The Scientific Temper (2024) Vol. 15 (4): 3205-3213

E-ISSN: 2231-6396, ISSN: 0976-8653

Doi: 10.58414/SCIENTIFICTEMPER.2024.15.4.30

https://scientifictemper.com/

RESEARCH ARTICLE

Exploring e-learning system loyalty: The role of system quality and satisfaction

Amanda Quist Okronipa[1*], Isaac Asampana[1], Jones Yeboah Nyame[2]

Abstract

The study examined how e-learning service quality affected students' satisfaction and loyalty while noting the mediating role of e-learning students' satisfaction in Ghana. Previous findings on e-learning service, information, and system quality were mostly undertaken in industrialized nations, with little effort made in sub-Saharan Africa.

The conceptual framework is informed by the theories reviewed in this study. The positivist research philosophy's explanatory research design was used. Data for the survey were obtained from 526 undergraduate students of the University of Professional Studies, Accra, who accessed the University's e-learning website. Partial least squares structural equation modeling techniques were deployed employing the SmartPLS 3.3.3 application to find the relationships between the constructs based on an established conceptual model. The findings of the study suggest that e-learning service quality and e-learning student satisfaction significantly and directly affect e-learning student loyalty. Besides, the results also showed that e-learning service quality, e-learning information quality, and e-learning system quality have an indirect significant positive effect on e-learning student loyalty via partial mediation of e-learning student satisfaction. Our findings also suggest that for practitioners to accomplish successful e-learning deployment, (1) their e-learning sites must provide the best connectivity, availability, integration, navigation, and convenience for learners; (2) they must not only understand the importance of the overall e-learning service quality but also ensure that their e-learning support service workers and instructors have the empathy, civility, responsiveness, and kindness required while servicing online learners.

Keywords: E-learning information, E-learning service quality, Students' satisfaction, Students' loyalty, System quality, Higher education.

Introduction

E-learning systems have recently become very popular in educational institutions worldwide. E-learning platforms have become widespread techniques for sharing educational material and enabling distance learning owing to the rapid advancement of technology (Dangaiso *et al*., 2022). E-learning, also known as electronic learning, is built on a variety of technology components and infrastructure to facilitate online education. The specific elements on which e-learning is built may vary depending on the platform or system used, but the following are some common foundations: Internet, learning management system (LMS), content creation tools, learning content management system (LCMS), video conferencing and webinar tools, learning analytics, mobile devices and apps, and so on. These features work together to provide educational information, interactive learning experiences, and the ability to connect learners and instructors in online contexts. Organizations that employ e-learning can enjoy various benefits, including cost savings, improved learning processes, accommodating varied learning styles, enhanced student access to instructors, dynamic course content, and quality training that can be structured or unstructured. Higher and primary education, corporate training, and government employee training are some of the sectors where e-learning is being used De Leeuw *et al*. (2019). The relationship between student loyalty and its antecedents has been extensively examined in the traditional context where learning encounters take place in physical structures, Martínez-Argüelles and Batalla-Busquets (2016), cited by Dangaiso *et al*. (2022). In the existing e-learning literature,

[1]Department of Information Technology Studies, University of Professional Studies, Accra.

[2]Systems and Network, Ghanalink Network Services Limited, Accra.

***Corresponding Author:** Amanda Quist Okronipa, Department of Information Technology Studies, University of Professional Studies, Accra, E-Mail: amanda.okronipa@upsamail.edu.gh

How to cite this article: Okronipa, A.Q., Asampana, I., Nyame, J.Y. (2024). Exploring e-learning system loyalty: The role of system quality and satisfaction. The Scientific Temper, **15**(4):3205-3213.

Doi: 10.58414/SCIENTIFICTEMPER.2024.15.4.30

Source of support: Nil

Conflict of interest: None.

Received: 22/10/2024 **Accepted:** 08/11/2024 **Published** : 20/12/2024

learners' perceptions of the quality of e-learning services have been highlighted as critical to the sustainability of Higher Educational Institutions (HEIs). It is important to mention that new research paths have been provided in recent years and that education delivery has experienced significant changes (Lee *et al*., 2020). Due to concerns over the ever-growing demand for higher education and, the need to provide learners with service continuity, increase operational effectiveness, and the need to attract and retain qualified students, e-learning is growing in popularity in higher education (Lwoga & Sife, 2018). The need for e-learning has also been fuelled by the pervasiveness of learning and the adaptability of lecture delivery. Students can now connect to a virtual class from any location around the world more easily, thanks to advancements in educational technologies (Dangaiso *et al*., 2022).

