



# Performance expectancy of E-learning on higher institutions of education under uncertain conditions: Indonesia context

Raden Edi Sewandono<sup>1</sup> · Armanu Thoyib<sup>1</sup> · Djumilah Hadiwidjojo<sup>1</sup> · Ainur Rofiq<sup>1</sup>

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## Abstract

Performance expectancy is the expected impact of a technology's functional advantage even in uncertain conditions. This study suggests that the learning collaboration quality, information quality, and course content support impact the actual use of e-learning and satisfaction perceived by the user, resulting in performance expectancy that meets stakeholder expectations. This study outlines the theoretical model for defining student success in e-learning systems through a theory of online collaborative learning. The research examines the empirical data gathered from 109 postgraduate doctoral students' participated in the postgraduate universities in Indonesia. The research attempts to focus specifically on how the actual use of e-learning and satisfaction perceived by users mediates the influence of learning collaboration quality, information quality, and course content support on performance expectancy to enhance the sustainability and performance of e-learning in Indonesian universities. The study shows that the learning collaboration quality, information quality, and course content support have no impact on performance expectancy, while each of the constructs indirectly impacts the performance expectancy through the actual use of e-learning. Conversely, the learning collaboration quality and course content support have not indirectly influenced toward performance expectancy by satisfaction perceived by the user as mediator except the information quality.

**Keywords** Learning collaboration quality · Information quality · Course content support · Actual use of e-learning · Satisfaction perceived by user · Performance expectancy

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## 1 Introduction

Indonesia has 470 universities that have postgraduate's programs, only 54 universities have been registered to conduct doctoral programs (Dikti 2019). Almost all of those programs use direct learning methods or face-to-face lectures. By uncertain conditions like pandemic events, normal learning was thrown into a state of turmoil. The government enforces a lockdown system to the higher institutions of education institution and postgraduate students have stayed with their parents and personality-quarantined together (UNESCO 2020).

Uncertainty refers to the inability to foretell consequences or outcomes because there is a lack of knowledge or bases on which to make any predictions. Since the impact of the pandemic and its responses are likely to hit disproportionately communities (Paton et al. 2020; Tai et al. 2020) that are left out of knowledge production by the academic institutions (Gillborn and Mirza 2000).

Whenever the COVID-19 outbreak is causing urgent action throughout higher education, the Directorate of higher education Indonesia (Dikti) made substantial changes to its Code of Ethics and Professional Practices, which forced urgent strategic decisions in a matter of months. Then, the COVID-19 pandemic struck, complicating every facet of higher education. While higher education institutions are adapting to the new Dikti rules, they're facing the challenges posed by a global pandemic. From making immediate changes to how classes are administered to supporting students from a distance, these unprecedented challenges are plaguing higher education institutions.

Following that rules, all higher education in Indonesia are required to implement a study from home and several universities conduct e-learning education systems. Some lecturers have documented and uploaded their tutorials to access online for learners and are protected by a wider concept of technology-based learning through learning portals & web conferencing as blended learning resources. E-learning platforms are expected to facilitate providers of learning to organize, schedule, deliver and monitor the process of learning and teaching. Most of the postgraduate student expects e-learning systems can be accessed using their information technology devices, that will support to make certain for continuous education during the pandemic.

Scholars have defined e-learning similar to the distance education method as “planned learning that normally occurs in a different place from teaching, requiring special techniques of course design and instruction, communication through various technologies, and special organizational and administrative arrangements.” (Moore and Kearsley 2011). During the uncertain condition, planned learning has the urgency to develop because it is critical to emphasize “planned” within this definition to help us position the systematic considerations, resources, training, and development that are implemented to support distance learning. As stakeholders with expertise in designing, planning for, and implementing learning experiences using online tools and digital materials, the government has created this resource to clarify the various types of distance learning that will likely take

place this fall, as well as propose possible scenarios for e-learning process during and in the wake of a pandemic outbreak.

A survey conducted by Indonesia's consultant of 27,046 teachers in 34 provinces shows that teachers still face various obstacles and need more support to carry out education amid a pandemic. As many as 43% of teachers admitted that they needed to improve competence in education management in an emergency, 43% did not understand effective and efficient learning methods, 37% needed incentives and/or access to internet or pulse quotas, 31% needed monitoring and supervision from various parties, 27% need teaching materials according to the new curriculum, 26% need communication tools, and 21% need guidance for learning (Wahana Visi Indonesia, 2020).

As a solution to this problem, most school principals are now supporting online education and enhance learning quality (UNESCO 2020). Larger universities have been steadily shifting their programs online over the past decade and removing face-to-face delivery (Bao 2020), which formerly only use distribution by face-to-face teaching. The change to the online way, however, has caused concerns about the standard of education (Sahu 2020) where there are many challenges to adopt the e-learning system for higher institutions of education institutions in the Indonesian context.

In reality, the availability and use of online studying content in the e-learning portal have become a major issue for many educational institutions. Due to its ubiquitous (accessibility everywhere and every time), Affordable, accessibility, and user experience, the e-learning system is an essential source of knowledge to facing uncertain conditions. Ülker and Yilmaz (2016) have stated that the handle of the Learning Management System (LMS) is one approach to succeed the implementation of e-learning system during the uncertain condition,

E-learning, therefore, includes providing, arranging, and handling e-learning activities within a structure, for instance, student registration, tests, tasks, details of lessons, course materials, emails, and syllabus (Haghshenas 2019). This will facilitate learners to access e-learning systems such as performance e-learning dashboard 24 hours a day by switching from conventional learning and offers many advantages, such as the quality and effectiveness of learning facilities by improving lecturer accessibility and improving access to study resources (Idris and Osman 2015).

Apart from several positive aspects above, cannot be denied that the optimization of the e-learning system at a higher education institution is determined by the synergy between lecturers, students, managers of the e-learning system, and campus leaders. E-learning system will run optimally if both lecturers and students utilize the e-learning system in the teaching and learning process. Therefore, research that aims to find out whether the e-learning system that has been provided by the campus has been well performed and utilized optimally by lecturers and students becomes very important.

Some research regarding the performance of e-learning has been conducted, for example, e-learning acceptance and performance (Akbar 2013; Marchewka and Kostiwa 2007; Tan 2013), distance learning acceptance in Taiwan (Wang et al., 2009), mobile learning performance in the United Kingdom (Abu-Al-Aish & Love, 2013), and then performance expectancy, effort expectancy, and facilitating

conditions (Yahaya et al. 2017). However, only a few studies have discussed the issue of the performance of e-learning, especially in uncertain conditions.

