EFFECTIVENESS OF E-LEARNING MANAGEMENT DURING COVID- 19 PANDEMIC IN INDONESIA

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ABSTRACT

This research aims to analyze the effectiveness of e-learning management during the Covid-19 pandemic in Indonesia with Delone and Mclean Model and Virtual Learning Effectiveness approach. The research method used is quantitative, with a sample of students in Indonesia. The data collection method uses an online questionnaire sent by email and an actual phone number. The data analysis method uses structural equation modeling based on Partial Least Square (PLS). This study found empirical evidence that technological factors, namely the quality of the system and the quality of information, and psychological factors, namely self-efficacy and human factors that are the services of lecturers, have a significant effect on user perception and user satisfaction. User perception and user satisfaction have a significant effect on the effectiveness of e-learning. This study develops research models DM and VLE. Future research planned to extend this research model into an integrated model structure that could help define factors in the performance of e-learning systems and important e-learning success factors, or superior to conventional face-to-face learning systems

Keywords: e-learning management, Delone and Mclean Model, Virtual Learning Effectiveness, Covid-19

Introduction

The COVID-19 pandemic in Indonesia and around the world has the effect of limiting regular activity, namely social distancing, and physical distancing. This condition causes schools to conduct online learning or distance education systems to follow health protocol to prevent the spread of the Covid-19 pandemic. The technology-based Remote Education System certainly requires educational institutions, teachers, students, and even parents to be technologically proficient. This opportunity can indirectly trigger the acceleration of the transformation of educational technology in Indonesia. This situation can have a positive impact because the use of technology in education is in line with the evolving era of Industrial Revolution 4.0. The acceleration of the transformation of education technology due to the Corona pandemic led various companies to launch various online learning applications to support distance education.

A large number of online learning apps make learning at home still useful. Online learning applications have developed with the provision of features that make it easier to learn online. Since the release of local appeals and regulations on social distancing as a step in anticipation of the broader spread of Covid-19 in early March 2020, many universities and schools have stopped learning to teach face-to-face. Teaching and learning activities have did replaced by online lectures in the form of learning materials, discussion forums, assignments, video conferences, and quizzes. Exams online using learning management systems and applications such as e-study, moodle, zoom, google meet, Jitsi, WA, Telegram, and others. The rules on the distance learning system did contain in Law No. 20 of 2003 on the National

Education System, Article 31. At that time, the new Open University was the only campus serving distance education. Seventeen years later, although the development of technology has been so rapid and supported by various government regulations for the application of blended learning and e-learning, few colleges or schools have successfully run it.

By the end of 2019, not many universities are ready and carrying out e-learning massively. Some campuses that have implemented limited e-learning for certain lecture classes or by particular lecturers only. In April 2020, almost all campuses and schools implemented distance education and stopped teaching face-to-face. Currently, lecturers, teachers, students, and students are getting proficient in using various devices and supporting media to learn online. However, to date, there has been no study of the effectiveness of online learning conducted during the COVID-19 pandemic, especially in Indonesia. This study examines the effectiveness of distance or online learning reviewed from information systems, information quality, self-efficacy, service from lecturers, self-learning skills, user satisfaction, and ease of use of learning systems. This study did base on the fact that the transformation of educational technology in Indonesia has not done thoroughly carried out by universities and students, as well as limited supporting facilities and infrastructure for distance learning.

Research conducted by Eom & Eom (2012) shows that the quality of the system, the quality of information, and user satisfaction have a positive and significant effect on the effectiveness of online learning systems. Al-fraihat, Joy, & Sinclair (2020) found that the technological quality of the system, the quality of knowledge, the quality of service, the quality of the support system, the quality of learning, the quality of the teacher and the perception of use had a major impact on the satisfaction of the distance learning system (e-learning). Satisfaction and understanding of use influence the advantages for students or students. Younis, Cater-steel, & Soar (2016) found that IT infrastructure, system quality, and information quality significantly impacted service delivery quality. Service delivery quality mediates the relationship between IT infrastructure, system quality, and information quality with the perception of use.