Researchers have long investigated the elements that lead to student loyalty to the system in the e-learning environment (Pharm *et al*., 2020). Few studies have been carried out to study how the main features of e-learning service quality influence e-learning student loyalty through the intermediary function of e-learning student satisfaction (Alexandra & Choirisa, 2021). Previous research (Alexandra & Choirisa, 2021; Long *et al*., 2019; Stodnick & Rogers, 2008), according to the authors, failed to investigate the indirect impacts of an independent construct on a dependent construct by examining the impact of one or more mediators. It is therefore necessary to undertake a mediation analysis to provide insights into causal relationships between the variables, which will also enhance theoretical understanding. This analysis will help the researchers better explain the complicated relationships between variables. The authors will also examine the relationship between e-learning student loyalty, e-learning student satisfaction, e-learning information quality, e-learning system quality, and e-learning service quality, as well as which of these criteria has the biggest impact on total student satisfaction.

This study is aimed at contributing to educational technologies literature by providing research-based solutions to e-learning satisfaction and loyalty. The study's main goal is to investigate the mediating effects of e-learning service quality on student satisfaction and loyalty to the use of e-learning platforms in higher education institutions. According to the study's model, the quality of the e-learning system, the quality of the e-learning information, and the quality of the e-learning service all have an impact on e-learning student happiness. E-learning student pleasure, on the other hand, is modeled as a predictor of e-learning student loyalty. In this study, the term e-learning refers to the Moodle learning management system (LMS), which enables an online teaching environment for both lecturers and students to boost learning processes.

Materials and Methods

The information success model presented by Delone and McLean (2003) examined six dimensions: information quality, system quality, system use, user satisfaction, and organizational impact. In 2003, the authors changed the original model by including a service quality factor and, ultimately, substituting individual and organizational impacts with net benefits. In 2016, the model was updated. The combined models of Dangaiso *et al*. (2022) and Dayanti & Ilham (2022) are used in this investigation. The new model's components and evidence for hypothesized causal relationships with appropriate supporting literature are detailed in Figure 1.

The Relationship Between Model and Its Variables

The link that exists between system quality of e-learning and student satisfaction

In this study, e-learning system quality is associated with students' experiences with e-learning, such as ease of use, understanding, and learning, which is also intriguing. Furthermore, e-learning system quality influences user satisfaction and system usability (Dangaiso *et al*., 2022; Long *et al*., 2019). In this situation, the quality of e-learning can be determined by numerous factors, such as ease of use, flexibility, and timeliness. E-learning system quality was observed to have a substantial influence on e-learning student satisfaction at East Java universities (Dayanti & Ilham, 2022). Given the preceding discussion, the following hypothesis was proposed:

H1: A significant positive relationship exists between the quality of e-learning systems and e-learning student satisfaction.

The link that exists between information quality of e-learning and students' satisfaction

E-learning information quality plays a pivotal role in enhancing the learning experience for students during

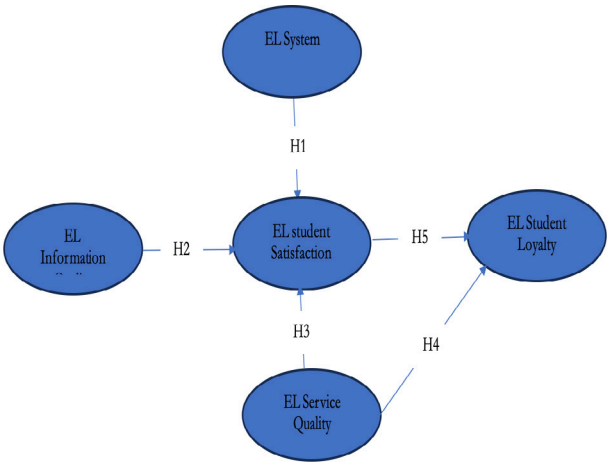

Figure 1: Conceptual model

e-learning sessions (Shehzadi *et al*., 2021). The influence of e-learning information quality is particularly significant in shaping the satisfaction levels of e-learning students in East Java universities (Dayanti & Ilham, 2022). High-quality information not only fosters user satisfaction but also contributes to students' long-term engagement with e-learning platforms, encouraging them to return for future visits. Researchers (e.g., Dangaiso *et al*., 2022; Al Mulhem, 2020) have consistently demonstrated the substantial impact of e-learning information quality on student satisfaction. In light of these assertions, the authors offered this hypothesis:

H2: A significant positive relationship exists between the quality of e-learning information and the satisfaction of e-learners.