Major universities have problems realizing the e-learning system and implement the e-learning process during uncertain conditions. There are 3 (three) most problem that often occurs which influencing performance expectancy, i.e.: information quality, learning quality, and course content. The problems have been identified that performance expectancy although significant is a determinant of the intention to use technology-related applications (Davis, 1989).

The employing of e-learning system has failed to be applied by postgraduate students in its higher institutions of education because technology challenges are difficult (Almaiah and Almulhem 2018; Al-Araibi et al. 2019; Almaiah and Alyoussef 2019), lack of technical support by high internet traffic and slow speed of internet (Eltahir 2019), lack of faculty members acceptance of e-learning systems (Vershetskaya et al. 2020) and lack of technology infrastructure relate to hardware, software, services, and networking system within higher institutions of education (Almaiah and Almulhem 2018).

Therefore, the other barriers are course content with lower interactivity quality (Almaiah and Alyoussef 2019; Almaiah and Almulhem 2018), lack of clarity, the correctness of course subject, and mismatch of course material with the requirement for learners (Ozudogru and Hismanoglu 2016; Almaiah and Alyoussef 2019; Almaiah and Almulhem 2018). Whereas many research studies showed that e-learning systems improve student performance in universities because of the high quality of course content and information quality (Aldowah et al. 2019; Al-Fraihat et al. 2018; Ahmad et al. 2018; Salloum & Shaalan, 2018). Therefore, this in conclusion effort to fill this research gap by analyzing the effect of implementing an e-learning system on performance expectancy in higher institutions of education institutions.

Subsequently, the theory of online collaborative learning (OCL) uses the internet as a source of learning through the flexibility of using and combining synchronous and asynchronous network technology, the principle of online collaboration tries learning process accessible (Garrison, 2006a, b). The theory emphasizes the internet as a means of learning into the encouragement of partnerships and knowledge building. The three core elements of a group inquiry, social presence, cognitive presence, and teaching presence, are defined by collaboration and development. Social presence represents the willingness to communicate on a personal level with members of a group of learners. The process of creating meaning through collective analysis is cognitive presence. Finally, the main incorporating influence that constructs and leads the educational process in a positive, mutually supportive, and adequately is the teaching presence. Through these practices, the educational process is driven by an e-learning structure that influences the willingness of postgraduate students to adopt e-learning courses. E-learning requires the allow of the internet to connect the accuracy and awareness of information with support for course material (Aparicio et al., 2014). Predictors of an embrace of e-learning are perceived utility, simplicity of use, and desired enjoyment, which are the key determinants of e-learning systems' acceptance (Cheng 2011).

To fulfill this gap based on the online collaborative learning theory, this study examines how e-learning impacts the overall use of e-learning, and satisfaction

perceived by the user, and the leveraging performance expectancy. The object of the present study to examine the influence of learning collaboration quality, information quality, and course content support on satisfaction perceived by the user and actual use of E-learning system increase on the performance expectancy of e-learning during uncertain conditions that would be meet stakeholder expectations.

## 2 Literature review

### 2.1 Theory of online collaborative Learning (OCL)

Online collaborative learning theory (OCL) provides an enabling approach to deep learning through learning strategies to leverage student accomplishments (Garrison and Cleveland-Innes, 2005). Collaborative learning involves learners create content and develop skills in the same way as teachers in technologically controlled, communicative, and sustainable conditions (Royle and Nikolic 2013). The acquisition of information relies upon interactive learning, the use of the internet, and learner information (Harasim 2017) to exchange experiences and use prior expertise and experience to solve the appropriate alternative solutions (Dewiyanti et al. 2007). Conceiving an online learning experience is an enormous challenge. The Method of influential collaboration is textual Information exchange (interpreting and composing) when creating an online learning experience. Designing an online learning environment involves taking social and cognitive problems into account on the front-end – problems with which postgraduate students must be able to communicate formally and informally with colleagues. There is evidence to indicate that design and social presence are related (Tu and McIsaac 2002). Previous findings have shown that the promotion of higher social capacity has a strong intentional influence of continuing to implement e-learning through more communication resources in courses that enable students to enhance the student's community involvement (Brahmasrene and Lee 2012). Selim (2003) found that web courses are easy to use as the main driving force for implementation as an accessible and reliable e-learning platform. It is well known how necessary it is to encourage discussion for effective and satisfactory online learning. The facilitator focuses on the discussion, supports commitment, promotes a conversational approach, provides relevant information links, and resolves problems.

When using an e-learning environment, the satisfaction of the student in determining the efficacy of e-learning should be regarded. The level of e-learning student satisfaction plays a key role in the adoption of e-learning. Some studies have shown that participants who engaged in online learning collaboration activities are more pleased with their learning processes than students who did not engage in collaboration online learning (Jung et al. 2002). In web-based collaborative learning, therefore, a student can be defined as a degree to which his or her own collaborative learning experience is positively linked (Dewiyanti et al. 2007). Online learning allows students to create, exchange information, essential exercise, synthesize testing, and collaborate written tasks to improve knowledge building through e-learning (Zhu 2012). Based on the OCL framework, this study, therefore, identifies

satisfaction perceived by the user and the actual use of the method of e-learning as an essential tool for efficient e-learning.

## 2.2 Performance expectancy

E-learning has been implemented in learning, but e-learning needs a good and planned evaluation as material for recommendations and further improvements. Evaluation of the implementation of e-learning is carried out to test the effectiveness of the e-learning system so far held. The quality of e-learning can be said to be good if the e-learning is tested and always revised or improvements to the system and its operation. This evaluation is one of the steps important in measuring the quality of e-learning delivery which is conducted. Several studies explain that the quality of information technology implementation is just like e-learning will always be in touch with voluntary user acceptance (Yulius [2016](#)). Therefore, the extent of understanding and acceptance of users (lecturers and postgraduate students) towards e-learning implementation is decisive the quality of the success of the implementation.

Performance expectancy (PE) has been explored and defined from different perspectives. Whereas the construct was originally conceptualized as the degree to which an individual believes that using the system will help to attain gains in job performance (Venkatesh et al. [2003](#)), it has been operationally modified from several vantage points (Ani [2013](#); Engotoit et al. [2016](#); Jambulingam [2013](#)). Within the context of this study, PE is defined as the extent to which the use of e-learning is believed to enhance faculty research productivity. However, the extent to which faculty believe that using the resources would improve their research prospects (performance expectancy) varies significantly. For example, 77% of respondents who are in the professorate cadre submitted in a study that they constantly obtain teaching and research information from e-learning's database (Nwone and Mutula [2019](#)). For these individuals, the frequency with which they obtain information from the e-learning databases will reveal their PE level of the technology.

