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VARIABLES AFFECTING E-LEARNING SERVICES QUALITY IN INDONESIAN HIGHER EDUCATION: STUDENTS' PERSPECTIVES

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ABSTRACT

Aim/Purpose	This research aims to evaluate and analyze the e variables which influence the quality of e-learning services at the university-level based on the perspectives of students (stakeholders). It seeks to identify factors of e-learning quality and satisfaction and to examine the relationship between the dimensions of e-learning quality, satisfaction, and behavioral intention as perceived by university students.
Background	E-learning is an electronic learning approach that supports online teaching and learning. One of key indicators of the success of e-learning development and implementation is the increased satisfaction of e-learning users. However, research focusing on the service quality of e-learning in universities, especially in Indonesia, has not been widely carried out and has not been comprehensive. Researching the quality of e-learning services in universities, especially in Indonesia, will help to increase the gross enrollment rate (GRE) in tertiary education
Methodology	This research uses quantitative methods. Research data were obtained by distributing a questionnaire at one of state universities in Indonesia. The study was based on an extension of a service quality model consisting of teacher quality perception represented by factors of assurance, empathy, responsiveness, and rela-

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bility, the quality of the Learning Management System (LMS) represented by usability and informativeness, and the quality of lecture materials represented by learning contents. Data collected were analyzed with SmartPLS, using a partial least squares-structural equation model (PLS-SEM).

Contribution	This research contributes to knowledge in the field of information systems, especially the management of e-learning as an online learning media. Most e-learning research only involves one aspect, for example, teacher quality or service quality. This research investigates several dimensions including teacher quality, LMS quality, and content quality, resulting in a model that incorporates several aspects.
Findings	The findings of this research indicate that content quality, teacher quality (empathy, responsiveness, reliability, and assurance), and LMS quality (usability and informativeness) have a significant influence on the quality of e-learning based on the students' perceptions. However, LMS quality does not have a significant effect on satisfaction. The quality of e-learning and user satisfaction are found to have a significant and positive effect on user intention to engage in e-learning. The findings of this study suggest that satisfaction is very influential and has a higher value than e-learning quality in relation to students' intention to use e-learning.
Recommendations for Practitioners	The significant influence of the constructs investigated in this research could shape strategies and approaches that are adopted to enhance e-learning service quality and increase the success of e-learning development and implementation, resulting in higher interest in e-learning services, especially in Indonesian higher education.
Recommendations for Researchers	This work offers a theoretical understanding of e-learning service quality in a higher education institution. We recommend that fellow researchers consider LMS quality, content quality, and user satisfaction as important factors which influence the quality of e-learning services.
Impact on Society	For universities, this research provides insights into important indicators of e-learning service quality so that the success of e-learning development and implementation can increase e-learning users' interest in using e-learning services.
Future Research	Future studies focusing on e-learning services should incorporate indicators of LMS quality, content quality, and user satisfaction as important factors that influence the quality of e-learning services. Our research is limited to the e-learning of one university in Indonesia. The research might be expanded to a larger scale, including all regions in Indonesia which are represented by several public and private universities.
Keywords	e-learning, e-learning quality, service quality, ServQual model, Indonesian higher education, student perspectives

INTRODUCTION

In the era of industrial revolution 4.0, the Indonesian Government and universities are looking to expand e-learning to all private and public campuses. The goals of e-learning growth in Indonesia include nation-building (quality), improving the quality and relevance of higher education, innovation and industry (relevance), increasing access to quality higher education (access), expanding higher education opportunities (competitiveness) and equitable education at a high level that is affordable and flexible across space and time (Pannen, 2016). The journey of distance education in Indonesia began

with Correspondent Courses for Teachers, followed by the establishment of Open University (UT), the Hylite Program (Hybrid Learning for Indonesian Teachers Program), the Indonesian Higher Education Networks (Inherent), and the National Education Network (Jardiknas). Recently, Massive Open Online Courses (MOOCs) have become popular (Pannen, 2016). Distance education is the answer to the demand for increasing the national gross enrollment rate (GER), which represents the college-age population or the community studying in college. The policies for the implementation of distance education have also been regulated by the Government of Indonesia through the Ministry of Education and Culture Regulation No.109 of 2013. In 2015, the GER was 27.63%. It increased to 28.10% in 2016. In 2017, Indonesia experienced an 3% increase of GRE to 31%, but Indonesia was still behind other Asian countries, such as Malaysia 38%, Thailand 51%, and Korea 92%.

Higher education in Indonesia is not evenly distributed and the application of e-learning to support distance education is considered lacking. The application of e-learning in Indonesia is very challenging due to many factors including the low culture of independent learning that leads to the perceptions that the absence of direct contact between lecturers and students is less attractive, and e-learning does not necessarily improve student ability to learn independently. The quality of e-learning needs to be assessed in order to guide e-learning providers in product customization so that the e-learning meets user needs and expectations (Gress, Fior, Hadwin, & Winne, 2010).

Research focusing on the service quality of e-learning in universities, especially in Indonesia, has not been comprehensive or widely executed. The researchers believe that it is important to examine the quality of e-learning services in universities, especially in Indonesia, to increase the gross enrollment rate (GER) of tertiary education. This research aims to evaluate and analyze the variables that influence the quality of e-learning services at the university-level based on the perspective of students (stakeholders). It seeks to identify dimensions of e-learning quality and satisfaction and to examine the relationship between the dimensions of e-learning quality, satisfaction, and behavioral intention as perceived by university students. Studies related to variables that affect e-learning quality based on students' perspectives, especially in the Indonesian context, are still rare. This study, therefore, addresses the existing gap.

Efforts to improve the quality of education that can meet the demands and improve the satisfaction of stakeholders must be realized. Therefore, research which evaluates e-learning service quality for the purpose of improving education quality needs to be conducted. One of the methods for investigating e-learning services quality is the application of the service quality method, known as the Serv-Qual method.

This paper is organized as follows. The background discusses theories related to e-learning service quality. The section after that presents the research model, e-learning service quality attributes and their impact on e-learning quality and e-learning satisfaction, e-learning service quality attributes and their impact on satisfaction, and the impact of e-learning quality and satisfaction on behavioral intention. The next section discusses the methodology, instruments, and data analysis. The last section of this paper presents the results and discussion.

BACKGROUND

The application of e-learning is one of solutions for distance education and increasing the national gross enrollment rate. E-learning has emerged as a modern educational paradigm as its design and implementation have been facilitated by current technologies (Cidral, Oliveira, Felice, & Aparicio, 2018). However, the application of e-learning in Indonesia is still very low. According to Sayekti (2015), the use of e-learning as a learning media increased learning effectiveness and efficiency, improved information technology skills, strengthened discipline in completing lecture assignments, and facilitated communication with educators who are in charge of the subject matters. E-learning develops cognitive, psychomotor, and interpersonal skills. The three main drivers that influence the use of e-learning are technology and information system design, individual motivation, and environmental

characteristics (Sorgenfrei, Borschbach, & Smolnik, 2013). This aligns with the research conducted by Anwas (2000) indicating that the conducive variables of an organization influence the attitude of academics towards e-learning adoption. One of the variables that has the biggest contribution in explaining the concept of e-learning compatibility in Indonesia is learning styles, especially in e-learning settings (Suartha & Suwintana, 2012). Perceptions of ease of use, compatibility, and trust are significant indicators of the use and adoption of an innovation (Carter & Belanger, 2005).