Asoodar, Vaezi, & Izanloo (2016) found that factors that influence online learning satisfaction are learning dimensions, teacher dimensions, training dimensions, technological dimensions, learning design dimensions, and environmental dimensions. The dimension of teacher interaction is the dimension that most powerfully affects the satisfaction of online learning. Bhuasiri, Xaymoungkhoun, Zo, Jeung, & Ciganek (2012) examined critical factors that influence success in the implementation of e-learning systems in developing countries. The analysis results show that critical factors that influence the success of e-learning are curriculum design, technology, motivation, and behavioral adjustment in teaching.

Ching-ter, Su, & Hajiyev (2017), Cidral, Oliveira, Felice, & Aparicio (2018) examine the determination that influences interest in using e-learning in the library. The results showed that web-quality had a significant effect on perceptions of value and satisfaction. The perception of value and satisfaction has a significant effect on the interest in using the library's e-learning system. Hong, Tai, Hwang, Kuo, & Chen (2017) and Chang et al. (2017) examined factors influencing the student's intention to study using e-learning in Azerbaijan. His research found that subjective norms, experiences, and enjoyments had a positive and significant effect on perceptions of e-learning use. Experience and enjoyment have a positive and significant effect on the perception of the ease of using e-learning.

The results of research on online learning conducted in various countries of the world show that the effectiveness of online learning did influence by information systems, information quality, self-efficacy, service from lecturers, self-learning ability, user satisfaction, and ease of use of the system. In contrast to these studies conducted under normal circumstances, this research did conduct on the ongoing Covid-19 pandemic situation, so it needs to have examined more deeply the effectiveness of online learning.

DeLone and McLean Model

Bailey et al. (1983), Delone and Mclean (1992), Seddon (1997), developed multiple models for assessing the success rate of information systems. Of many popular information system models, which received more attention from researchers were the DeLone and McLean models. Delone and Mclean's Models said the quality of information, system quality and service would have a positive impact on use, customer satisfaction, and net profit. The analysis sponsored Livari (2005), empirically evaluating DeLone and McLean models. Results indicate that system quality and information quality affected the information system's performance. DeLone and McLean's model showed in Figure 1.
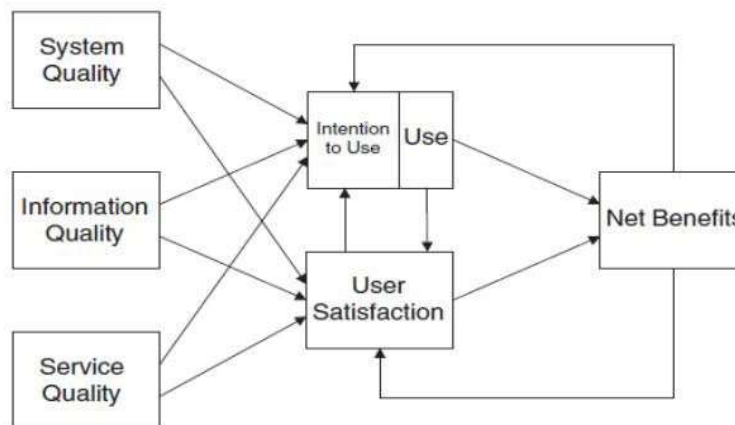

Figure 1. DeLone and McLean model

The DeLone and McLean model has been widely used, such as research conducted by Eom (2012), Furukawa (2013), and Kerta (2013). The model in this study is used as a reference for developing a questionnaire to measure the effectiveness of e-learning.