In connection with this explanation, an evaluation approach must be a solution. Because, the emphasis of evaluation on user acceptance of e-learning, then the technology acceptance model is considered most appropriate to use. One of the reception models of technology that is widely used is the unified theory of acceptance and use of technology (UTAUT). UTAUT model as a comprehensive synthesis before research acceptance of technology. UTAUT model has experienced the development from before has four keys construct, consist of performance expectancy, business expectancy (effort expectancy), social influence (social influence), and the conditions of the facilities (facilitating conditions) against behavior intention for acceptance technology (use technology). performance expectancy is the level of individual believes that the use of the system can help him gain benefits in his activities (Venkatesh et al. [2003](#)). Meanwhile, performance expectancy is that an individual will use an information system if the system can help to improve its performance. According to Venkatesh et al. ([2003](#)), this variable is composed of 5 variables from

several previous models, namely: perceived usefulness, extrinsic motivation, job-fit, relative advantage, and outcome expectations.

Several researchers such as Anderson and Elloumi, (2004), Chua et al. (2005), and Walters (2010) have studied how online learning systems can provide various advantages for educational institutions in terms of communicating with students, especially in educational institutions with an increasing number of students. This system is believed to be able to help educational institutions reach more students. Garrison dan Innes, (2005) explained that with an online learning system, postgraduate students do not need to be present in class for face-to-face teaching and learning by the teacher. Much of the teaching and learning process is done via the internet. The system can help teachers communicate, share, and discuss various things with postgraduate students anywhere and anytime. Teaching materials can be made more interesting with videos, sounds, and various information from the internet. However, apart from the advantages and disadvantages of the online learning system, there is an important question regarding the performance expectancy of the system for users of the online learning system. Can online learning systems provide good performance expectancy for postgraduate students and teachers who have used them? It is said to be good, of course, when compared to conventional learning systems. With an online learning system, teachers cannot know what postgraduate students are doing during the learning process. They also cannot easily confirm whether the postgraduate students understand the material that has been taught properly. On the other hand, many postgraduate students also said that it was impossible to understand the material well without face-to-face teaching. These things can create poor performance expectancy of online learning systems when compared to conventional learning systems.

The results of a survey on expectations of stakeholders by the Jakarta educational research institute in mid-2020, using 230 student respondents in Jakarta. From the results of this analysis, the level of achievement of stakeholder expectations in 2020, the highest is on the parameter of Capacity Increase Education and education personnel (89.61%). The value of achieving the lowest expectations is in the parameters of the education program or curriculum with a value of 73.80%, and the quality of education services with a value of 68.20%. these results require increased expectations to reach the peak expectations of the stakeholders (Dikti 2019).

### 2.3 Stakeholder on education

Education stakeholders are several people who collaborate and interact with each other to achieve common goals for education. In essence, education stakeholders have the same commitment to achieving common goals. Stakeholders are the key to the success of managing the educational curriculum of an educational institution or school. For schools that have weak stakeholders, the quality of education from the school will have a bad impact or even decline. Higher Education stakeholders consist of campus leaders or postgraduate school principals, lecturers, school employees, students, and education quality managers, the community, and the government (Dede 2004).



In the context of the school, stakeholders are the school community who are citizens or individuals who are in the school and around the school who are directly or indirectly related to school management, have social awareness, and influence the school. Stakeholders are all related components that have the same rights and obligations in planning, implementing, and supervising educational programs. In general, the term stakeholder is defined as a stakeholder. In simple terms, stakeholders are.

Professor Hattie (2009) from the University of Auckland in his research stated that the factors that influence the learning effect are 40% students, 7% peers, 7% schools, 7% home and 30% teachers and the rest are principals as other stakeholders. The study used a meta-analysis to estimate the effect on student achievement from several stakeholder factors.

Stakeholders' expectations of e-learning performance include the quality of interaction between lecturers and students that can accelerate the formation of values in the lecturing and learning process; the quality of the information system; the quality of staff who know and have skills to operate the internet; curriculum quality that supports e-learning; and support for appropriate learning modules (Bullen 2001; Beam 1997).

## 2.4 Theoretical model

This study modulates to achieve performance expectancy by implementing the e-learning system in Indonesian universities. This study focuses on performance expectancy, performance expectancy can be measured on each individual subject or group with influencing variables so that they can be compared as long as the two individuals or groups being compared are equal or homogeneous. This consideration is also reinforced by the research of Venkatesh et al. (2012) and Min et al. (2008), where performance expectancy is one of the things that encourage someone to use a system. The framework developed is based on the previous theory of online collaboration learning, performance expectancy and information quality.

### 2.4.1 Constructs

The developed research framework involves 6 (six) theoretical constructs: learning collaboration quality (LCQ), information quality (IQ), course content support (ACSS), satisfaction perceived by user (SPU), the actual use of e-learning (AUE), and performance expectancy (PE). The learning collaboration quality represents the web environment, digital society and widespread apply of the portal on many platforms, including mobile devices and laptops (Urbach et al. 2010; Cidral et al. 2018). Information Quality is certain aspects, such as effectiveness, relevance and consistency that are necessary for the reliability of e-learning system expertise (Cidral et al. 2018). The use of multimedia elements with strong content and effective teaching approaches may have a major effect on the learning process that enhance learning by engaging and inspiring students (Tchoubar 2014). Satisfaction perceived by user (student) is an indicator of the overall student satisfaction level (Sun et al. 2008).



Use measures for students to actually use the e-learning system to carry out their learning practices, for instance, to acquire, publish and share knowledge with others (Cidral et al. 2018). The performance expectancy is the level that postgraduate students take advantage from using an e-learning system in uncertain conditions.

### 2.4.2 Hypotheses

On the basis of the results of Urbach et al. (2010), the quality of the collaboration has become an important factor in perceived usefulness and user satisfaction. The project therefore offers opportunities for value creation, training groups and shared expertise (Urbach et al. 2010). For promoting collaborative projects, the productivity of the various collaborative components, ease of use, productivity, and simplicity of cooperation, enabling information sharing and knowledge exchange on multifunctional channels (such as LMS, networks and social media). The present study therefore hypothesizes that:

H1a. Learning Collaboration Quality has a significant impact on the performance expectancy.

H1b. Learning Collaboration Quality has a significant impact on the actual Use of e-learning systems.

H1c. Learning Collaboration Quality has a significant impact on the Satisfaction perceived by user.