Indonesia is ranked 8th out of 10 countries in terms of e-learning growth with a 25% increase in the online education industry (Rentjoko, 2017). There are several dimensions that impact on e-learning application in Indonesia including organizational dimensions, infrastructure dimensions, funding source dimensions, and resource dimensions (Darmayanti, Setiani & Oetojo, 2007). Various steps have been taken by the Indonesian Government to implement online network infrastructure development programs on a national scale. The programs include the national education network (Jardiknas), the Indonesia Open and Integrated Online Learning Program (PDITP), distance learning products and e-learning / Hybrid Learning through the Online Learning System (SPADA), as well as Hybrid Learning for Indonesian Teachers. However, the adoption of e-learning in Indonesia remains low, despite the government efforts. There are equity and access obstacles that thwart the implementation of information technology-based learning, which include the cost of internet access, procurement of infrastructure development and maintenance, and learning culture (strong preference for face-to-face learning and underdeveloped independent learning culture) (Sudarwan, 2003). In addition, in Indonesia, community-based education is still centered on formal face-to-face education. Bennett and Bennett's research (2003) identified the main obstacles faced by teachers in using information technology communication (ICT), which include the willingness to use ICT and the belief in the benefits of ICT. Therefore, simplicity is needed, including ease-of-use, so that the adoption of innovative technology can be accepted more quickly and comprehensively. Removing these obstacles will accelerate the adoption of e-learning services.

E-LEARNING SERVICE QUALITY

According to Gronroos (1978), service quality consists of three dimensions with seven perceived service quality criteria, namely the outcome dimension (professionalism and skills), the process dimension (attitude and behavior, accessibility and flexibility, reliability and trust, service recovery, servicescape) and image dimensions (reputation and credibility). According to Lien and Kao (2008), service quality comprises technical quality (results from service quality) and functional quality (service delivery process). Both the technical quality and functional quality have a greater impact on customer satisfaction. Satisfaction reflects a person's judgment of a product's perceived performance in relationship to expectations. If the performance falls short of expectations, the customer is disappointed. If it matches expectations, the customer is satisfied. If it exceeds them, the customer is delighted (Kotler & Keller, 2012, p.10). Parasuraman, Zeithaml and Berry (1988) proposed a ServQual model consisting of five factors, which are assurance, tangibles, empathy, reliability, and responsiveness. The ServQual model has become a reference for research in various fields related to service quality evaluation. Based on these dimensions, service quality aims to identify customers' needs, fulfill their expectations, and satisfy them by meeting their requirements, especially important requirements (Chen & Kuo, 2011). Some studies have found that there is a linear relationship between customer satisfaction and quality, and they propose that satisfaction results from good performance in certain quality elements, and dissatisfaction results from the opposite situation. However, not all quality elements have the same effect on customer satisfaction.

E-learning service quality is the result of comparison between user expectations and their perceptions about the performance of e-learning information system services through service characterizations, such as intangibility, heterogeneity, inseparability, and perishability (Yener, 2013). Three variables influence e-learning service quality including user satisfaction, system quality, and information quality (Rahman & Hamid, 2017). User satisfaction will increase, and users will be interested in e-learning

services if they have stable, easy-to-use, and adequate contents. If e-learning services can give users convenience to have discussions with experts when they need help, users will be happy to use these services (Chen et al., 2011).

SERVICE QUALITY MODEL

Several studies dealing with e-learning service quality adopted the ServQual model (Parasuraman et al., 1988). For more than 30 years, the ServQual instrument has been proven to be a valid instrument for measuring service quality in several industries. Other studies have used a modified version of the ServQual model to assess the quality of e-learning in higher education such as research conducted by Uppal, Ali, and Gulliver (2018). A summary of research regarding service quality is presented in Table 1.

Table 1. A summary of service quality studies

Author	Study / Context	Identified variables
Parasuraman, Zeithaml, and Berry (1988) Santos (2003)	Service and retailing organization E-services	Assurance, tangibles, empathy, reliability, and responsiveness. Consist of ease of use, appearance, linkage, structure and layout, and content. Active dimensions consist of reliability, efficiency, support, communication, security, and incentives.
Stodnick and Rogers (2008) Udo, Bagchi, and, Kirs (2011)	Service quality in a classroom setting E-learning system	Assurance, tangibles, empathy, reliability, and responsiveness. Assurance, empathy, responsiveness, reliability and website content, e-learning quality, satisfaction and behavioral intention.
Chen and Kuo (2011)	E-learning service quality at a commercial bank	Consisting of four dimensions, namely the learner interface, learning community, content and learner. The dimensions of interfaces and content are equivalent to 'ease of use', 'system quality', and 'information quality' in terms of user satisfaction.
Rahman and Hamid (2017)	MEDIU E-Learning System	System design (system quality, information quality), system delivery (user satisfaction) and system outcome.
Uppal, Ali, and Gulliver (2018)	E-learning system	Assurance, empathy, responsiveness, reliability, tangibility, learning content and learning quality.

Based on Table 1, assurance, responsiveness, tangibility, course website, and learning content had a positive correlation with the perception of e-learning quality. E-learning students appreciate a stable, easy to use e-learning environment, but empathy and reliability are not significant to student perceptions of e-learning quality. On the other hand, research conducted by Udo, Bagchi, and Kirs (2011) modified the ServQual instrument by incorporating eight variables of e-learning to evaluate the perceived quality of online programs and e-learning. These variables included assurance, empathy, responsiveness, reliability, website content, e-learning quality, satisfaction and behavioral intention. Udo et al.'s study has demonstrated that the variables of assurance, empathy, responsiveness, and website content are significant, but service quality does not directly affect behavioral intention or ensure e-learners' satisfaction.

RESEARCH MODEL

This study proposes an e-learning quality model, which is an extension of the ServQual model. The model proposed in this study was built by adapting the ServQual model (Cao, Zhang, & Seydel, 2005; Parasuraman et al., 1988; Udo et al., 2011; Uppal et al., 2018). The design and implementation of e-learning involves 3 components, namely: People (lecturers and students), Process (interaction between the learning process and the system) and Product (learning content, output) (Prayudi, 2009). Therefore, as Figures 1 and 2 indicate, e-learning quality is a triangle consisting of teacher quality represented by assurance, empathy, responsiveness, and reliability; learning management system (LMS) quality represented by usability and informativeness; and lecture material quality represented by learning content.

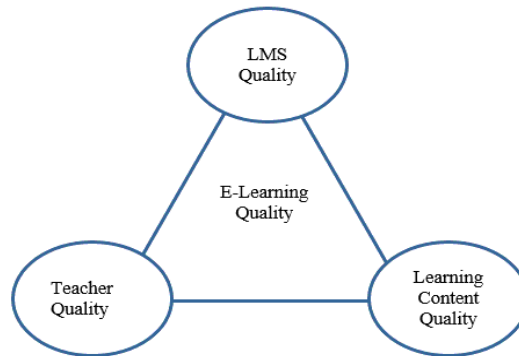


Figure 1. E-learning quality

The research model proposed in this study is depicted in Figure 2.