The Virtual Learning Environment (VLE)

The VLE effectiveness model dimensions include student control and technology as an essential determinant of learning effectiveness (Piccoli et al., 2001). Technology Construct can do measured by the quality and reliability of e-learning accessibility. The internal psychological process of the learner is a construct that directly affects the results of the study. Psychological processes did influence by information technology and learning strategies in specific instructional contexts (Alavi and Leidner, 2001). This e-learning system technology can play an essential role in supporting the theory of specific learning models (Leidner and Jarvenpaa, 1995). Figure 2 shows the three main dimensions of the VLE and its relationship.
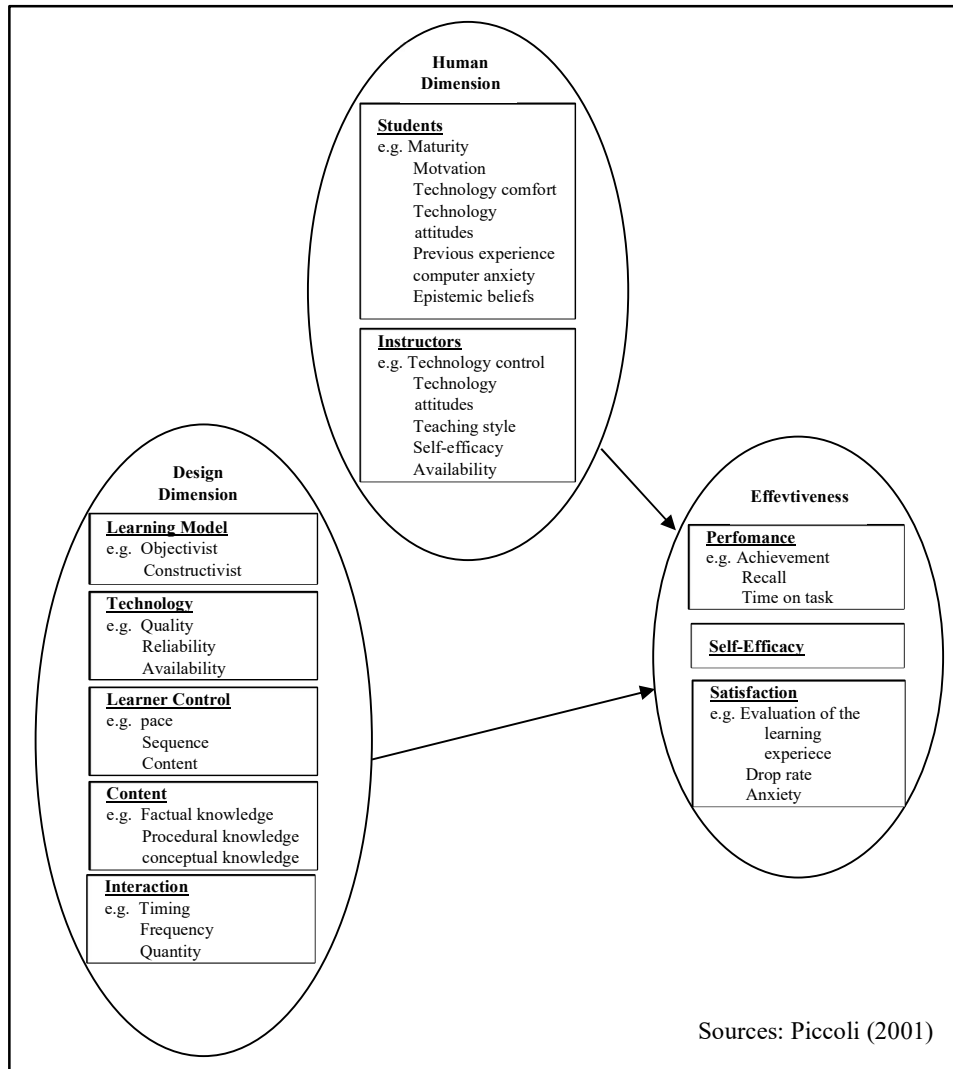
Figure 2. VLE model

This research was developed based on the theory of DM and VLE. The VLE model is a theory that develops and combines the human dimensions and design dimensions that are used to improve performance effectiveness and in this study the effectiveness of performance is measured by the effectiveness of e-learning.