Good information offers knowledge consistency about its utility, comprehensibility, and robustness (DeLone and McLean 1992; Fig. 1). Many findings have shown that information quality has had a significant influence on the actual Use of e-learning systems and Satisfaction perceived by User (Student) (Urbach et al. 2010; Cidral et al. 2018; Shahzad et al., 2020). Information quality can also significantly influence employee success (DeLone and McLean 2002). The present study therefore hypothesizes that:

H2a. Information Quality has a significant impact on the performance expectancy.

H2b. Information Quality has a significant impact on the actual Use of e-learning systems.

H2c. Information Quality has a significant impact on the Satisfaction perceived by user.

The applying of multimedia elements with strong content and effective teaching approaches represents course content support that enhance learning by engaging and inspiring students (Tchoubar 2014). The course content support has had a significant effect on the actual Use of e-learning portals by audio recordings and animations that learners create content and develop skills in the same way as teachers in a technologically controlled, communicative and sustainable conditions (Wahana Visi Indonesia 2020). The course content support was found to have a positive effect on the performance expectancy of

e-learning systems (Almaiah and Alyoussef 2019). In addition, the utilization of discussion and chat boards allows students to interact and interchange their opinions and experiences asynchronously with their teachers. Course content support can also significantly influence satisfaction perceived by user because of the student success from an advanced technologies while conducting a specific task (Almaiah and Alyoussef 2019; Venkatesh et al., 2012). The present study thus the hypothesizes that:

H3a. Course content support has a significant impact on the performance expectancy.

H3b. Course content support has a significant impact on the actual Use of e-learning systems.

H3c. Course content support has a significant impact on the Satisfaction perceived by user.

The more the end-user satisfaction, the grander the individual effect (Shahzad et al. 2020; Urbach et al. 2010). User perceived satisfaction and their performance such as academic achievement are the key factors which are essential to determine if an innovative learning process can be implemented in a practical environment. (Zhu 2012). Thus the, the present study hypothesizes which:

H4. The Satisfaction perceived by user has a significant impact on the performance expectancy.

The use of information portals is certainly linked to the performance of individuals (Cidral et al. 2018; Tam and Oliveira 2016; Urbach et al. 2010). If the understanding of use by e-learners is matched with their preferences, students may perform their assignments in a more productive way. The extra students utilize e-learning systems, the further those who define improving student effects (Aparicio et al. 2016). The use of e-learning benefits the student when performing a particular activity (Venkatesh et al. 2012). Thus the, the present study hypothesizes which:

H5. The Actual Use of e-learning systems has a significant impact the performance expectancy.

Based above arguments, The Satisfaction perceived by user and The Actual Use of e-learning systems have a significant role in mediating the total effect of Learning Collaboration Quality, Information Quality, and Course content support on Performance expectancy. Thus, the hypotheses proposed is:

H6a. The Satisfaction perceived by user mediates the impact of Learning Collaboration Quality on Performance expectancy.

H6b. The Satisfaction perceived by user mediates the impact of Information Quality on Performance expectancy.

H6c. The Satisfaction perceived by user mediates the impact of Course content support on Performance expectancy.

H7a. The Actual Use of e-learning systems mediates the impact of Learning Collaboration Quality on Performance expectancy.

H7b. The Actual Use of e-learning systems mediates the impact of Information Quality on Performance expectancy.

H7c. The Actual Use of e-learning systems mediates the impact of Course content support on Performance expectancy.

### 3 Methodology

#### 3.1 Data collection and sample

The research employed a quantitative approach, with descriptive exploratory research. Data for the main study were received from the postgraduate doctoral students in Indonesian Universities. In collecting the data, an e-mailing questionnaire was distributed to gather the responses from postgraduate students. The random sampling technique has been used where the research used a cross-sectional survey method. In Table 1, resulting in data were gathered from 109 postgraduate doctoral students that studied on postgraduates' doctoral programs in Indonesian Universities.

#### 3.2 Instrument development

Based on the literature review, the researcher has identified five variables (Course content support; Information Quality; Learning Collaboration Quality; The Actual Use of e-learning systems; The Satisfaction perceived by users contributing to performance expectancy. For instance, respondents were asked to state all the items, using a five-point scale with endpoints

**Table 1** Demographic Profile of Respondents (N = 109)

Demographics	respondent percentage (%)	Frequency	Percentage
Gender			
Male		63	57,79%
Female		46	42,20%
Age-Group			
21–30 years		36	33,02%
31–40 years		45	41,28%
41 years above		28	25,68%
Experience Using the E-learning Portal			
Less than 1 year		47	43,11%
More than 1 to 2 years		49	44,95%
More than 3 years		16	14,67%

“Strongly disagree” (1) and “strongly agree” (5). Learning Collaboration Quality was measured by four items which enable easy and comfortable communication, sharing information more effectively and efficiently, storing, and sharing documents more comfortably, locating my colleagues’ contact information more easily and quickly (Urbach et al. 2010; Cidral et al. 2018). Information Quality was measured by four items that information provided by e-learning system are useful, understandable, interesting, reliable (Urbach et al. 2010; Cidral et al. 2018). Course content support was measured by three items that e-learning courses use multimedia features, discussion forum, and chat, and applying video animation (Almaiah and Alyoussef 2019). The Actual Use of e-learning systems was measured by five items to perform tasks are retrieved information, publish communication, communicate with classmates and lectures, store and share documents, execute coursework (Cidral et al. 2018). The Satisfaction perceived by the user was measured by four items the e-learning system is adequately supporting the study, efficient process, effective process, satisfied on the whole (Shahzad et al. 2020; Cidral et al. 2018). The performance expectancy was measured by four items the e-learning system is to accomplish a task quickly, to increase productivity, easy to accomplish a task, to be useful for my job (Cidral et al. 2018). The questionnaire was derived from previous studies with validated measurement scales that analyzed the constructs in a query in the present study. The Instrument Constructs and Indicators (Variable and Item indicator) explained in Appendix 1.

## 4 Results

In order to understand the direct and indirect impact of learning collaboration quality, information quality, course content support, with the mediating influence of satisfaction perceived by user and the actual use of e-learning on performance expectancy in Indonesian universities, a statistical SmartPLS software package was used for PLS-SEM (Partial Least Square Structure Equation Modeling) data analysis.

### 4.1 Convergent validity

The convergent validity of the assessment is generally calculated by analyzing the loadings, the average extracted variance (AVE) and also the composite reliability. The loadings were all bigger than 0.708, the composite reliabilities were all bigger than 0.7 and the AVE of all constructs was also bigger than 0.5 as indicated in the literature (see Table 2).

Table 2 above informs that both Composite Reliability (0.7) and Convergent Validity methods have been used and it informs that the Average Variance Extracted values (0.5) are Bigger than the standard rates for all constructs. It supports the Composite Reliability and convergent validity of the constructs.