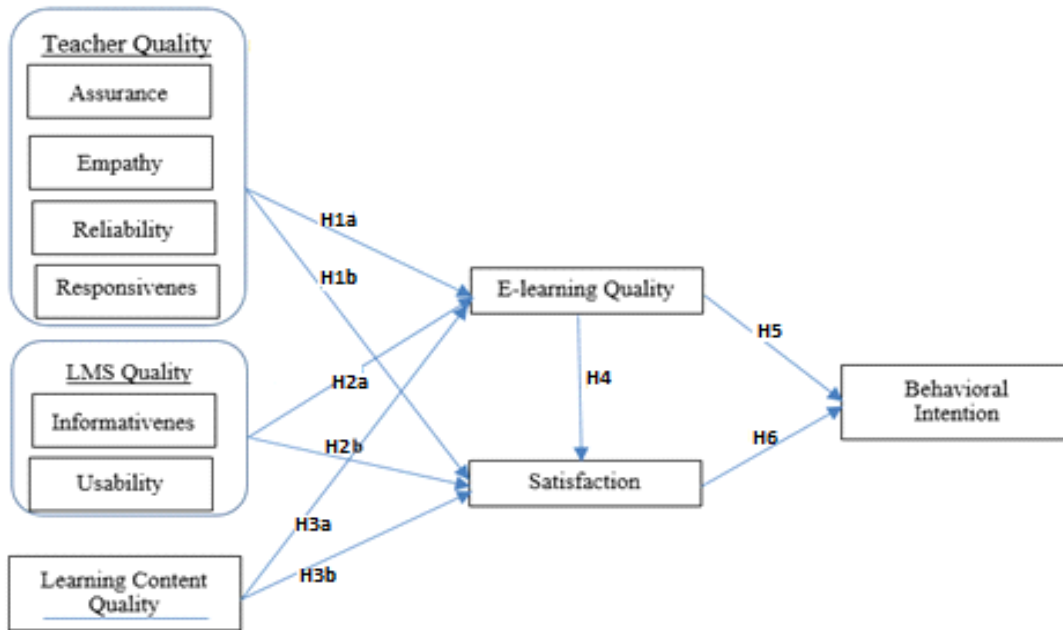


Figure 2. Research Model

To expand service variables, we introduce the teacher quality dimension which consists of such factors as assurance, empathy, reliability, and responsiveness. The dimension of LMS Quality includes informativeness and usability. The dimension of learning content quality includes a single factor. The definitions of these factors are as follows:

1. Assurance is a guarantee that lecturers have knowledge and understandings of the materials provided to guide students to obtain a sense of confidence in their learning and that lecturers are fair and objective in assessing the achievements and capabilities of students (Parasuraman et al, 1988; Udo et al, 2011; Uppal et al, 2018;).
2. Empathy includes lecturers' concern for students, encouraging and motivating the students to do their best (Parasuraman et al, 1988; Udo et al, 2011; Uppal et al, 2018).
3. Responsiveness is the willingness to help and respond quickly and efficiently to the needs of students by answering students' questions and assisting them in problem-solving activities (Parasuraman et al, 1988; Udo et al, 2011; Uppal et al, 2018).
4. Reliability refers the consistency of lecturers in providing materials in accordance with the curriculum set by the study program (Parasuraman et al, 1988; Udo et al, 2011; Uppal et al, 2018).
5. Informativeness refers to the availability of multimedia features in the e-learning system, the availability of information that is updated, accurate, useful, of high quality and relevant to the courses taught. System quality and information quality have a positive relationship with student satisfaction. Student satisfaction is determined by the quality of e-learning which depends on the information in the information system. Online education providers must pay attention to content, design, and website layout in assessing learning materials and the design of the website learning system (Udo et al, 2011).
6. Usability represents the physical facilities of e-learning systems including various learning activities, ease of use and accessibility of e-learning user interface, and ease of management by students (Parasuraman et al, 1988; Udo et al, 2011; Uppal et al, 2018).
7. Learning content quality refers to the availability of materials and services that are directly related to student learning outcomes (Uppal et al, 2018; Cao et al, 2005).
8. E-learning quality describes the availability of updated usage instructions, which are clear and properly described (Udo et al, 2011; Uppal et al, 2018).
9. Satisfaction is positively correlated with future intentions, both directly and indirectly (Oliver, 1980). Satisfaction refers to student satisfaction with the decision to use an e-learning system.
10. Behavioral intention describes the intention of users to continue using e-learning, recommend e-learning to other users, and be willing to use e-learning continuously to support lectures (Udo et al, 2011).

E-LEARNING SERVICE QUALITY ATTRIBUTES AND THEIR IMPACT ON E-LEARNING QUALITY AND E-LEARNING SATISFACTION

The quality of information system services perceived by end-users plays an important role in the adoption of e-learning and influences the success of the system. Several studies have implemented service quality to test variables that affect the quality of e-learning services. According to Wang, Zhang, and Ma (2010), IS-adapted ServQual has good fitness, showing good validation in measuring the quality of information system services, especially e-learning and ServQual. It has been validated in various industries and the results show good effectiveness. IT professionals developed the ServQual scale to assess the quality of information system services (W. T. Wong & Huang, 2011). The ServQual scale consists of tangible (physical facilities, equipment, and appearance of personnel), reliability (the ability to perform services reliably and accurately), responsiveness (the desire to help customers and provide fast service), assurance (knowledge and politeness of employees, inspiring trust and confidence) and empathy (caring and individual attention) (Parasuraman et al, 1988).

The quality of services provided by lecturers will certainly affect student satisfaction. Satisfaction is individuals' feelings of pleasure or disappointment resulting from comparing their perceptions of a product or service's performance to their expectation levels (Sun et al, 2005). If the performance is below expectations, the customer is not satisfied. On the other hand, if the performance meets expectations, the customers are satisfied. If performance exceeds expectations, customers are very satisfied or happy (Kotler, 2005). In e-learning, students interact more with learning materials. Teachers usually give various materials online. In practice, not all materials will be learned independently by students. So, they also need to interact with lecturers. Lecturers who give more attention, are responsive in responding to any questions in discussion forums and can answer every question asked by students will certainly make students more satisfied with the e-learning system services. This is emphasized by Uppal et al (2018) who found that the assurance and responsiveness have a positive correlation with students' perceptions of e-learning quality. This is also in line with various ServQual-related studies that show the impact of the ServQual dimension on customer satisfaction (McDougall & Levesque, 2000; Udo et al., 2011). Thus, it can be concluded that the quality of lecturer services represented by the factors of reliability, assurance, empathy, and responsiveness has an influence on the quality of e-learning services, which is also strengthened by findings from other studies (Cheng, 2012; Hassanzadeh, Kanaani, & Elahi, 2012; Li, Duan, Fu, & Alford, 2012; Lin, 2011; Mohammadi, 2015; Poulouva & Simonova, 2014; Ramayah, Ahmad, & Lo 2010; Roca, Chiu, & Martinez, 2006; Tajuddin, Baharudin, & Hoon, 2013; H. C. Wang & Chiu, 2011; Xu, Huang, Wang, & Heales, 2014). Therefore, the following hypotheses can be formulated:

Hypothesis H1a: Teacher Quality (assurance, empathy, reliability, responsiveness) has a positive relationship with students' perceptions of e-learning quality.

Hypothesis H1b: Teacher Quality (assurance, empathy, reliability, responsiveness) has a positive relationship with student satisfaction in using e-learning.

In addition to the quality of teaching provided by lecturers, the service quality of the e-learning system also depends on the quality of the LMS used in the learning process. LMS, which stands for Learning Management System, is a platform that is used as a means of interaction between students, lecturers, and learning materials. All student activities in e-learning are carried out through the LMS. LMS in higher education provides a centralized system for all learning resources, allowing universities to obtain a comprehensive picture of learning by individual learners, and more. Therefore, the quality of LMS represented by usability and informativeness is crucial in relation to the use of e-learning. The quality of e-learning is determined by usability. An e-learning system pays attention to not only the functionality and appearance, but also the pleasant experience that users feel when using an e-learning system.

An e-learning system provides benefits for lecturers both for delivering and managing learning contents in various formats, creating and/or uploading their learning and reporting contents of learning activities and individual performance. An e-learning system is used by students to access assignments, take exams, collaborate with peers, and communicate with lecturers. LMS in higher education provides a central location for all learning resources, allowing universities to get a comprehensive picture of learning by individual learners, and more.

Information in e-learning systems supports the process of learning activities including academic information, task deadlines, and quizzes, information on accessing lecture materials, and information on task grading. This is emphasized by the findings of others (Almutairi & Subramanian, 2005; DeLone & McLean, 1992; McGill, Hobbs, & Klobas, 2003; Pawirosumarto, 2016), as well as by Livari (2005), which state that the quality of information has a positive and significant effect on user satisfaction. User satisfaction will increase if the quality of the information in the information system is up-to-date and accurate. Based on the elaboration above, the quality of LMS represented by usability

and informativeness dimensions has an influence on the quality and satisfaction of e-learning services, in line with the results of others (Barnes, 2007; Cao et al., 2005; Koernig, 2003; S. Y. Sun et al., 2008; Udo et al., 2011; Uppal et al., 2018). Therefore, the following hypothesis are proposed:

Hypothesis H2a: LMS Quality (usability, informativeness) has a positive relationship with students' perceptions about the quality of e-learning.