The link that exists between the quality of e-learning services and students' satisfaction

If the quality of a service meets or exceeds user expectations, it can be argued that the service has successfully satisfied the user and is of high quality (Ilham & Siregar, 2021). Pham *et al*., (2020) conducted a study that discovered that system quality, information quality, and service quality have a positive influence on students' satisfaction with e-learning systems. Researchers (e.g., Dayanti & Ilham, 2022) confirmed that finding, citing a 2017 study by Purwanto and Pawirosumarto, that system quality, information quality, and service quality all have a substantial impact on e-learning customers. The factor of e-learning service quality was found as critical in East Java universities when determining e-learning student satisfaction (Dayanti & Ilham, 2022). Thus, the following hypothesis was tested in this study:

H3: A significant positive relationship exists between the quality of e-learning services and student satisfaction with e-learning.

The link that exists between the quality of e-learning service and student loyalty

The desired standard of excellence in service quality is to address customer requirements effectively (Onuma & Ada, 2016). Service quality is defined as the disparity between the actual service experience and the expectations that customers have about the services they receive. According to the aforementioned studies, service quality represents the gap between what consumers expect and what they find acceptable. A product's service quality provides good benefits and user enjoyment. This satisfaction can result in the user's long-term commitment to the product (Onuma & Ada, 2016). According to Long *et al*. (2019), the overall quality of e-learning services has a direct effect on student e-learning loyalty. Thus, the hypothesis:

H4: A significant positive relationship exists between the quality of e-learning services and student loyalty to e-learning.

The link that exists between students' satisfaction and students' loyalty to e-learning

In the context of e-learning quality standards, student satisfaction is a key benchmark. When e-learning users express satisfaction, it indicates that they are pleased with their online learning experiences. High-quality training courses are intended to provide consumers with a pleasant learning experience. Customer loyalty, on the other hand, is defined as a long-term commitment to continue utilizing one or more items or services that the customer enjoys. Customers' loyalty is strengthened when they believe the product or service continues to offer them value (Long *et al*., 2019). Student devotion to e-learning in this setting sees students as customers and universities as educators, with universities adopting the role of a national service provider organization. Previous research by Long *et al*. (2019) shows that students' e-learning satisfaction positively influences their e-learning loyalty. Thus, the authors hypothesize the following:

H5: E-learning student satisfaction and student loyalty have a considerable positive relationship.

The mediating role of e-learning satisfaction

Apart from the direct effect of e-learning service quality on student loyalty, e-learning service quality may influence e-learning student loyalty indirectly through e-learning student satisfaction. According to the authors, e-learning student satisfaction acts as a mediator between e-learning service quality and student loyalty, given that the absence of e-learning student satisfaction may be the primary reason students do not interact with e-learning sites or switch to other sites. Furthermore, other researchers have found distinct relationships between e-learning service quality and e-loyalty (Dayanti & Ilham (2022)), e-learning service quality and students' satisfaction (Dangaiso *et al*., 2022; Dayanti & Ilham, 2022), and e-learning students' satisfaction and loyalty (Long *et al*., 2019). Furthermore, prior research has proven there is a positive influence between e-learning information quality and e-learning student satisfaction, as demonstrated by Al Mulhem (2020). Furthermore, studies conducted by Dangaiso *et al*. (2022)and Long *et al*. (2019) show a confirmed significant association between the quality of e-learning systems and the satisfaction of e-learning students. Furthermore, research from (Dangaiso *et al*., 2022) and Dayanti & Ilham (2022) demonstrate the importance of e-learning on student satisfaction on student loyalty. According to the authors, e-learning student satisfaction may act as a moderator in the relationships between its antecedents, such as e-learning service quality, e-learning information quality, e-learning system quality, and e-learning student loyalty. As a result, the following hypotheses are advanced:

H6: E-learning student satisfaction mediates the relationship between e-learning information quality and

e-learning students' loyalty.