Research Model and Hypotheses

The research model did a test using partial least squares (PLS) based on Structural Equation Modelling (SEM), as PLS is suitable for early-stage theoretical development and testing (Chin, 1998). The model in Figure 3 shows the relationship between the eight constructions. Five independent constructions are system quality, information quality, self-efficacy, self-learning, and lecturer service. Then, two mediation constructions are the use of the system and user satisfaction. Dependent construction is the effectiveness of e-learning.
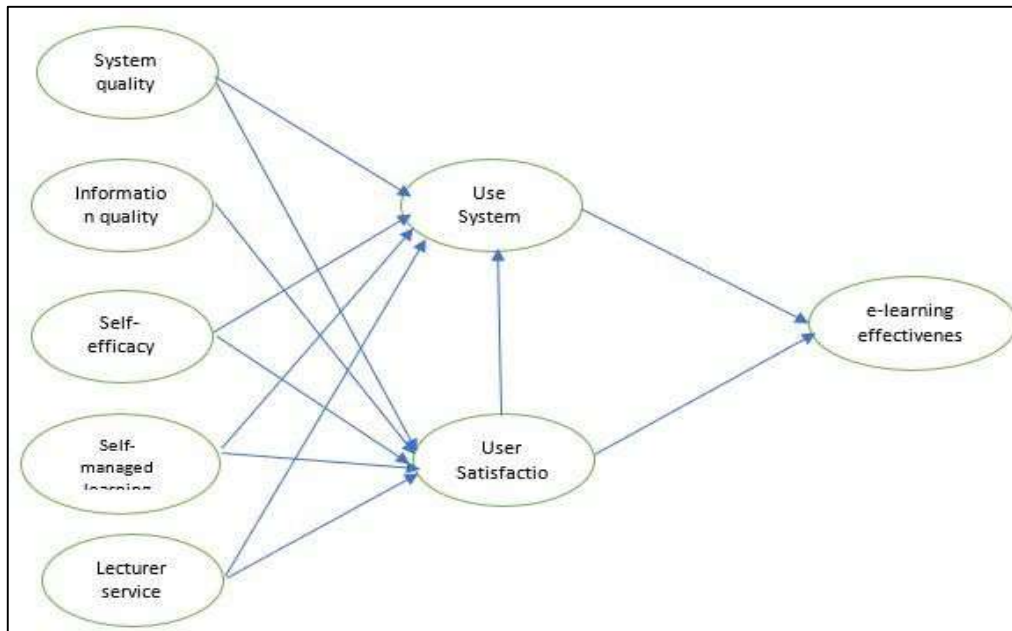
Figure 3. Research model

The performance of IS systems and e-learning systems depends on the media variables, which rely on information, systems and services quality (user satisfaction, and usage) (DeLone and McLean, 1992, and Holsapple and Lee-Post, 2006). The TAM model is a useful model to describe how e-learning systems are used and fulfilled (Landry et al., 2006). TAM describe the relationship between device application and perceived utility and easy-to-use perception. The hypothesis proposed the following based on the description:

H1: System quality has a positive effect on the use of the system.
H2: System quality has a positive effect on user satisfaction.
H3: Information quality has a positive effect on the use of the system.
H4: Information quality has a positive effect on user satisfaction

The confidence of a person in the ability to perform certain tasks and achieve a level of success based on his abilities is known as self-efficacy (Bandura, 1994). Self-effectiveness defines how people motivate and act (Bandura, 1994). Compeau and Higgins (1995) describes self-efficacy as a perception by an individual of his/ her ability to use a computer to complete a task." It means that it can be inferred that self-effectiveness is generally the belief/evaluation of an individual's abilities, including by means of computers and IT.