Hypothesis H2b: LMS Quality (usability, informativeness) has a positive relationship with student satisfaction in using e-learning.

Teaching materials play an important role in the transformation of learning through e-learning. The process of transforming teaching materials requires adequate knowledge of the digitizing process of e-learning teaching materials. There are several types of teaching material formats including Web content with XHTML web standards, Images (PNG, GIF, or JPEG), Videos (Flv, Avi, mp4 or SWF) and Audio (mp3). For interactivity needs, instructional materials are converted into flash form presentations and SCORM / AICC forms using tools such as authorPOINT Lite or iSpring Presenter. SCORM (Shareable Content Object Reference Model). Learning content quality plays an important role in the service quality of the e-learning system. Learning content development can improve learning optimization so that students are more interested in learning. Thus, e-learning content quality influences the quality and satisfaction of e-learning services. Therefore, the following hypotheses are proposed:

Hypothesis H3a: Learning Content Quality has a positive relationship with students' perceptions about the quality of e-learning.

Hypothesis H3b: Learning Content Quality has a positive relationship with student satisfaction in using e-learning.

LEARNING QUALITY AND ITS IMPACT ON SATISFACTION

According to Misut and Pribilova (2015, p. 313), two contexts of e-learning quality namely "quality through e-learning" with reference to the quality of education in general by using e-learning systems and the quality of e-learning itself. E-learning quality relates to overall perceptions of teacher quality, LMS quality, e-learning content quality, clarity of instruction, current of information, and functionality of the features of an e-learning system. A good e-learning system has clear usage instructions and updates. For each function added, the e-learning administrator performs an update of the use instructions so that users, especially lecturers and students, can learn the e-learning user interface and facilitate use. Updating the instructions for using the e-learning system can help students manage learning/lecturing activities such as attending lectures online, uploading assignments, conducting online examinations or lecture quizzes, and running program codes through e-learning systems. An e-learning system with updated instructions will certainly make students more satisfied with the quality of e-learning. Thus, e-learning quality influences satisfaction with e-learning services, which is also strengthened by the findings of Udo et al. (2011). Therefore, the following hypothesis is proposed:

Hypothesis H4: e-learning quality has a positive relationship with student satisfaction with e-learning.

THE IMPACT OF E-LEARNING QUALITY AND SATISFACTION ON BEHAVIORAL INTENTION

Research conducted by Udo et al (2011) suggested that four of the five ServQual dimensions (except Reliability) play an important role in the perception of e-learning quality and influence satisfaction and behavioral intentions. Research conducted by Mohammadi (2015) indicates that service quality ($b = 0.611$) and course quality ($b = 0.608$) are significant determinants of students' behavioral intention to reuse. The implication is that the quality of e-learning indirectly influences behavioral intentions to use e-learning. Factors satisfaction, behavioral intention, and e-learning quality are significant enough

to ensure student satisfaction as a mediating construct between e-learning quality and behavioral intention in the context of e-learning (Udo et al., 2011).

Through this, the authors believe there is a positive relationship between e-learning quality with behavioral intention and satisfaction with behavioral intention, which is formulated in the following hypotheses:

Hypothesis H5: Student perceptions of e-Learning Quality have a positive relationship with students' intention to continue using e-learning.

Hypothesis H6: Student perceptions of satisfaction using e-learning have a positive relationship with students' intention to continue using e-learning.

METHODOLOGY

INSTRUMENT

This research was conducted based on students' perceptions of the quality of e-learning services by using the service quality (ServQual) model that has been modified to describe the quality of lecturer services, LMS, and learning materials. The model proposed in this study adopted the e-learning quality model from Udo et al. (2011) and Uppal et al. (2018). The instrument developed consists of ten latent variables and thirty-six manifest variables. The variables used were assurance, empathy, responsiveness, reliability, usability, informativeness, learning content quality, e-learning quality, satisfaction, and behavioral intention. The e-learning service quality questionnaire was adapted from Udo et al. (2011) and Uppal et al. (2018). The respondents were asked to state their agreement to the statement given using a Likert scale of 1 to 5. The Likert scale consisted of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and scale 5 (strongly agree).

This questionnaire consists of two parts. The first part consists of demographic data of the respondents including gender, frequency of accessing e-learning, and average time used to access e-learning. The second section contains statements related to the variables investigated in this study (shown in Tables 3, 4, & 5) consisting of four statements about assurance, four statements about empathy, three statements representing responsiveness, three statements about reliability, four items related to usability statements, five items representing informativeness, four statements dealing with learning content, three statements about e-learning quality, three statements of satisfaction, and three statements about behavioral intention.

Before the questionnaire was distributed, a readability test was carried out with 30 respondents to ensure that the respondents did not experience difficulties and were not confused by the statements given. The next process was collecting data from 359 students as e-learning users through the questionnaire instrument. After the data had been collected, an analysis was then carried out.

DATA COLLECTION PROCEDURE

This research used quantitative methods. Data collection was done by using a questionnaire. The questionnaire was distributed to 500 students at UPN Veteran Jakarta who used e-learning and was distributed at the end of the first semester in 2018-2019. 71.8% of the 500 filled out the questionnaire. Overall, the research sample consisted of 359 UPN Veteran Jakarta students. The number of male respondents was 171 (47.63%) and the number of female respondents was 188 (52.36%). Table 2 presents the respondents' demographic data, consisting of four parts, namely, gender, study year, frequency of e-learning usage, and duration of time to access e-learning.

Table 2. Respondent Demographics

Factor	Frequency	Percentage (%)
Gender		
Male	171	47.63
Female	188	52.36
Study Year		
First	116	32.31
Second	85	23.68
Third	158	44.01
Frequency of Use of e-learning		
Everyday	226	62.95
Once a month	61	17.00
Once every two weeks	72	20.05
Duration of accessing e-learning		
Less than 15 Minutes	8	2.23
15 minutes to less than 30 minutes	64	17.83
30 minutes to less than 1 hour	168	46.80
1 hour to less than 2 hours	90	25.07
More than 2 hours	29	8.07

DATA PROCESSING

Data processing employed multivariate structural equation modeling techniques to see the relationship between variables using the SmartPLS program. The initial stage was making the path diagram according to the Figure 2 and the hypotheses that have been formulated previously. Model evaluation was carried out by conducting a measurement model test and structural model using the SmartPls 3.0 tool. This research applied a bootstrapping test, using 5000 resamples to assess the significance of the strength of the path association between the exogenous latent constructs (teacher quality, LMS quality, and learning content quality) and endogenous latent constructs (learning quality, satisfaction, and behavioral intention). The SmartPLS applied this bootstrapping test to evaluate the significance of the relationship between two variables by accounting for the values of the path coefficient (β), t-values, and p-values (Hair, Hult, Ringle, & Sarstedt, 2016). Evaluation of structural models was done using the bootstrap method by looking at the value of the coefficient of determination (R^2) of the endogenous latent variables and the value of t-values.

RESULT

Regarding the teacher quality dimension, the students' response with the highest value was "AS1 Lecturers have knowledge in their fields" reaching 77.16% (Mean 3.96 SD 0.770). For the attributes of empathy, "EM4 Lecturers encourage and motivate students to do their best", 64.90% of the students agreed with the question (Mean 3.71 SD 0.831). In terms of reliability, the question "RE1 Lecturers consistently provide material" 57.94% of students agreed with this (Mean 3.78 SD 0.911). The results of data processing are presented in Appendix A.