**Table 2** Convergent Validity

Constructs	Items	Loadings Factor	Cronbach	rhoA	Composite Reliability	AVE
Learning Collaboration Quality (LCQ)	LCQ1	0,858	0,880	0,889	0,917	0,734
	LCQ2	0,835				
	LCQ3	0,856				
	LCQ4	0,878				
Information Quality (IQ)	IQ1	0,753	0,921	0,933	0,946	0,815
	IQ2	0,947				
	IQ3	0,939				
	IQ4	0,955				
Course Content Support (CCS)	CCS1	0,887	0,837	0,845	0,902	0,754
	CCS2	0,823				
	CCS3	0,894				
Actual use of E-learning System (AUE)	AUE1	0,939	0,949	0,950	0,961	0,833
	AUE 2	0,946				
	AUE 3	0,948				
	AUE 4	0,854				
	AUE 5	0,873				
Satisfaction Perceived by user (SPU)	SPU1	0,853	0,916	0,923	0,941	0,800
	SPU 2	0,860				
	SPU 3	0,923				
	SPU 4	0,939				
Performance expectancy (PE)	PE1	0,848	0,895	0,896	0,927	0,760
	PE2	0,866				
	PE3	0,888				
	PE4	0,885				

**Table 3** Discriminant Validity (HTMT Ratio)

	AUE	LCQ	CCS	IQ	SPU	PE
AUE						
LCQ	0.729					
CCS	0.779	0.616				
IQ	0.852	0.759	0.881			
SPU	0.755	0.876	0.642	0.778		
PE	0.833	0.874	0.646	0.816	0.854	

## 4.2 Discriminant validity

This new suggested approach was also used to check the discriminant validity in the form of Heterotrait-Monotrait ratio of correlations and the results are informed in Table 3. If the  $HTMT_{0,90}$  surpassed the value of 0.90 (Gold et al. 2001), then there is

problem of discriminant validity. As all the values are less than the  $HTMT_{0.90}$  (Gold et al. 2001) informed in Table 3 that discriminant validity has been identified.

### 4.3 Hypothesis testing results

The fit model was first tested before testing the hypothesis using two suitable parameters: Standardized Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI). The SRMR is defined as the difference between the observed correlation and the model-implied association matrix, whereas values below 0.08 (Hu and Bentler 1998) are recognized as a good fit. Henseler et al. (2015) implemented the SRMR as a fit test for PLS-SEM which can be used to avoid model inaccuracies. The second fit index is a Normed Fit Index (NFI), an accumulative fit metric that measures the Chi-square value of the proposed model and links that value to a meaningful parameter (Bentler and Bonett 1980). NFI values above 0.9 generally contain acceptable fit. The model's data fits are acceptable since the SRMR value was 0.072 ( $< 0.08$ ) and the NFI was 0.928 ( $> 0.90$ ).

The analysis informed in Table 4 describes standardized study model path coefficients (beta coefficients in which the findings are interpreted from a regression analysis). Table 4 and Fig. 2 describe that the path coefficients from Learning Collaboration Quality to Performance expectancy was positive but non-significant (Standardized coefficient = 0.018;  $p > 0.05$ ), the path coefficients from Learning Collaboration Quality to Actual Use of e-learning systems was also positive and significant (Standardized coefficient = 0.344;  $p < 0.01$ ), and the path coefficients from Learning Collaboration Quality to Satisfaction perceived by the user was also positive but non-significant (Standardized coefficient = 0.134;  $p > 0.05$ ). Thus, H1a and H1c are rejected but H1b is supported.

The path coefficients from Information Quality to performance expectancy was positive but non-significant (Standardized coefficient = 0.006;  $p > 0.05$ ), the path coefficients from Information Quality to Actual Use of e-learning systems was also positive and significant (Standardized coefficient = 0.286;  $p < 0.01$ ), and the path coefficients from Learning Collaboration Quality to Satisfaction perceived by the user was also positive and significant (Standardized coefficient = 0.633;  $p < 0.01$ ). Thus, H2a is rejected but H2b and H2c are supported.

The path coefficients from Course content support to performance expectancy was positive but non-significant (Standardized coefficient = 0.195;  $p > 0.05$ ), the path coefficients from Course content support to Actual Use of e-learning systems was also positive and significant (Standardized coefficient = 0.354;  $p < 0.01$ ), and the path coefficients from Course content support to Satisfaction perceived by the user was also positive and significant (Standardized coefficient = 0.181;  $p < 0.05$ ). Thus, H3a is rejected but H3b and H3c are supported.

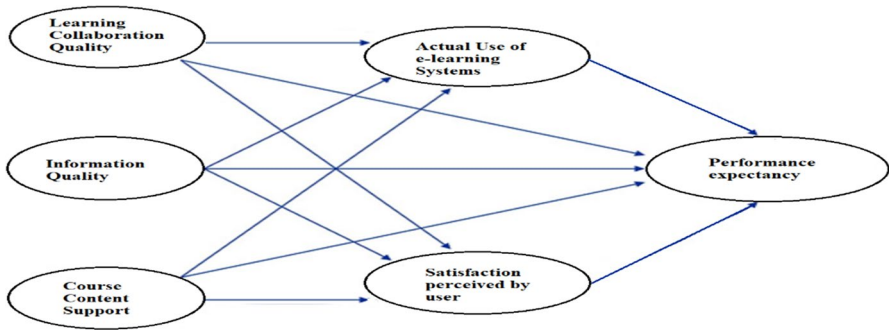
The path coefficients from Satisfaction perceived by the user to performance expectancy was positive and significant (Standardized coefficient = 0.423;  $p < 0.01$ ), and the path coefficients from Actual Use of e-learning systems to performance expectancy was also positive and significant (Standardized coefficient = 0.292;  $p < 0.05$ ). Thus, H4 and H5 are supported.