Simmering et. al (2009) research suggests that the positive impact of self-efficacy on electronic learning results. In his study, Johnson et al (2008) found that the automatic and perceived use of the method has an effect on the values of quality, satisfaction and performance. Self-efficacy on computers, value for performance, usefulness and value are important predictors of a person's intention to keep learning on the web (Chiu and Wang, 2008). A significant impact of self- efficacy, student satisfaction and perceived utility was found among the three e-learning variables (Womble, 2008; Eom, 2012). The hypothesis can therefore be derived as follows:

H5: Self-efficacy has a positive effect on the use of the system.
H6: Self-efficacy has a positive effect on user satisfaction

Students should be able to learn freely in the age of e-learning. Independent learning is the action of students to control themselves, to inspire themselves, to learn (Zimmerman, 1995). Many studies have shown that the role of students, from passive to active students, in independent learning like distance learning is more important than conventional learning (King et al., 2000; Eom, 2012). Educational psychology considers that cognitive learning techniques and performance, constant evaluation and self-assessment of learning efficiencies and success in learning results are the important attributes that distinguish self-reguliant learners from others (Zimmerman, 1986; Eom, 2012). Independent students should have three qualities of self-regulation in independent learning (self- efficacy self-awareness, and perfection) to promote independent learning. Efficient qualities of self-regulation are positively linked to mission persistence, effective learning and learning performance (Zimmerman, 1989). One research found that student satisfaction was a significant predictor of study results (Eom et al., 2006). These two features of self-regulation apply to the capacity to regulate the environment and obtain assistance from social outlets such as individuals and non-human references (Zimmerman, 1989). An successful and persistent inquirer is an autonomous student. The hypothesis can therefore be derived as follows:

H7: Self-managed learning has a positive effect on the use of the system.
H8: Self-managed learning has a positive effect on user satisfaction.

Lecturer's service to online learning is beneficial for students in the learning process. This service is related to students' ability to understand the lessons given and the obstacles they face in the e-learning system. The results of research conducted by Eom (2012), Alsabawy et al. (2016), and Fraihat et al., (2019) show that lecturer services have a significant effect on system usage and system users satisfaction. Based on these results can be formulated hypothesis as follows:

H9: Lecturer services have a positive effect on the use of the system.
H10: Lecturer service has a positive effect on user satisfaction.

The use of the method has been seen as affecting the performance of the system over the last ten years (DeLone and McLean, 1992, 2003; Holsapple and Lee-Post, 2006; Rai et al., 2002). DM describes the use of information as a consumption of the information system output from the receiver. As Figure 1 shows, the DM model uses the term 'use rather than "use system" or "useful information." Accordingly, in this model, the word "use system" was used for user behaviour. The device use also was calculated as frequency/use ratios, e.g. "I will depend on the system." The measuring object uses "I use the system frequently." The following theories may be developed based on the explanation:

H11: The use of the system has a positive effect on the e-learning effectiveness

There have been many previous research studies examining the relationship between user satisfaction and individual impact (Doll and Torkzadeh, 1988; Rai et al., 2002; Livari, 2005) and user satisfaction and learning outcomes (Eom et al., 2006). This study consistently shows that there is a positive relationship between user satisfaction and the effectiveness of

learning systems/learning outcomes. Therefore it can be passed down the hypothesis as follows:

    H12: User satisfaction has a positive effect on the use of the system.
    H13: User satisfaction has a positive effect on the effectiveness of e-learning

Materials and Methods

Wang (2010) and Wang et al. (2007) created a questionnaire in this report. This questionnaire conceptualizes the construction and empirical validation of the building and its underlying aspects of the E-Learning Success System (ELSS). There were 35 items in the survey device using a Likert scale of seven, ranging from "strongly disagree to strongly agree" Many of the buildings used in this analysis are reflective buildings. Students in Indonesia participated in this research. The technique of sampling uses purposeful sampling, that is to say, online students. Survey URLs and instructions did send to all valid email addresses and phone numbers. Survey URLs did give to 1230 respondents. Of the 1230 respondents, 938 students voluntarily responded with 827 questionnaires filled out in full and usable, meaning the response rate in the study was 67.2 percent. The data analysis method uses structural equation modeling based on Partial Least Square (PLS).