The LMS Quality dimension has two variables: informativeness and usability. For the factor usability “US4 The E-learning system is easily managed by students”, 54.32% agreed with the statement (Mean 3.54 SD 0.956). For the factor of informativeness, 69.35% of students agreed with the statement “IN2 e-learning system provides useful information” (Mean 3.92 SD 0.803). The results of data processing can be seen in Appendix B which shows students’ perceptions of the quality of e-learning services (LMS Quality).

For the Learning Content dimension, the question with the highest value is “LC2 The e-learning system uses video elements correctly” with 57.38% of students who agree (Mean 3.84 SD 0.794). For the e-learning quality dimension, the question is “EQ3 The e-learning system has clear usage instructions” students were neutral 27.57% (Mean 3.18 SD 0.919). The dimension of satisfaction, the question with the highest value is “SA2 I feel my decision is wise to register in e-learning” the percentage of students agree 50.42% (Mean 3.75 SD 0.786). For the last dimension, behavioral intention, the question with the highest score is “BI2 I would recommend e-learning to other students;” the percentage of students who agreed was 49.30% (Mean 3.57 SD 0.780). The results of data processing can be seen in Appendix C which shows students’ perceptions of the quality of e-learning services.

MEASUREMENT MODEL TEST

An important step before investigating the research hypotheses was examining the reliability and validity of the survey. Evaluation of the measurement model in this study was carried out through two stages. The first stage is to evaluate the first-order constructs (constructs formed by the indicators: assurance, reliability, empathy, responsiveness, usability and informativeness), and the second stage is to evaluate second-order constructs (constructs formed by the first-order constructs which become its dimension: teacher quality, LMS quality, learning content quality, e-learning quality, satisfaction and behavioral intention). The first-order construct evaluation was done by using the SmartPLS tools to test convergent validity and discriminant validity. Validity testing is done to determine whether a variable is a convergent manifest (indicators forming variables) has a high correlation with latent variables.

Data processing employed the SmartPLS Algorithm. The value of loading factors in the indicator path and latent variables must be greater than 0.7 and Average Variance Extracted (AVE) > 0.50 (Hair et al., 2016). Based on the results of data processing presented in Table 3, all latent variables have AVE values more than 0.5 while four items have a loading factor value less than 0.7 so that four indicators need to be eliminated including RE1, US5, LC3, and LC4. The reliability composite value was in the range 0.849441 to 0.905947, exceeding the value of 0.80. Therefore, the results of data processing have internal values of good consistency. The value of composite reliability equal to or greater than 0.80 is considered good for confirmatory research (Garson, 2016). The Composite Reliability (CR) test results indicate that the model has good reliability by the required minimum value limit. In the book by Sujarweni (2015, p.193), the reliability test can be performed on all items or statement items in the research questionnaire. If the value of Cronbach’s Alpha (CA) > 0.60 then the questionnaire expressed reliability or consistency. All variables with Cronbach’s Alpha range between 0.694 and 0.870 (See Table 3).

Table 3. Result of measurement model – convergent validity

Construct	First Order Construct	Item	Loading	AVE	CA	CR
Teacher Quality (TQ)	Assurance	AS1	0.716	0.613	0.767	0.865
		AS2	0.811			
		AS3	0.785			
		AS4	0.815			
	Reliability	RE1	0.661	0.619	0.756	0.888
		RE2	0.879			
		RE3	0.805			

Construct	First Order Construct	Item	Loading	AVE	CA	CR
	Empathy	EM1	0.865	0.669	0.834	0.889
		EM2	0.810			
		EM3	0.765			
		EM4	0.827			
	Responsiveness	RS1	0.828	0.652	0.735	0.849
		RS2	0.833			
		RS3	0.760			
LMS Quality	Usability	US1	0.792	0.621	0.797	0.867
		US2	0.782			
		US3	0.823			
		US4	0.849			
		US5	0.643			
	Informativeness	IN1	0.761	0.659	0.870	0.906
		IN2	0.836			
		IN3	0.873			
		IN4	0.820			
		IN5	0.762			
Learning Content Quality		LC1	0.758	0.512	0.707	0.868
		LC2	0.815			
		LC3	0.608			
		LC4	0.661			
e-Learning Quality		EQ1	0.858	0.722	0.810	0.886
		EQ2	0.871			
		EQ3	0.819			
Satisfaction		SA1	0.829	0.653	0.733	0.849
		SA2	0.742			
		SA3	0.850			
Behavioral Intention		BI1	0.785	0.620	0.694	0.830
		BI2	0.818			
		BI3	0.757			

Fornell-Larcker criteria are used to ensure discriminant validity, the AVE for each latent variable must be higher than R^2 with all other latent variables. Discriminant validity is measured by comparing the value of AVE of the construct itself and other constructs. To test the discriminant validity, for adequate discriminant validity, the diagonal elements should be significantly greater than the off-diagonal elements in the corresponding rows and columns (Hulland, 1999). Based on the results of Discriminant validity- Fornell-Larcker criterion in Table 4, the top number (which is the square root of AVE) in any factor column is higher than the numbers (correlations) below it. All the criteria were met for convergent and discriminant validity (Garson, 2016).

Table 4. Discriminant validity- Fornell-Larcker criterion

	AS	BI	EQ	EM	LMSQ	RE	RS	SA	TQ	US	LC	IN
AS	0.783											
BI	0.370	0.788										
EQ	0.342	0.426	0.850									
EM	0.709	0.357	0.423	0.818								
LMSQ	0.589	0.524	0.659	0.608	0.740							
RE	0.545	0.280	0.440	0.448	0.413	0.787						
RS	0.659	0.334	0.554	0.699	0.594	0.685	0.808					
SA	0.287	0.574	0.411	0.493	0.441	0.214	0.331	0.808				
TQ	0.856	0.404	0.522	0.904	0.671	0.699	0.881	0.435	0.713			
US	0.437	0.434	0.600	0.513	0.895	0.294	0.476	0.389	0.534	0.789		
LC	0.424	0.561	0.588	0.440	0.597	0.296	0.359	0.621	0.467	0.531	0.716	
IN	0.622	0.517	0.611	0.591	0.947	0.441	0.598	0.408	0.677	0.704	0.565	0.812

Note: Assurance (AS), Behavioral Intention (BI), E-learning Quality (EQ), Empathy (EM), LMS Quality(LMSQ), Reliability (RE), Responsiveness (RS), Satisfaction (SA), Teacher Quality(TQ), Usability(US), Learning Content Quality (LC), Informativeness (IN)

^aThe off-diagonal are the correlations between the latent constructs and diagonals are square values of AVEs.

The next step in this research is to conduct discriminant validity using the heterotrait-monotrait (HTMT) ratio of correlation criterion technique (Henseler et al., 2015). Henseler et al. (2015), Gold et al. (2001) and Teo et al. (2008) used an HTMT threshold value below 0.90, the discriminant validity has been established between a given pair of reflective constructs. Clark and Watson (1995) and Kline (2015) used HTMT threshold value below 0.85. Based on Table 5 below, all correlations were lower than 0.90, thus confirming discriminant validity.