H7: E-learning student satisfaction mediates the relationship between e-learning service quality and e-learning students' loyalty.

H8: E-learning student satisfaction mediates the relationship between e-learning system quality and e-learning students' loyalty.

Study participants

We employed a quantitative approach with a cross-sectional survey in our study. We used this strategy since it is thought to produce reliable, acceptable, and generalizable results (Sendurur, 2018). A questionnaire survey can also be distributed to a large number of people. Furthermore, when data is collected from a representative sample, a quantitative analysis allows researchers to make generalizations about a population (Sendurur, 2018).

Students were selected from the University of Professional Studies, Accra (UPSA) to offer research data for this study. A stratified random sampling strategy was used in the study to choose participants. The adoption of stratified random sampling was justified because of the following: (a) researchers can use stratified random sampling to generate a sample population that best represents the total population being researched, and (b) it was done in order to accurately reflect male and female students at the University. For stratification purposes, a proportionate sample approach was used. Simple random sampling was eventually used in each stratum. A 526 students fully participated in the survey. The participants were undergraduate students who responded to an online questionnaire. All five theoretical constructs were evaluated based on a Likert scale with a rating of five (1 = strongly disagree, 5 = strongly agree), which is commonly used in information systems, marketing, and social science studies. This was in line with previous studies (Long *et al*., 2019). To confirm that the modified scales were suitable, reliability and validity tests were performed. Cronbach's values were employed in this study to establish the reliability of the constructs, and all items had a Cronbach's value of 0.7 or higher. The data was examined using the partial least squares (PLS) technique and SmartPLS 3.3.3.

Table 1 lists the sources of measurement scales used in this investigation. Respondents' voluntary participation was respected, and they were made aware that they could opt out of the study at any time. Respondents' anonymity was upheld throughout the investigation. The information gathered from the participants was kept confidential and used only for academic purposes, which were communicated to all study participants.

Data Collection

A total of 526 valid responses were submitted to the online survey. According to demographic data, there were 312 males (59.3%) and 214 females (40.7%). All respondents were undergraduate students, with 52.5% majoring in accounting, 35.6% in business administration, 9.9% in information technology, and 2.1% in public relations. While 97.5% of students used the e-learning website at least once per week, only 2.5% used it at least once every month. In addition, 74.7% of students preferred e-learning, while the remaining 25.3% preferred face-to-face instruction.

Results

Measurement Model

The PLS technique was used to analyze the measurement model with SmartPLS 3.3.3 software. The researchers looked at the indicator loadings. When the loadings exceed 0.50, the factor represents over 50% of the variation in the indicator (Md Noor *et al*., 2019). The internal consistency and dependability of the constructs were investigated. Greater numbers indicate higher degrees of dependability for the composite reliability benchmarks. The dependability scores for "acceptable to good" range from 0.70 to 0.95 (Sarstedt *et al*., 2019). Cronbach's alpha is used to assess internal consistency and dependability, assuming the same criteria. Shmueli *et al*. (2019) believe that reliability ratings of 0.70 to 0.95 are reasonable. Convergent validity, which describes how a concept converges with item variation, is also calculated. Convergent validity is ascertained by computing the average variance extracted (AVE) from items connected to a specific construct. The AVE must be 0.500 or greater, and it must account for 50% of the difference in its elements on average. All factors had Cronbach alpha (CA) and composite reliability (CR) values greater than the permissible limit of 0.7, according to the data in Table 2.

