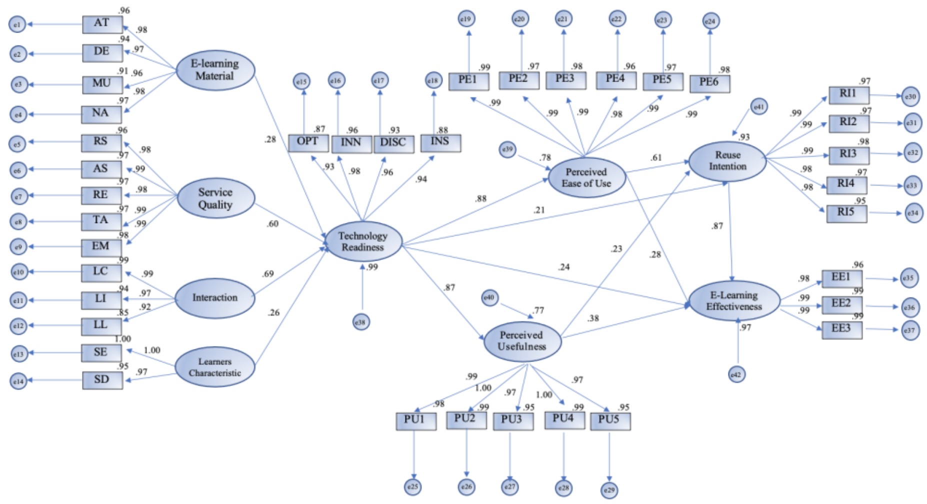

Fig. 1. Structural model.

Based on Fig. 1, the estimation results of the structural model parameters are presented in Table 3.

Table 3. Summary of estimation of structural model parameters.

			Estimate		S.E.	C.R.	P	R2
			RW	SRW				
Elearning Material	→	Technological Readiness	0.604	0.281	0.028	21.573	***	0.986
Service Quality	→	Technological Readiness	1.234	0.599	0.036	34.456	***	
Interaction	→	Technological Readiness	2.782	0.695	0.100	27.884	***	
Learners Characteristic	→	Technological Readiness	0.522	0.257	0.026	19.748	***	
Technological Readiness	→	Perceived Ease of Use	0.324	0.883	0.013	25.881	***	0.779
Technological Readiness	→	Perceived Usefulness	0.289	0.877	0.012	24.235	***	0.768
Technological Readiness	→	Reuse Intention	0.084	0.211	0.004	4.295	0.011	0.993
Perceived Ease of Use	→	Reuse Intention	0.566	0.613	0.012	64.393	***	
Perceived Usefulness	→	Reuse Intention	0.236	0.226	0.010	22.910	***	
Reuse Intention	→	eLearning Effectiveness	.768	0.868	0.275	4.620	***	0.996
Perceived Usefulness	→	eLearning Effectiveness	0.255	0.377	0.067	3.826	0.049	
Perceived Ease of Use	→	eLearning Effectiveness	0.247	0.282	0.209	3.177	0.039	
Technological Readiness	→	eLearning Effectiveness	0.114	0.244	0.008	3.816	0.027	

3.4. Hypothesis 1: Effect of E-learning material, service quality, interaction, and learner characteristics on technology readiness

The findings revealed that the level of technology readiness gets a positive influence through the level of e-learning material, service quality, interaction, and learners' characteristics. This result is obtained through the value of the path coefficient SRW > 0 for each variable with a p-value ≤ 0.05, then Ho is rejected, and Ha is accepted, which means a positive influence occurs between e-learning materials, service quality, interaction, and learners' characteristics on technology readiness. Interaction is the highest factor that influences technology readiness with a path coefficient value of 0.695. Meanwhile, the variable that has the lowest influence on technology readiness is learners' characteristics with a path coefficient of 0.257.

The magnitude of the effect of e-learning material on technology readiness is 0.281 or (0.2812x100%) = 7.90%. This fluctuation that occurs in technology readiness can be explained by e-learning material. Meanwhile, the magnitude of the influence of service quality on technology readiness is 0.599 or (0.5992x100%) = 35.88%, the high and low variations that occur in technology readiness can be explained by service quality.

The magnitude of the effect of interaction on technology readiness is 0.695 or (0.6952x100%) = 48.30% high and low variations that occur in technology readiness can be explained by interaction. Meanwhile, the influence of learners' characteristics on technology readiness is 0.257 or (0.2572 x 100%) = 6.60%. The high and low variations that occur in technology readiness can be explained by learners' characteristics.

The R2 value for the model of the influence of e-learning materials, service quality, interaction, and learners' characteristics on technology readiness is 0.986. The estimated structural equation for the technology readiness model is: Technology Readiness = 0.281 E-Learning Material + 0.599 Service Quality + 00.695 Interaction + 0.257 Learner Characteristic +0.99e; R2 = 0.986.

3.5. Hypothesis 2: Effect of technology readiness on perceived ease of use

The findings revealed that the level of perceived ease of use is positively influenced by the level of technology readiness. It is reflected from the SRW path coefficient value of 0.883 > 0 with a p-value ≤ 0.05, then Ho is rejected, and Ha is accepted, which means technology readiness impacts positively perceived ease of use.