Table 5. Discriminant validity assessment via HTMT

Constructs	1	2	3	4	5	6	7	8	9	10	11	12
1. Assurance												
2. Behavioral intention	0.532											
3. Elearning quality	0.414	0.534										
4. Empathy	0.866	0.453	0.507									
5. Informativeness	0.742	0.651	0.729	0.693								
6. LMS Quality	0.685	0.648	0.775	0.696	0.864							
7. Learning content	0.555	0.657	0.673	0.539	0.705	0.685						
8. Reliability	0.634	0.334	0.524	0.508	0.469	0.415	0.429					
9. Responsiveness	0.861	0.455	0.721	0.870	0.746	0.725	0.497	0.778				
10. Satisfaction	0.377	0.798	0.498	0.628	0.509	0.527	0.707	0.290	0.449			
11. Teacher quality	0.815	0.500	0.608	0.819	0.766	0.738	0.577	0.814	0.875	0.525		
12. Usability	0.529	0.569	0.748	0.620	0.826	0.816	0.579	0.293	0.613	0.491	0.616	

The next stage was the evaluation of the second-order construct in Table 6, a structural model (i.e., in terms of exploring the relationship between exogenous and endogenous variables), the second-order factor model produced superior fit indices and thus provides a more parsimonious framework for explaining the model (Sam, Brijs, Daniels, Brijs, & Wets, 2020). “In essence a second order factor is directly measured by observed variables for all the first order factors” (Esposito Vinzi, Chin, Henseler, & Wang, 2010, p.637). According to Wold (1982, as cited in Latan and Ghozali, 2012), evaluation of second-order constructs was done by using the repeated indicator approach or hierarchical component model, modifying the first-order construct to be a second-order construct indicator. So that the factor value of the first order construct will be the indicator value for the construct second-order (Kock, 2011). Based on the results in Table 6, teacher quality and LMS quality have AVE values more than 0.5. The composite reliability value was in the range 0.915 to 0.918, exceeding the value of 0.80 so the results of data processing have internal values of good consistency. The Composite Reliability test results indicate that the model has good reliability by the required minimum value limit.

Table 6. Second Order Construct

Second order construct	First order construct	Beta	t-values	p-values	AVE	CR
Teacher Quality	Assurance	25.616	25.424	$p < 0.001$	0.508	0.918
	Reliability	12.168	12.125	$p < 0.001$		
	Empathy	28.418	28.074	$p < 0.001$		
	Responsiveness	23.767	23.578	$p < 0.001$		
LMS Quality	Usability	35.063	35.065	$p < 0.001$	0.547	0.915
	Informativeness	43.749	43.506	$p < 0.001$		

ASSESSMENT OF STRUCTURAL MODEL

The interpretation of the value of R^2 is the same as the interpretation of linear regression R^2 , that is the magnitude of the variability of endogenous variables that can be explained by exogenous variables. The results of R^2 for endogenous latent variables in the structural model indicate that the model is substantial. Based on Table 7, the R^2 research results for student perceptions resulted in a value of behavioral intention (BI) of 0.373 the value of satisfaction (SA) of 0.413, e-learning quality (EQ) of 0.497, LMS Quality of 1.000 and Teacher Quality of 0.992.

Table 7. R^2 Value

Construct	R^2
Teacher Quality	0.992
LMS Quality	1.000
Behavioral Intention	0.373
Satisfaction	0.413
E-learning quality	0.497

Based on the R^2 value that has been obtained using the bootstrap method, it can be said that the exogenous latent variable (teacher quality and LMS quality) has a moderate effect on the endogenous latent variables (e-learning quality, satisfaction, and behavioral intention). Chin (1998) and Hock and Ringle (2006) describe results above the cutoffs R^2 value of 0.67, 0.33 and 0.19 to be “substantial”, “moderate” and “weak” respectively.

The level of significance of the path coefficient is obtained by running the bootstrapping algorithm so that it produces a t-value. As Table 8 shows, this study uses a significance value of 10% so that the hypothesis is supported if each path has a t-value greater than 1.65 and a path coefficient greater than

0.1. The path coefficient values that are in the range of -0.1 to 0.1 are considered not significant (Hair et al., 2016). Seven path coefficients have values bigger than 0.1 and t-values values bigger than 1.65 are teacher quality with e-learning quality (TQ→EQ), teacher quality with satisfaction (TQ→SA), learning management system quality with e-learning quality (LMSQ →EQ), learning content with e-learning quality (LC→EQ), learning content with satisfaction (LC→SA), e-learning quality with behavioral intention (EQ→BI), and satisfaction with behavioral intention (SA→BI).

Multicollinearity test is done to determine the relationship between indicators. To find out whether formative indicators experience multicollinearity by knowing the value of VIF, VIF coefficients for the structural model are printed by SmartPLS 3 in the “Inner VIF Values” table shown below. Based on Table 8, all the inner VIF values ranged between 1.462 and 2.520. In a well-fitting model, the structural VIF coefficients should not be higher than 4.0 (some use the more lenient criterion of 5.0) (Garson, 2006).

Table 8. Hypothesis Testing Results

Hypothesis	Path	Path Coef-ficient	Standard Error	t-value	p-values	Decision	VIF
H1a	TQ → EQ	0.110	0.036	3.012	<i>p</i> <0.001	Supported	1.855
H1b	TQ → SA	0.185	0.043	4.347	<i>p</i> <0.001	Supported	1.879
H2a	LMSQ →EQ	0.421	0.050	8.062	<i>p</i> <0.001	Supported	2.104
H2b	LMSQ → SA	-0.008	0.069	0.115	0.408	Not Supported	2.520
H3a	LC → EQ	0.224	0.036	7.900	<i>p</i> <0.001	Supported	1.462
H3b	LC → SA	0.535	0.058	9.223	<i>p</i> <0.001	Supported	1.550
H4	EQ → SA	0.020	0.058	0.043	0.153	Not Supported	1.914
H5	EQ → BI	0.227	0.041	4.844	<i>p</i> <0.001	Supported	1.206
H6	SA → BI	0.484	0.039	12.054	<i>p</i> <0.001	Supported	1.206

Below is a regression equation in this study according to the model above. The regression equation represents the relationship between exogenous variables and endogenous variables that are affected. The following regression equation in this study is made according to the model above:

$$EQ = 0.224 * LC + 0.110 * TQ + 0.421 * LMSQ + \epsilon_1$$

$$SA = 0.535 * LC + 0.185 * TQ + \epsilon_2$$

$$BI = 0.227 * EQ + 0.484 * SA + \epsilon_3$$

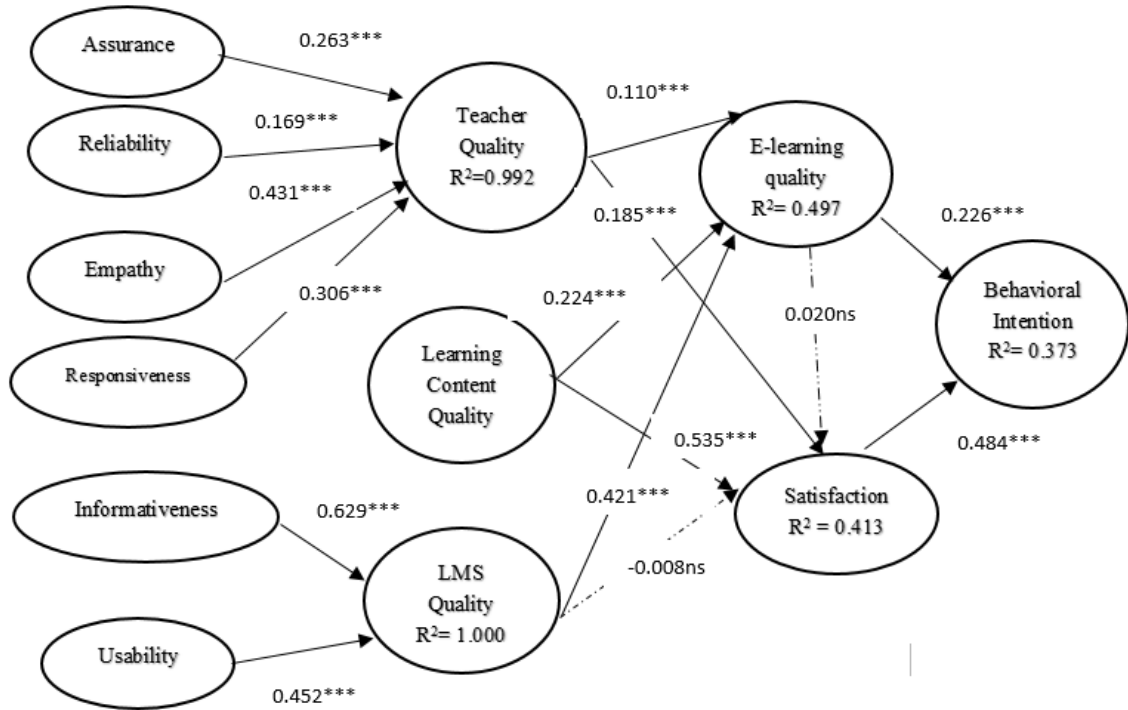
Based on the regression equation above, the e-learning quality variable is influenced by learning content quality, Teacher quality, and LMS Quality. The satisfaction variable of e-learning students is influenced by the learning content quality and teacher quality, while the intention of students to continue to use e-learning is influenced by e-learning quality by 22.6% and satisfaction by 48.4%.