The discriminant validity (Palos-Sanchez *et al*., 2019) shows how systematically distinct a theory is from another. In PLS-SEM, the heterotrait-monotrait (HTMT) correlation ratio is employed to test discriminant validity. The HTMT ratio criterion is a unique condition for testing discriminant validity (Sarstedt *et al*., 2019), outperforming the Fornell-

Table 1: Sources of measurement scales

Construct	*Source*	*Scale*
EL System quality	Long *et al*. (2019)	5 Point from SD to SA
EL Information quality	Alexandra & Choirisa (2021)	5 Point from SD to SA
EL Service quality	Alexandra & Choirisa (2021)	5 Point from SD to SA
EL Student satisfaction	Alexandra & Choirisa (2021)	5 Point from SD to SA
EL Student loyalty	Alexandra & Choirisa (2021)	5 Point from SD to SA

Notes: EL = E-Learning; SA = Strongly Agree; SD = Strongly Disagree

Larcker criterion and cross-loading evaluations in PLS-SEM. Tables 3 and 4 illustrate the discriminant validity and HTMT measurement of the model's outputs; all computations were provided in accordance with the norms of the examination. Because the HTMT criterion is either 0.85 or 0.9, our constructs' HTMT values were all acceptable because they were less than 0.9 at a 5% confidence interval.

Notes

Construct correlations with the square root of AVE along the diagonals

Structural Model

Multicollinearity

Scholars (e.g., Sarstedt *et al*., 2021) argue that indications that signal the occurrence of multicollinearity should be avoided.

Table 2: Construct reliability and validity

Items	*Constructs*	*Loading*	*CA*	*CR*	*AVE*
	E-learning information quality		0.863	0.906	0.709
EIFQ1	The e-learning courses provided by my University are relevant information (enough for me to master the course content)	0.898			
EIFQ2	The e-learning courses provided by my University are easy to understand information.	0.905			
EIFQ3	The e-learning courses provided by University are the right level of detailed information	0.762			
EIFQ4	The e-learning courses provide timely information.	0.793			
	E-Learning students Loyalty		0.844	0.893	0.677
ELOY1	I am likely to retake an e-learning course from the current University	0.839			
ELOY2	I am likely to take another e-learning course that is provided by this University	0.887			
ELOY3	I will recommend other people to take e-learning courses from my University.	0.833			
ELOY4	I will say positive things to other people about the services provided at my University	0.724			
	E-Learning Students Satisfaction		0.884	0.929	0.813
ESAT1	The learning experience in e-learning courses was better than I expected	0.916			
ESAT2	The e-learning on our campus compares favourably to other institutions around the country.	0.837			
ESAT3	I am generally satisfied with the quality of the e-learning course(s) in our department	0.948			
	E-Learning Service Quality		0.925	0.947	0.817
ESEQ1	The e-learning course makes me feel connected in interactions.	0.856			
ESEQ2	The e-learning course creates a sense of personalisation.	0.928			
ESEQ3	The e-learning course makes it easy to communicate my needs with the University.	0.908			
ESEQ4	The e-learning course service and instruction will be delivered as promised.	0.921			
	E-Learning System Quality		0.849	0.897	0.687
ESYQ1	The layout of the information at my University's e-learning website is easy to follow	0.900			
ESYQ2	I feel the risk associated with e-transactions is low through my University's e-learning website	0.875			
ESYQ3	It is easy to connect, navigate, and download information through my University's e-learning website	0.814			
ESYQ4	The information on my University's e-learning website is up-to-date	0.713			

Table 3: Discriminant validity using fornell–larcker criterion

	EL information quality	*EL service quality*	*EL student loyalty*	*EL system quality*	*EL student satisfaction*
EL information quality	0.842				
EL service quality	0.392	0.904			
EL student loyalty	0.437	0.579	0.823		
EL system quality	0.178	0.48	0.354	0.829	
EL student satisfaction	0.479	0.583	0.752	0.437	0.902

Table 4: Discriminant validity using heterotrait-monotrait ratio (HTMT)

	EL Information quality	*EL service quality*	*EL student loyalty*	*EL system quality*	*EL student satisfaction*
EL information quality					
EL service quality	0.436				
EL student loyalty	0.484	0.629			
EL system quality	0.205	0.522	0.366		
EL student satisfaction	0.537	0.638	0.824	0.48	

The reason is that they have the potential to inflate bootstrap standard errors and also increase the likelihood of failing to discover the presence of an effect in the research. In addition, they created the variance inflation factor (VIF) indicator to assess multicollinearity concerns. The recommended VIF value should be less than 5.00 (Giao *et al*., 2020). The greatest inner VIF of constructs in this investigation was 1.514. Hence, the elements' collinearity was not an issue (Table 5).