Result

a. Measurement model estimation and validation

The testing of measurement models includes estimates of internal consistency and convergent validity, discrimination, and factoriality of instrument items, as suggested by Straub et al. (2004).

(1) **Factorial validity**

In PLS, the factorial validity determined when the square root of each construction of average variance extracted (AVE) is significantly higher than its correlation with other constructions (Chin, 1998). Table 1 clearly shows the factorial validity of the construction model.

Table 1. Validity Factor

	QS	IQ	SE	SML	LS	USE	SAT	EF
QS	0.807							
IQ	0.777	0.876						
SE	0.667	0.651	0.858					
SML	0.479	0.477	0.529	0.715				
LS	0.136	0.104	0.132	0.312	0.761			
USE	0.525	0.495	0.515	0.393	0.287	0.878		
SAT	0.655	0.622	0.669	0.432	0.153	0.522	0.845	
EF	0.698	0.718	0.673	0.502	0.182	0.573	0.761	0.789

(2) **Construct Validity**

The validity of the construct did assess through the convergent formation and discriminant validity. Convergent validity refers to the extent to which a set of indicator variables are correlated and have a high correlation value (above 0.050) on related

factors. Reflective measurements did consider reliable if correlated more than 0.7 with the construction to measure. Table 2 shows that most correlations are above 0.715 for eight constructs, higher than the threshold value of 0.7. When indicator variables are not cross-correlated on two or more constructs, each construct is said to show discriminant validity. In PLS, the validity of the discriminant did assess using two methods. First, by checking the cross-loading of the construct and size; second, by comparing ave square root for each construct with the correlation between construct and other constructs in the model (Fornell and Larcker, 1981; Chin, 1998). All constructs in the model estimated in this study qualify for discriminant validity.

Table 2. Discriminant Factor

Variable	Composite Reliability	AVE	Factor Loadings	
QS	0,881	0,651	QS1	0.796
			QS2	0.857
			QS3	0.855
			QS4	0.710
IQ	0,943	0,767	IQ1	0.854
			IQ2	0.891
			IQ3	0.904
			IQ4	0.870
			IQ5	0.858
SE	0,893	0,736	SE1	0.868
			SE2	0.853
			SE3	0.852
SML	0,805	0,511	SML1	0.762
			SML2	0.614
			SML3	0.803
			SML4	0.665
LS	0,873	0,580	LS1	0.831
			LS2	0.784
			LS3	0.799
			LS4	0.679
			LS5	0.703
USE	0,871	0,771	USE1	0.878
			USE2	0.878
SAT	0,882	0,713	SAT1	0.841
			SAT2	0.879
			SAT3	0.813
EF	0,865	0,622	EF1	0.820
			EF2	0.878
			EF3	0.850
			EF4	0.569

(3) Reliability

The precision of measures in a building is a function of reliability. For measurements between structures, construction validity applies. With two tests of composites of internal consistency and AVE, the composite strength of an indicator block measuring the construction had been calculated. Internal consistency is a test of how strongly interconnected are a number of indicators of a latent construct and the same latent construct measures (Hair et al., 2010). All reliability measures surpass the

recommended 0.70 levels (Table 2), which show ample internal consistency (Nunnally and Bernstein, 1994; Fornell and Bookstein, 1982). In addition, Ave values range from 0.511 to 0.771 above the threshold minimum of 0.5 (Fornell and Larcker, 1981; Chin, 1998b) (Table 2). All in all, findings of the measurement pattern support the validity and reliability measures used for the factorial, convergent and discretionary measures.

(4) **The goodness of Fit Model**

The structural evaluation of the model did carry out by looking at the model fit. Fit models did use to test the overall level of the individuality of the research model.