DISCUSSION

The application of e-learning in Indonesia is very challenging, including infrastructure to build e-learning information systems, human resource competencies, teachers and students in terms of learning independence, and capital for the operation of e-learning infrastructure. This is what motivates the researchers to identify variables that influence the quality of e-learning services in Indonesia. We limited the research on the quality of e-learning services, namely teacher quality (assurance, empathy, reliability, and responsiveness), LMS Quality (informativeness and usability) and learning content quality. The main objective of this study is to understand the constructs that affect the quality of e-learning services in higher education, based on the perceptions of students in Indonesia. This study

produces factors such as assurance, empathy, responsiveness, reliability, learning content, usability, informativeness, e-learning quality, satisfaction, and behavioral intention.

For the e-learning service quality model, all the original hypotheses of the ServQual model (Cao et al., 2005; Parasuraman et al., 1988; Udo et al., 2011; Uppal et al., 2018) supported. Three components of e-learning design and implementation include teacher quality (people), LMS quality (process) and learning content (product). Therefore, the quality study of an e-learning system is a triangle consisting of teacher quality represented by factors of assurance, empathy, responsiveness, and reliability. The quality of LMS is represented by usability and informativeness factors, and the quality of lecture material is represented by learning content.



Notes: Dotted arrows indicate rejected hypotheses; solid arrow indicate significant relationships.

***p<0.001

Figure 3. Final Research Model

This research was analyzed using SmartPLS software, using a partial least squares-structural equation model (PLS-SEM). Partial Least Square is used to confirm the theory, explaining whether or not there is a relationship between latent variables. Thus, changes in latent variables are expected to cause changes in all indicators. There are 2 outer PLS SEM models, namely reflective and formative measurement models. The measurement model reflective is assessed using reliability and validity. Validity consists of convergent validity and discriminant validity. Convergent validity uses the value of Average Variance Extracted / AVE and discriminant validity uses the value of crossloading and Discriminant validity - Fornell-Larcker criterion, discriminant validity via HTMT. Discriminant validity - Fornell-Larcker criterion assesses discriminant validity at the construct level (latent variable) and cross-loading at the indicator level, while reliability uses the Cronbach's Alpha value.

The arrows from the variable toward the indicator, show variables (learning content quality, assurance, reliability, empathy, responsiveness, informativeness and usability) are measured by indicators - indicators that are reflections of variations of latent variables (Henseler, Ringle, & Sinkovics, 2009). The direction of the arrow from the indicator to the variable shows the causal relationship coming

from the indicator toward the latent variable. This can happen if a latent variable is defined as a combination of indicators. Thus, changes in the indicators will be reflected in changes in the latent variable.

The numbers in the circle show how much the variance of the latent variable is being explained by the other latent variables. The structural model test results in R^2 , the factor e-learning quality has a contribution of 49.7% and the satisfaction factor is 41.3%. Meanwhile, the factor behavioral intention has a contribution of 37.3% in students' intention to continue using e-learning (see Table 7). The numbers on the arrow are the path coefficients (as seen in Table 8). They explain how strong the effect of one variable is on another variable. The weight of different path coefficients enables us to rank their relative statistical importance (K. K. K. Wong, 2013, p. 18).

DETERMINANT VARIABLES OF E-LEARNING QUALITY

Based on Figure 3, the inner model (structural model) suggests that LMS quality has the strongest effect on e-learning quality (0.421), followed by learning content quality (0.224), and teacher quality (0.110). The inner model specifies the relationships between the independent and dependent latent variables (K. K. K. Wong, 2013, p. 1). The hypothesized path relationship between learning content quality, teacher quality and LMS quality for behavioral intention is statistically significant. Thus, we can conclude that teacher quality, learning content quality and LMS quality are moderately strong predictors of e-learning quality. The inner model suggests that empathy has the strongest effect on teacher quality (0.431), followed by responsiveness (0.306), assurance (0.263) and reliability (0.169). The empathy factor significantly has the greatest influence on teacher quality compared to the variables of responsiveness, assurance, and reliability. This proves that students in Indonesia need empathy from lecturers. Empathy is the most important part of the teaching and learning process. Lecturers who do not understand students' condition will experience difficulties in facilitating the students' learning, resulting in unsuccessful learning process. Educators must prioritize a service excellence attitude by giving motivation to students so that they are able to learn independently and do their best. Teachers should pay attention to and understand the needs of students so that student achievement can be improved.

The inner model suggests that informativeness has the strongest effect on LMS quality (0.629), followed by usability (0.452). This finding implies that the implementation of e-learning using LMS with interactive learning system, materials packaged in multimedia-based learning (text, animation, video, and sound) can improve students' mastery of the materials and their quality of learning. Our research confirms that teacher quality, LMS quality, and learning content significantly affect e-learning quality so H1a, H2a, and H3a are supported.

DETERMINANT VARIABLES OF E-LEARNING SATISFACTION

The overall loading of the latent variables reflected via satisfaction is only influenced by learning content quality (0.535) and teacher quality (0.185) variables. Learning content quality, and teacher quality together explain 41.3% of the variance of satisfaction. The hypothesized path relationship between satisfaction and behavioral intention is statistically significant. So, H1b, H3b are supported. The hypothesized path relationship between LMS quality and satisfaction is not statistically significant. This is because its standardized path coefficient (-0.008) is lower than 0.1. As well as the hypothesized path relationship between e-learning quality and satisfaction is not statistically significant, standardized path coefficient (0.020) is lower than 0.1. Thus, we can conclude that teacher quality and learning content quality are both moderately strong predictors of satisfaction, but LMS quality and e-learning quality does not predict satisfaction directly. The hypothesized path relationship between LMS quality and satisfaction is not statistically significant. So, H2b are not supported. This is because its standardized path coefficient (-0.008) is lower than 0.1. As well as the hypothesized path relationship between e-learning quality and satisfaction is not statistically significant, standardized path coef-

ficient (0.002) is lower than 0.1. Thus, we can conclude that teacher quality and learning content quality are both moderately strong predictors of satisfaction, but LMS quality and e-learning quality does not predict satisfaction directly. Our research confirms that teacher quality and learning content significantly affect satisfaction so H1b and H3b are supported. LMS Quality and e-learning quality it is not affect satisfaction. So h2b and H4 are not supported.

IMPACTS OF E-LEARNING QUALITY AND SATISFACTION TOWARD BEHAVIORAL INTENTION

Based on Table 7, the coefficient of determination, R^2 , is 0.373 for the behavioral intention endogenous latent variable. This means that the two latent variables (e-learning quality, and satisfaction) moderately explain 37.3% of the variance in behavioral intention. The inner model suggests that satisfaction has the strongest effect on behavioral intention (0.484), followed by e-learning quality (0.226). The hypothesized path relationship between e-learning quality and behavioral intention is statistically H5 supported. E-learning quality has a higher value compared to satisfaction towards students' intention to use e-learning. This is in line with research conducted by Liaw (2008), satisfaction and quality of e-learning will positively influence students' behavioral intentions towards the use of e-learning. The hypothesized path relationship between satisfaction and behavioral intention is statistically H6 are supported.