Model fit of PLS model

The structural model calculations used to evaluate our hypotheses are shown in Table 6. At a 5% threshold of significance, all hypotheses were accepted. The literature confirmed that all of the approved hypotheses had a significant favorable effect. Researchers (e.g., Sarstedt *et al*., 2021) suggested that R^2 and model fit should be used to evaluate the structural model (see Table 6). The e-learning students' loyalty R^2 value (0.596) implies that 59.6% of the total difference in endogenous factor loyalty could be addressed by exogenous factors such as e-learning students' satisfaction and e-learning service quality. The e-learning students' satisfaction R^2 value (0.447) implies that 44.7% of the total variation of the endogenous factor of student satisfaction could be addressed by exogenous factors such as e-learning information quality, e-learning system quality, and e-learning service quality. Additionally, according to Giao *et al*. (2020), R^2 values could be estimated as 0.02 (weak), 0.13 (moderate), and 0.26 (large). The R^2 values in our research for e-loyalty and e-satisfaction were greater than 0.26 (59.6 and 44.7%), respectively. Hence, the PLS model used in our study revealed a strong model-data fit.

Figure 2 displays SmartPLS's calculation of path coefficients based on structural equation modeling. At the 0.05 level, all five hypotheses are significant.

Hypotheses Testing

Based on what was observed in the PLS-SEM estimations (Figure 2 and Table 6), the hypotheses' outcomes were as follows:

Hypothesis 1

The findings revealed that system quality has a significant positive effect on students' satisfaction ($\beta = 0.208$, $p = 0.000$). This implies that when e-learning system quality increases, there will be a corresponding increase in students' satisfaction. This was corroborated by earlier research by Dangaiso *et al*. (2022) and Long *et al*. (2019). This study confirms previous studies done in other geographical regions where e-learning is prevalent. Hence, hypothesis 1 was accepted.

Hypothesis 2

The results revealed a positive and substantial causality linking e-learning information quality and student satisfaction ($\beta = 0.298$, $p = 0.000$). This implies that when

Table 5: The Result of Multicollinearity

	Inner VIF Values				
Constructs	*EL information quality*	*EL service quality*	*EL student loyalty*	*EL system quality*	*EL student satisfaction*
eL information quality					1.182
EL information quality			1.514		1.487
EL information quality					
EL information quality					1.299
EL information quality			1.514		

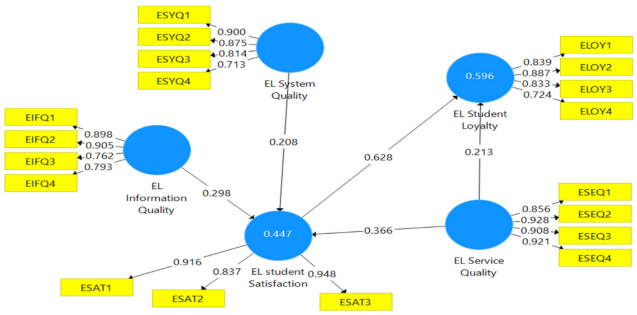

Figure 2: Path coefficient

e-learning information quality improves, students' satisfaction improves as well. This was corroborated by earlier studies (e.g., Dangaiso *et al*., 2022; Long *et al*., 2019). As a result, hypothesis 2 was supported. According to the findings of this study, students prioritize the accessibility of material that is legible, timely, readily available, comprehensible, and current.

Hypothesis 3

The results found a substantial link between e-learning service quality and student satisfaction (β = 0.366, *p* = 0.000). This implies that when e-learning service quality increases, there will be a corresponding increase in students' satisfaction. This was corroborated by the prior investigations (Dangaiso *et al*., 2022; Long *et al*., 2019; Dayanti & Ilham, 2022). As a result, hypothesis 3 was accepted.

Hypothesis 4

Our result showed that e-learning service quality had a significant positive influence on e-learning students' loyalty (β = 0.213, *p* = 0.000). This implies that when e-learning service quality increases, there will be a corresponding increase in e-learning students' loyalty. This was supported by the previous examination by Dayanti and Ilham (2022). Hence, hypothesis 4 was accepted.