Table 3. The goodness fit model

Information	Value	Criteria	Conclusion
Average path coefficient (APC)	P<0.001	P<0.05	Accepted
Average R-squared (ARS)	P<0.001	P<0.05	Accepted
Average adjusted R-squared (AARS)	P<0.001	P<0.05	Accepted
Average block VIF (AVIF)	2,059	<= 3,3	Accepted
Average full collinearity VIF (AFVIF)	2,420	<= 3,3	Accepted
Tenenhaus GoF (GoF)	0,592	>= 0,36	Accepted
Sympson's paradox ratio (SPR)	1,000	1	Accepted
R-squared contribution ratio (RSCR)	1,000	1	Accepted
Statistical suppression ratio (SSR)	1,000	1	Accepted
Nonlinear bivariate causality direction ratio (NLBCDR)	1,000	1	Accepted accepted

Based on the results of the goodness of fit model test can be concluded that all tests are acceptable, which means that the model in this study is already suitable or the suitability of the model is very good.

b. Structural equation modeling results

PLS has the primary purpose of minimizing errors (or equivalent to the variance maximization described) in all endogenous constructions. The result of the structural model did summarize in Table 4. The results showed that structural models accounted for 40.4 percent of variances in system usage, 54.3 percent of variances in user satisfaction constructs, and 62.3 percent of variances in constructed effectiveness of e-learning systems. The percentage of variance described for more than 10 percent of primary dependent variables implies satisfactory and substantive and predictive value on the strength of the PLS model (Falk and Miller, 1992).

The results of the structural analysis of equation modeling with PLS can do seen in Table 4. Based on the results of the study, the hypothesized five antecedent constructs would influence system usage, indicating that two technological variables, namely system quality and information quality, have a major impact on perception of use. For psychological variables, only self-efficacy affects perception of use significantly, whereas self-managed learning has no significant impact. The lecturer's service construct has a significant effect on the perception of system usage for human dimension variables measured by the lecturer's service construct. User satisfaction also shows a significant influence on perceptions of system use. Furthermore, of the five constructs (information quality, system quality, self-efficacy,

self- managed learning, and lecturer services) that did hypothesize will affect user satisfaction, only self-managed learning is insignificant. As for other constructs, information quality, system quality, self-efficacy, and lecturer services have a significant effect on user satisfaction. Hypothetical results on the effectiveness of e-learning show that e-learning and user satisfaction have a significant effect on the effectiveness of e-learning.

Table 4. Result of Structural Equation Modelling

	Path Coefficient	Sign Level	Hypotheses
Effect on Use of System			
System quality	0,153	< 0,001	H1 accepted
Information quality	0,110	< 0,001	H3 accepted
Self-Efficacy	0,145	< 0,001	H5 accepted
Self Managed Learning	0,032	0,182	H7 Rejected
Lecture service	0,197	< 0,001	H9 accepted
User satisfaction	0,226	< 0,001	H12 accepted
Effect of User Satisfaction			
System quality	0,276	< 0,001	H2 accepted
Information quality	0,150	< 0,001	H4 accepted
Self-Efficacy	0,366	< 0,001	H6 accepted
Self Managed Learning	0,025	0,239	H8 rejected
Lecture service	0,059	0,045	H10 accepted
Effect on E-Learning Effectiveness			
System Use	0,243	< 0,001	H11 accepted
User Satisfaction	0,634	< 0.001	H13 accepted

Discussion

In early March 2020, many colleges and schools stopped teaching face-to-face in the classroom, in anticipation of the spread of Covid-19. Teaching and learning activities did replace by online lectures in the form of learning materials, discussion forums, assignments, video conferences, quizzes. Exams online using learning management systems and applications such as e-study, moodle, zoom, google meet, Jitsi, WA, Telegram, and others. Whereas by the end of 2019, not many universities are carrying out massive e-learning. Some campuses that have implemented e- learning are limited to certain lecture classes or by particular lecturers only. However, by April 2020, almost all campuses and schools are implementing e-learning and stopping face-to-face teaching. This sudden situation can undoubtedly result in the effectiveness of learning in college.