CONCLUSIONS AND IMPLICATIONS

E-learning is one of the information technology innovations to disseminate information and knowledge, making it easy for individuals to learn flexibly, conduct the learning process according to student needs, and reduce the cost of learning. This study has identified and analyzed the quality of e-learning using a triangle consisting of teacher quality, the quality of an e-learning system, and the quality of lecture materials represented by learning content. This study also evaluates the impact of e-learning quality on satisfaction and the intention to use e-learning. The results of this study prove that two of nine variables significantly affect students' intention to continue using e-learning, including e-learning quality, satisfaction, content quality, teacher quality, and LMS quality. Therefore, to improve the quality of e-learning services in Indonesia, the Government of Indonesia needs to improve the quality of LMS that is tailored to the needs of users and learning content so that e-learning can be a better means of online learning. However, our research is limited to e-learning in Indonesia originating from one University. Future, research should cover the entire territories of Indonesia represented by several universities, both public and private.

This research contributes to the knowledge in the area of information systems, especially the management of e-learning. For universities, this research provides important information about indicators of e-learning service quality so that the success of e-learning development and implementation can increase e-learning users' interest in continuing to use e-learning. Most e-learning research only involves one aspect, for example, teacher quality aspects or service quality aspects. Meanwhile, this research involves many aspects as an e-learning component including teacher quality, LMS quality, and content quality, so that the proposed model brings together various aspects into one whole (integrative).

This research has shown that content quality, teacher quality (empathy, responsiveness, reliability, and assurance), and LMS quality (usability and informativeness) have a significant influence on the quality of e-learning based on student perceptions. However, LMS quality does not have a significant effect on satisfaction. This implies that the quality of LMS in Indonesia needs to be improved or adjusted to the needs of users. It is necessary to analyze and evaluate functional requirements of e-learning systems so that e-learning can be a better means of online learning.

The implications of our research to the literature is that it is expected to serve as a new reference in analyzing the variables that influence the quality of e-learning services in universities based on student perceptions. This study aligns with the research model adapted by the ServQual model (Cao et al., 2005; Parasuraman et al., 1988; Udo et al., 2011; Uppal et al., 2018). Furthermore, this study provides evidence that LMS quality affects e-learning quality, that content quality has the greatest influence on user satisfaction for using e-learning, and that student satisfaction affects the intention to use e-learning. Therefore, future studies should consider LMS quality and content quality as important indicators that influence the quality of e-learning services. Based on the results of the study, several recommendations can be made to e-learning management. For example, the management must focus more on variables that will influence e-learning quality including e-learning systems. Educators can understand the needs better and respond to students in terms of their questions and comments.

APPENDIX A

Student perceptions of e-learning service quality (Teacher Quality)

Variables	Indicator	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	SD
Assurance	AS1: Lecturers have knowledge in their fields	0	4.46	18.38	54.04	23.12	3.96	0.77
	AS2: Lecturers are fair and impartial in giving judgments	2.51	3.34	22.56	50.97	20.62	3.84	0.87
	AS3: The lecturer answers all Student questions thoroughly	0	5.57	31.2	41.22	22.01	3.80	0.84
	AS4: I believe lecturers have an understanding of the material provided	0.28	2.23	20.89	55.15	21.45	3.95	0.73
Empathy	EM1: Lecturers pay attention and care for students	1.95	6.13	37.05	48.46	6.41	3.51	0.78
	EM2: Lecturers understand the needs of students	1.67	8.35	40.95	40.95	8.08	3.45	0.82
	EM3: Lecturers provide the best assessment for students	1.67	4.18	30.36	52.37	11.42	3.68	0.79
	EM4: Lecturers encourage and motivate Students to do their best	0.56	7.52	27.02	49.86	15.04	3.71	0.83
Responsiveness	RS1: Lecturers respond to student needs quickly and efficiently	1.11	12.53	43.46	39.28	3.62	3.32	0.78

Variables	Indicator	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	SD
	RS2: Lecturers are willing to help students in solving problems	0.28	5.29	38.72	46.80	8.91	3.59	0.73
	RS3: Lecturers always respond to Student questions and comments	0.56	3.06	41.50	39.00	15.88	3.67	0.79
Reliability	RE1: Lecturers consistently provide material	0.28	5.57	36.21	31.48	26.46	3.78	0.91
	RE2: Lecturers are reliable	1.95	8.36	33.43	45.95	10.31	3.54	0.86
	RE3: Lecturer improves the information that has been provided if needed	0	3.34	39.00	47.35	10.31	3.65	0.70

APPENDIX B

Student perceptions of e-learning service quality (LMS Quality)

Variables	Indicator	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	SD
LMS Quality Usability	US1: User interface. The e-learning system is easy to use	4.74	29.81	38.16	21.72	5.57	2.94	0.962
	US2: The e-learning system is fast and easily accessible	2.79	32.87	34.26	23.95	6.13	2.98	0.963
	US3: The e-Learning system includes a variety of learning activities	2.79	10.03	33.98	42.34	10.86	3.48	0.915
	US4: The e-Learning system is easily managed by Students	1.67	12.53	31.48	38.72	15.60	3.54	0.956
LMS Quality Informativeness	IN1: e-learning system uses multimedia features	0.56	19.50	25.63	41.78	12.53	3.46	0.962
	IN2: e-learning system provides useful information	0	2.79	27.86	43.45	25.90	3.92	0.803

Variables Affecting E-Learning Services Quality

Variables	Indicator	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	SD
	IN3: e-learning system provides accurate information	0.28	12.26	27.86	39.55	20.05	3.67	0.942
	IN4: e-learning system provides quality information	0.84	8.36	30.08	50.70	10.02	3.61	0.811
	IN5: Information on e-learning websites is relevant to the courses taught	0.56	6.41	27.58	43.18	22.27	3.80	0.876

APPENDIX C

Student perceptions of e-learning service quality

Dimension	Indicator	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	SD
Learning Content Quality	LC1: The e-learning system has good audio	1.67	8.36	35.10	47.91	6.96	3.50	0.811
	LC2: The e-learning system uses video elements correctly	0.56	6.13	18.94	57.38	16.99	3.84	0.794
	LC3: e-learning system uses animation / images correctly	0.56	18.94	32.87	40.95	6.68	3.34	0.879
	LC4: The e-learning system uses multimedia features correctly	1.95	3.34	19.22	50.97	24.52	3.93	0.862
E-learning Quality	EQ1: e-learning system has updated usage instructions	3.62	23.12	40.67	27.86	4.73	3.07	0.917
	EQ2: The e-learning system has usage instructions	5.85	29.25	30.64	28.97	5.29	2.99	1.015

Dimension	Indicator	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	SD
	EQ3: The e-learning system has clear usage instructions	1.67	22.01	40.95	27.57	7.80	3.18	0.919
Satisfaction	SA1: I am satisfied with my decision to learn to use the e-learning system	2.51	13.93	35.65	37.88	10.03	3.39	0.933
	SA2: I feel my decision is wise to register in e-learning	0.84	3.90	29.81	50.42	15.03	3.75	0.786
	SA3: I feel that my experience with e-learning is very fun	2.51	20.06	35.65	34.54	7.24	3.24	0.939
Behavioral Intention	BI1: I intend to continue using e-learning in the future	0.84	10.03	40.39	41.22	7.52	3.45	0.806
	BI2: I would recommend e-learning to other students	0.56	8.08	33.70	49.30	8.36	3.57	0.780
	BI3: I always try to use the e-learning system anytime and anywhere to support lectures	1.95	10.58	31.20	50.42	5.85	3.48	0.835

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