The magnitude of the effect of e-learning material on technology readiness is 0.883 or (0.8832x100%) = 77.96% the height of the variation that occurs in perceived ease of use can be explained by technological readiness. The R2 value for the model of the influence of technological readiness on perceived ease of use is 0.779. The estimated structural equation for the perceived ease of use model is: Perceived Ease of Use = 0.883 Technology Readiness +0.78e; R2 = 0.779.

3.6. Hypothesis 3: Effect of technology readiness on perceived usefulness

The research findings showed that the level of perceived usefulness is positively influenced by the level of technology readiness. This can be judged from the SRW path coefficient value of 0.887 > 0 with a p-value ≤ 0.05, then Ho is rejected and Ha is accepted, which means technology readiness gives a positive influence on perceived usefulness.

The magnitude of the effect of e-learning material on technology readiness is 0.877 or (0.8772 x 100%) = 76.91% high and low variations that occur in perceived usefulness can be explained by technological readiness. The R2 value for the model of the influence of technological readiness on perceived usefulness is 0.768. The estimated structural equation for the perceived usefulness model is Perceived Usefulness = 0.877 Technology Readiness +0.77e; R2 = 0.768.

3.7. Hypothesis 4: Effect of technology readiness, perceived ease of use, and perceived usefulness on reuse intention

The analysis found that the level of reuse intention is positively influenced by the level of technological readiness, perceived ease of use, and perceived usefulness. This can be assessed from the value of the path coefficient SRW > 0 for each variable with a p-value ≤ 0.05, then Ho is rejected and Ha is accepted, which means there is a positive influence between technological Readiness, perceived ease of use, and perceived usefulness on reuse intention. Perceived ease of use has the highest influence on reuse intention with a path coefficient value of 0.613. On the other hand, the variable that has the lowest influence on reuse intention is technological readiness with a path coefficient of 0.211.

The magnitude of the effect of technology readiness on reuse intention is 0.211 or (0.2112x100%) = 4.45% the height of the variation that occurs in reuse intention can be explained by technological readiness. Meanwhile, the magnitude of the influence of perceived ease of use on reuse intention is 0.613 or equal to (0.6132x100%) = 37.58% the height of the variation that occurs in reuse intention can be explained by the perceived ease of use.

The magnitude of the effect of perceived usefulness on reuse intention is 0.226 or equal to (0.2262x100%) = 5.11% The high and low variations that occur in reuse intention can be explained by perceived usefulness.

The R2 value for the influence model of technological Readiness, perceived ease of use, and perceived usefulness on reuse intention is 0.964. The estimated structural equation for the technology readiness model is: Reuse Intention = 0.211 technological readiness + 0.613 perceived ease of use + 0.226 perceived usefulness + 0.93e; R2 = 0.964.

3.8. Hypothesis 5: The influence of technology readiness, perceived ease of use, perceived usefulness, and reuse intention on e-learning effectiveness

In this hypothesis, the findings identified that the level of e-learning effectiveness is positively affected by the level of technological readiness, perceived ease of use, perceived usefulness, and reuse intention. This result can be determined through the value of the path coefficient SRW > 0 for each variable with a p-value ≤ 0.05, then Ho is rejected, and Ha is accepted, which means a positive influence occurs to e-learning effectiveness which gets positively influenced from the level of technological readiness, perceived ease of use, perceived usefulness and reuse intention. Reuse intention has the highest influence on e-learning effectiveness where the path coefficient value is 0.868. Besides, technological readiness causes the lowest influence on e-learning effectiveness with a path coefficient of 0.244.

The magnitude of the influence of reuse intention on e-learning effectiveness is 0.868 or equal to (0.8682x100%) = 75.34%. The fluctuating variation in the e-learning process effectiveness can be explained by reuse intention.

The magnitude of the effect of technology readiness on e-learning effectiveness is 0.244 or (0.2442x100%) = 4.45%. The increase and decrease that occurs in e-learning effectiveness can be explained by technological readiness. Meanwhile, the influence of perceived ease of use on e-learning effectiveness is 0.0.282 or (0.2822x100%) = 7.95% The high and low variations that occur in e-learning effectiveness can be explained by the perceived ease of use.

The magnitude of the influence of perceived usefulness on e-learning effectiveness is 0.377 or equal to (0.3772x100%) = 14.21%. The high and low variations that occur in e-learning effectiveness are explained by perceived usefulness.

The R2 value for the influence model of technological Readiness, perceived ease of use, and perceived usefulness on reuse intention is 0.964. The structural equation estimates for the technology readiness model are: E-learning Effectiveness = 0.244 technological readiness + 0.282 perceived ease of use + 0.377 perceived usefulness+0.868 reuse intention+0.97e; R2 = 0.996.

4. Conclusion

In conclusion, technology affects the process of learning and teaching. The level of e-learning material, service quality, interaction, and learners' characteristics are positively influenced by the level of technology readiness. Where Interaction has the highest influence on technology readiness, while the variable that has the lowest influence on technology readiness is the learner's characteristics. Technology readiness positively influenced the perceived ease of use. Technological readiness, perceived ease of use and perceived usefulness give positive impacts on reuse intention where perceived ease of use has the highest influence on reuse intention, while the variable that has the lowest influence on reuse intention is technological readiness. Moreover, the level of e-learning effectiveness also increased positively along with the level of technological readiness, perceived ease of use, perceived usefulness, and reuse intention where the highest influence is from e-learning effectiveness, while the lowest influence comes from technological readiness.

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