The effectiveness of online learning based on the Eom study (2012) did influence by factors in system usage and user satisfaction. The system's use did influence the quality of the system, the quality of information, self-efficacy, learning independence, lecturer service, and user satisfaction. The results of this study show that the quality of the system, the quality of information, self-efficacy, lecturer service, and user satisfaction have a positive and significant effect on the use of the system. The positive influence shows that the better the quality of the system, the quality of information, self-efficacy, lecturer services, and user satisfaction will further increase the use of e-learning systems. The results of this study also support research conducted by Alsabawy et al., (2016) and Fraihat et al., (2019) which found that the technical quality of the system, the quality of information, the quality of service, the quality of the supporting system, the quality of learning, the quality of instructors have a significant effect on the perception of e-learning use.

Satisfaction is vital in fostering interest in the use of e-learning systems. This conclusion did demonstrate by the results of research conducted by Eom (2012), which found that user satisfaction had a significant effect on the use of the system. Various factors influence user satisfaction. In this study, user satisfaction is significantly affected by the quality of the system, quality of information, self-efficacy, and lecturers' service. The positive influence shows that the better the quality of the system, the quality of information, self-efficacy, and services provided by lecturers will further

increase student satisfaction in using e-learning. The findings also support previous work from Livari (2005), Freeze et al. (2010), Alsabawy et al., (2016) and Fraihat et al., (2019), all four studies have proven to have a strong positive relationship between information quality, system quality, self-efficacy, and lecturer/instructor services and user satisfaction.

This research fails to prove a link between user satisfaction and learning independence. These results support research conducted by Eom (2012), which found no significant link between learning independence and user satisfaction and system use. These results contradict the findings of other studies (Womble, 2008) that reported a significant positive correlation between learning independence and system use and user satisfaction. A possible reason for this difference is due to different research methods and research designs. Womble used three different instruments, and respondents did give advanced training and development on e-learning.

E-learning is a method that depends heavily on the technology used. The use of technology or systems has a profound effect on the effectiveness of e-learning. In addition to the use of systems, the effectiveness of e-learning did also influenced by user satisfaction (Eom, 2012). The test results in this study support research conducted by Eom (2012), Alsabawy et al., (2016) and Fraihat et al., (2019) which shows that user satisfaction and perception of the use of e-learning systems have a positive and significant effect on the effectiveness of e-learning. The positive influence shows that the better the satisfaction felt by e-learning users and the better the perception of e-learning usage will further increase the effectiveness of e-learning. These results also support DeLone and McLean (2003), stating that the use of the system is the right measure of success in most cases. As well as research conducted by Freeze et al. (2010), Eom et al. (2006) and Livari (2005) found that the results of this study show that the DM model has excellent explaining power to understand against student satisfaction in the use of the system, the effectiveness of the system in the context of e-learning. The results of this study are supported by Chang (2013) research, which examines the determination that influences the interest to use e- learning in the library. The results showed that web quality had a significant effect on perceptions of value and satisfaction. The perception of value and satisfaction has a significant effect on the interest in continuing to use the e-learning system in the library.

Conclussion

This research provides empirical evidence that supports that technological factors, namely the quality of the system and the quality of information, psychological factors, namely self-efficacy and the human factor that is the service of lecturers, have a significant effect on user perception and user satisfaction. User perception and user satisfaction have a significant effect on the effectiveness of e-learning. Based on these results can be suggested First, university managers should continue to invest in improving information technology infrastructure, so that system quality and information quality become faster, better system accessibility, higher system reliability and flexibility, and ease of learning. By doing so, e-learning can provide better learning effectiveness. Second, universities must improve the quality of lecturers to master information technology better because the role of instructors or lecturers is significant in creating e-learning content with the materials necessary for students.

Acknowledgements

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