**Table 4** Results of the Hypothesis Testing

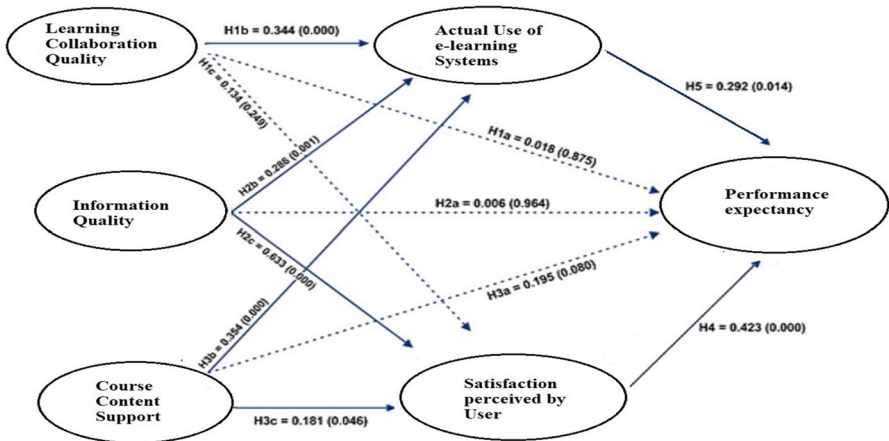
Hypothesis	Relationship	Standard Coefficients	Test Result
$H_{1a}$	Learning Collaboration Quality $\rightarrow$ performance expectancy	0,018	Non-Significant
$H_{1b}$	Learning Collaboration Quality $\rightarrow$ actual Use of e-learning systems	0,344 *	Significant
$H_{1c}$	Learning Collaboration Quality $\rightarrow$ Satisfaction perceived by user	0,134	Non-Significant
$H_{2a}$	Information Quality $\rightarrow$ performance expectancy	0,006	Non-Significant
$H_{2b}$	Information Quality $\rightarrow$ actual Use of e-learning systems.	0,286 *	Significant
$H_{2c}$	Information Quality $\rightarrow$ Satisfaction perceived by user	0,633 *	Significant
$H_{3a}$	Course content support $\rightarrow$ performance expectancy	0,195	Non-Significant
$H_{3b}$	Course content support $\rightarrow$ actual Use of e-learning systems	0,354 *	Significant
$H_{3c}$	Course content support $\rightarrow$ Satisfaction perceived by user	0,181 **	Significant
$H_4$	Satisfaction perceived by user $\rightarrow$ performance expectancy	0,423 *	Significant
$H_5$	Actual Use of e-learning systems $\rightarrow$ performance expectancy	0,292 **	Significant
$H_{6a}$	Learning Collaboration Quality $\rightarrow$ Satisfaction perceived by user $\rightarrow$ performance expectancy	0,057	Non-Significant
$H_{6b}$	Information Quality $\rightarrow$ Satisfaction perceived by user $\rightarrow$ performance expectancy	0,266 **	Significant
$H_{6c}$	Course content support $\rightarrow$ Satisfaction perceived by user $\rightarrow$ performance expectancy	0,076	Non-Significant
$H_{7a}$	Learning Collaboration Quality $\rightarrow$ Actual Use of e-learning systems $\rightarrow$ performance expectancy	0,101 **	Significant
$H_{7b}$	Information Quality $\rightarrow$ Actual Use of e-learning systems $\rightarrow$ performance expectancy	0,084 **	Significant
$H_{7c}$	Course content support $\rightarrow$ Actual Use of e-learning systems $\rightarrow$ performance expectancy	0,104 **	Significant

\* $p < 0,01$ ; \*\* $p < 0,05$





**Fig. 1** A conceptual model of incorporation of performance expectancy and UTAUT models



**Fig. 2** Result of Path Analysis. Notes: -----> Non-significant; —> Significant

The indirect effects of Learning Collaboration Quality on Performance expectancy through Satisfaction perceived by the user were also positive but non-significant (indirectly standardized coefficient=0.057;  $p > 0.05$ ; *Sobel Test*  $Z = 1.016$ ), which is non-supported. The indirect effects of Information Quality on Performance expectancy through Satisfaction perceived by the user as a full mediator were also positive and significant (indirect standardized coefficient=0.266;  $p < 0.05$ ; *Sobel Test*  $Z = 2.601$ ), which is supported and full mediation. The indirect effects of Course content support on Performance expectancy through Satisfaction perceived by the user was also positive but non-significant (indirect standardized coefficient=0.076;  $p > 0.05$ ; *Sobel Test*  $Z = 1.732$ ), which is non-supported.

The indirect effects of Learning Collaboration Quality on Performance expectancy through Actual Use of e-learning systems as a full mediator were also positive and significant (indirect standardized coefficient=0.101;  $p < 0.05$ ; *Sobel Test*  $Z = 2.095$ ), that is supported and full mediation. The indirect effects of Information Quality on Performance expectancy through Actual Use of e-learning systems

as a full mediator were also positive and significant (indirect standardized coefficient = 0.084;  $p < 0.05$ ; *Sobel Test*  $Z = 1.973$ ), which is supported and full mediation. The indirect effects of Course content support on Performance expectancy through Actual Use of e-learning systems was also positive and significant (indirect standardized coefficient = 0.104;  $p < 0.05$ ; *Sobel Test*  $Z = 2.285$ ), which is supported and full mediation.

Figure 2 displays the determination coefficient ( $R^2$ ) (the portion of the variance in the dependent variable that is predictable from the independent variable ranges from 0 to 1 the bigger the better). Values which are presented in Fig. 2 show that the Learning Collaboration Quality, information quality, course content support, satisfaction perceived by the user, and the actual use of e-learning, account for 79.7% of the variance in Performance expectancy.

## 5 Discussion

All of the relationships hypothesized were tested. The actual Use of e-learning systems is defined by learning collaboration quality, information quality, and course content support. Satisfaction perceived by the user is described by learning collaboration quality, information quality, and course content support. Performance expectancies are established by the Actual Use of e-learning systems and Satisfaction perceived by the user.

The findings from this study posit that the learning collaboration quality has not a significant impact on the performance expectancy because of lack of establishing of social presence. The circumstances should be structured in which postgraduate students can officially and privately communicate with their classmates. In a face-to-face setting, this will involve not only ice breakers but also small group discussions that have the same in an online community. The insignificant result of the direct effect of learning collaboration quality on performance is consistent with the previous studies in the field (Cidral et al. 2018). While the quality of collaboration has increased the effect on the actual use of e-learning systems, allowing easy communication makes communication more comfortable with classmates and lectures that are consistent with the previous studies in the field (Urbach et al. 2010; Cidral et al. 2018; Garrison 2006a, b). An example of a collaborative activity would be that each participant should present himself and share his / her individual and expert desires and practices. It could be willing to post a digital image in some conditions. For these posts, a special forum should be developed. In addition, postgraduate students can be assigned to small groups to discuss formal course expectations and to recognize concerns. Conversely, the learning collaboration quality does not influence the Satisfaction perceived by the user that is consistent with the previous studies in the field (Cidral et al. 2018). The workload must be taken as seriously in this context. The core of the research process is collaboration and discussion, whereas postgraduate students have little chance to interact with other postgraduate students, because the burden is too high, to focus on this discussion. Postgraduate students may return to modes of coping to adapt to the material needed to pass the test. Excessive workloads deny the probe as a deep, practical educational activity.

The findings from this study posit that the information quality is not a significant impact on the performance expectancy because of less quality in terms of interactivity. Postgraduate students value feedback when debates are scattered or blooming because of a lack of perspectives. It could mean a more profound explanation because of the absence of e-learning instructions for educators. Diagnosing misunderstandings and explaining them is a fundamental educational responsibility. It is necessary to control time, not to confuse postgraduate students as far as they are disengaged. The insignificant result of the direct effect of information quality on performance expectancy is consistent with the previous studies in the field (Cidral et al. 2018). While the information quality has increased the influence on the actual use of e-learning systems that are consistent with the previous studies in the field (Urbach et al. 2010; Cidral et al. 2018; Garrison, 2006a, b). Since these postgraduate students can benefit from the discussion actively, participation benefits much more from critical thinking. A crucial stage of the critical investigation is the constructive exchange, checking, and validation of concepts. Thus, the information quality has an impact on the Satisfaction perceived by the user that is consistent with the previous studies in the field (Cidral et al. 2018; Zhu 2012). The information gathered by e-learning systems is useful and understandable and satisfies the roles of the e-learning environment and the group's peer interaction.

The findings from this study posit that the course content support has not a significant influence on the performance expectancy because of lack of meaning, content precision, and distortion of course content with learner needs. The insignificant result of the direct effect of course content support on performance expectancy is consistent with the previous studies in the field (Almaiah and Alyoussef 2019; Voogt et al. 2013). While the course content support and the Satisfaction perceived by the user affect the actual use of e-learning portals which is consistent with the earlier researches in the field (Almaiah and Alyoussef 2019; Wright 2003). These findings advise that if the lesson material causing the e-learning framework aids various types of multimedia attributes to illustrate complicated perceptions in the content courses such as images, computer graphics, and audio recordings, the mechanism is improved; therefore, the utility of the e-learning system must be enhanced to increase user satisfaction perceived. The findings also indicate when the matter of the courses offers forums and discussions for postgraduate students to express their insights and perspectives on an asynchronous basis with their teacher, this will reassure postgraduate students for utilizing the e-learning system.

The Actual Use of e-learning systems and satisfaction perceived by the user has a significant impact on performance expectancy (H4, H5), and the results are steady with previous studies (Aparicio et al. 2017; Urbach et al. 2010; Cidral et al. 2018). The purpose is essentially to make postgraduate students self-directed and to learn. This includes cognitive processing consciousness. Knowledge of the evaluation method is important if learners are to be more responsible for their studying. Online learning will give postgraduate students a chance to focus on accomplishing assignments and practices. Learners show higher standards of communication and learning when they had online teachers who offered more “guided support” to achieve academic goals.

These results show that the satisfaction perceived by the user is a full mediator between the information quality and performance expectancy (H6b). Moreover, some postgraduate students will actively benefit from exchanges, controls, and confirmation of information on the online learning environment. When learners had teachers online who provided more “directed support” to achieve academic objectives, they demonstrated higher expectations for communication and education. They feel positive because quality information is being generated more and more satisfactorily in learning experiences (Dewiyanti et al. 2007). Conversely, the satisfaction perceived by the user has no impact as a mediator between the learning collaboration quality & course content support, and performance expectancy (H6a, H6c) that is less quality course content in terms of interactivity. Therefore, the actual use of e-learning systems is a full mediator between the learning collaboration quality, information quality, course content support, and performance expectancy (H7a, H7b, H7c). Postgraduate students can create, exchange ideas, exercise self-examination in online learning communities, solve problems, test synthesis, and achieve capacity. Postgraduate students can improve active learning through online, collaborative written work, group discussions, debates, and opinions of the arguments. Giving autonomy in learning will improve performance expectancy that is a part of responding to the assignment problem (Wahyuni et al., 2020a, b). For example, sharing information about course schedule between course scheduler, lecturers, and students through portal system help lecturers distribute course material just-in-time that are current interactive media features (e.g., video, graphics, voice recording) and networking resources e.g., discussion boards and online chats) to increase the degree of actual use of e-learning platforms to enhance the performance of learners (Almaiah and Alyoussef 2019). Regarded from these arguments, the definite Use of e-learning systems bridges the relationship between the information quality, learning collaboration quality, course content support, and performance expectancy that fulfills the research gap. Whereas the satisfaction perceived by the user only mediates the relationship between information quality and performance expectancy.

To elaborate the finding of the research, the following are six suggestions from the author to fulfill stakeholder expectations regarding e-learning performance in uncertain conditions;

First, starting with infrastructure improvements to run online distance learning or e-learning because not all postgraduate students have advance gadgets or laptops. In addition, data packages and internet networks must also be prepared to enter digital learning. The online learning infrastructure can be strengthened with a variety of initiatives, including determining the package of solutions chosen (such as learning management systems, video conferencing applications, learning content production applications) and designing their use in integrated learning. Escorting this aspect is not that difficult to do if the supporting resources are available: a concept development team and technical bodyguards with good capabilities and financial resources. However, preparing the human aspect is more challenging, including increasing digital capabilities. The production of quality online learning content and consistency in carrying out the scenarios that have been used falls into this realm. Building digital culture and capabilities is not an easy task, especially when a pandemic like

this is not on our side. Here, collective awareness and active participation of stakeholders are necessary.

Second, structured information, namely the learning management system that is currently available in the form of the Learning Center platform owned by the Ministry of Education. Unfortunately, the Ministry of Education does not encourage the use of this platform for all postgraduate students to use.

Third, info-culture, namely digital pedagogy which is very different from traditional pedagogy. This is because the digital concept recognizes the term anytime, anywhere, and any devices so that Indonesia recognizes asynchronous education. In determining the choice of scenario or learning design, the characteristics of postgraduate students who are currently scattered in various places with the quality of Internet connection and the availability of other supporting resources need to be included in the radar. This includes a choice of learning modes: synchronous (one time, different places), asynchronous (different times, different places), or mixed (Daniel 2020).

Fourth, there is no other choice for higher education institutions but to strengthen the information technology ecosystem, to support business processes and decision making. Digitalization of services is no longer an option, but a necessity. This has to do with many things, including providing services to postgraduate students and other stakeholders as well as data collection which is not only administratively important but more than that, strategically critical. Higher education institutions leaders need to pay special attention to this aspect, which may require a sizable investment. This does not only concern the procurement of goods but also increases the capacity (quantity) and capability (quality) of the escorts. But keep in mind, this investment is a capital expenditure for the long term and not a single-use operating expenditure.

In particular, universities need to pay attention to strengthening and maturing the online learning ecosystem. Not only in terms of technology infrastructure and information systems but also terms of the readiness of the actors: lecturers and postgraduate students.

In the early days of a pandemic, emergencies can be a reason to create tolerance for the quality of learning. However, at present, these reasons have not decreased their validity. This is the time to improve the quality of the learning experience, one of which is to strengthen the online learning ecosystem.

Fifth, the use of information technology forces higher education institutions to redesign its business processes. So far, we have been trained to think deductively from problems. This is what seems to trap us into automation. As a simple illustration, a business process redesign might turn seven process desks into just three. However, automation keeps it at seven tables. Therefore, it is important to include an inductive mindset that recognizes the potential of information technology as a complement to the perspective (Hammer and Champy 1993). A leap due to the innovative use of the information technology ecosystem needs to

be continuously explored and elaborated. For example, if an inductive approach is used, the admission process can change drastically without any physical presence. In addition, on the other hand, universities can think of opening a distance education study program to optimize the benefits of information technology investment in addition to being a strategy for future growth by expanding the student base.

Sixth, facts in the field show that not all learning activities can be transferred online. If this is the case, the stakeholders must also take mitigation to prepare for well-guarded physical activity. Some examples can be given here, including wet practicum, medical skills education, and clinical education. Portraits of each higher education institution can be different from one another. What is clear, higher education institutions must also invest to facilitate the new order or adaptation of this new approach of education digital systems.

## 6 Main implications

Theoretically, this study supports the theory of online collaborative learning that extends an integrated model by improving new constructs, which are the actual use of e-learning systems and satisfaction perceived by the user. These constructs are positioned as a mediator that becomes the construct of the new model fulfills the research gap of the relationship between the implementing e-learning systems on performance expectancy. The present study shows that the actual use of e-learning systems has more impactful as the indirect relationship between learning collaboration quality, information quality, and course content support on performance expectancy rather than satisfaction perceived by the user as mediator. So, learning collaboration quality, information quality, and course content support are significant factors for the actual use of e-learning, whereas only information quality is a key factor for satisfaction perceived by the user.

The practical outcomes of this research deliver guidance to designers and providers of e-learning systems. Such an inference has come about from this study the specific features of e-learning platforms must allow a collaborative atmosphere that is a key aspect of the achievement of e-learning systems. Its findings suggest that participants would benefit if collaboration features were considered in the portals. For example, technology platforms should allow communication and collaboration between postgraduate students to be communicated and thus influence the use and satisfaction of postgraduate students. This research also suggests that the standard of knowledge has a substantial influence on the use and content of courses. The material must be realistic, comprehensible, fascinating, and accurate. Foundations should establish different methods of self-evaluation using assessments, assessments, and other tests. Providers thus raise the overall degree of performance by participating in the material of the module. The author has

also learned from this study if e-learning platforms offer a range of methods to assess and communicate, they contribute to greater satisfaction. In these studies, the author found that the perception of individual success is because of the consistency of the system perceived by users. If the platform is simple to use and is organized in features and capabilities, it can make e-learning systems more enjoyable and effective.

## 7 Conclusions and limitations

The research findings have informed the significance of the actual use of e-learning and satisfaction perceived by the user as a mediator in improving the performance of postgraduate students in Indonesia. Even though there is an insignificant result between the information quality, learning collaboration quality, course content support, and performance expectancy. The study, therefore, indicates that approaching the actual use of e-learning has a greater effect than user (student) satisfaction to enhance performance expectancy.

Further research can be conducted to measure whether city differences can affect performance expectations in online learning systems. In addition, further research can also be carried out to measure whether differences in subject or course material can affect performance expectations in the online learning system.

The present study has limitations that indicate some future directions for research. This research applies a cross-sectional design, then a longitudinal study can be applied to the next research that will also contribute to analyzing the effects of information quality, learning collaboration quality, and course content support toward the definite use of e-learning and user satisfaction which also improves performance expectancy. Lastly, the analysis was generated from postgraduate doctoral students in universities, and it is highly advantageous to collect data from postgraduate doctoral students to provide additional proof of outcomes to provide additional evidence about distance learning outcomes and further research is needed regarding whether the learning outcomes match stakeholder expectations.



## Appendix A

**Table 5** Instrument Constructs and Indicators

Constructs	Items	Indicators	Reference
Learning Collaboration Quality	LCQ1	Our e-learning system allows me to locate my colleagues' contact information easily and quickly.	Urbach et al. 2010
	LCQ2	Our e-learning system supports an effective and efficient sharing of information with my colleagues	
	LCQ3	Our e-learning system enables an easy and comfortable communication with my colleagues.	
	LCQ4	Our e-learning system enables a comfortable storing and sharing of documents with my colleagues.	
Information Quality	IQ1	The information provided by e-learning system is reliable.	Urbach et al. 2010
	IQ2	The information provided by e-learning system is interesting.	
	IQ3	The information provided by e-learning system is useful.	
	IQ4	The information provided by e-learning system is understandable.	
Course Content Support	CCS1	The use of videos and animations can explain complex concepts effectively	Wright 2003
	CCS2	The e-learning courses use multimedia features	
	CCS3	The e-learning courses use discussion forums and chat	
Actual use of E-learning System	AUE1	Execute course work.	Urbach et al. 2010
	AUE2	Communicate with colleagues and teachers.	
	AUE3	Store and share documents.	
	AUE4	Publish information.	
	AUE 5	Please indicate the extent to which you use the e-learning system to perform the following tasks: Retrieve information.	
Satisfaction Perceived by User	SPU1	Are you satisfied with the e-learning system on the whole?	Urbach et al. 2010
	SPU2	How adequately does the e-learning system support your area of study?	
	SPU3	How efficient is the e-learning system?	
	SPU4	How effective is the e-learning system?	

Table 5 (continued)

Constructs	Items	Indicators	Reference
Performance Expectancy	PE1	Using e-learning system increases the quality of learning process.	Venkatesh et al. 2003
	PE2	Using e-learning system enables lecturer to accomplish their needs more quickly and more efficiently.	
	PE3	Using e-learning system increases equity between all students.	
	PE4	Using e-learning system would save students' and lecturer's time.	

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## Authors and Affiliations

Raden Edi Sewandono<sup>1</sup>  · Armanu Thoyib<sup>1</sup> · Djumilah Hadiwidjojo<sup>1</sup> · Ainur Rofiq<sup>1</sup>

✉ Raden Edi Sewandono  
raden\_edi@student.ub.ac.id

<sup>1</sup> Department of Management, Faculty of Economics and Business, Universitas Brawijaya, Malang, Indonesia