Hypothesis 5

Our findings showed that e-learning students' satisfaction had a significant positive influence on e-learning students' loyalty (β = 0.628, *p* = 0.000). This implies that when e-learning students' satisfaction increases, there will be a corresponding increase in e-learning students' loyalty. This was supported by previous studies by (Dangaiso *et al*., 2022; Long *et al*., 2019; Dayanti & Ilham, 2022). Hence, hypothesis 5 was accepted.

The Mediating Role of E-learning Students' Satisfaction

The study further assesses the mediating role of e-learning student satisfaction on the following independent variables: e-learning information quality, e-learning service quality, and e-learning system quality on the dependent variable, e-learning student loyalty (Table 7) shows the findings of the investigation. Bootstrapping was used to test for mediation in line with the proposed hypothesis for this study.

Hypothesis 6

As suggested by Preacher and Hayes (2004), our results showed that the total effect of e-learning information quality on student loyalty has a significant positive relationship (β = 0.187, *p* = 0.000). When the mediator variable, e-learning student satisfaction, was added, there was also a positive and substantial association between the influence of e-learning information quality and student loyalty (β = 0.187, *p* = 0.000). In summary, there is a positive relationship between the indirect effect of e-learning information quality and student loyalty through student satisfaction (β = 0.187, *p* = 0.000). This, therefore implies a complementary partial mediation effect between the associations of e-learning information quality and student loyalty. Hence, e-learning student satisfaction has played a mediating role (Giao *et al*., 2020). As a result, hypothesis 6 was supported, and the mediation was only partial.

Hypothesis 7

Assessing the mediation role of e-learning student satisfaction amongst e-learning service quality and student loyalty. The result in Table 7 also shows that the total effect of e-learning service quality and student loyalty has a significant positive impact (β = 0.443, *p* = 0.000). When

Table 6: Path coefficients, their significance, and R^2

Hypotheses		*β*	*t*	*p-values*	*Results*
H1	EL System Quality_ -> EL student Satisfaction	0.208	5.519	0.000	Supported
H2	EL Information Quality_ -> EL student Satisfaction	0.298	6.703	0.000	Supported
H3	EL Service Quality -> EL student Satisfaction	0.366	9.180	0.000	Supported
H4	EL Service Quality -> EL Student Loyalty	0.213	5.041	0.000	Supported
H5	EL student Satisfaction -> EL Student Loyalty	0.628	19.657	0.000	Supported
		R^2			
	EL Student Loyalty	0.596			
	EL student Satisfaction	0.447			

Table 7: The mediating role of e-learning students' satisfaction

	Total effect		*Direct effect*		*Indirect effect*		
	Path coefficient	*p-values*	*Path coefficient*	*p-values*		*Path coefficient*	*p-values*
EL information quality_ -> EL student loyalty	0.187	0.000	0.187	0.000	EL information quality_ -> EL student satisfaction -> EL student loyalty	0.187	0.000
EL service quality -> EL student loyalty	0.443	0.000	0.230	0.000	EL service quality -> EL student satisfaction -> EL student loyalty	0.230	0.000
EL system quality_ -> EL student loyalty	0.130	0.000	0.130	0.000	EL system quality_ -> EL student satisfaction -> EL student loyalty	0.130	0.000

the mediator variable, e-learning student satisfaction, was added, there was also a significant positive relationship (β = 0.230, $p = 0.000$). In short, there is a significant association linking the indirect effect of e-learning service quality and student loyalty through student satisfaction (β =0.230, $p = 0.000$). The result shows that there is a complementary partial mediation effect between e-learning service quality and student loyalty. Therefore, the mediating role of e-learning satisfaction has occurred (Giao *et al*., 2020). Hence, hypothesis 7 was accepted, and the mediation was only partial.

Hypothesis 8

Evaluating the mediation role of e-learning student satisfaction between e-learning system quality and student loyalty, the total effect of e-learning system quality on e-learning student loyalty has a significant positive effect (β = 0.130, $p = 0.000$). With the mediating variables, the results also show a significant positive relationship (β = 0.130, $p = 0.000$). The indirect effect between e-learning system quality and student loyalty through student satisfaction also establishes a significant positive effect (β = 0.130, $p = 0.000$). The findings indicated a complementary partial mediation effect between e-learning system quality and student loyalty. Hence, the mediating role of e-learning satisfaction has occurred (Giao *et al*., 2020). Hence, hypothesis 7 was accepted, and this mediation was partial.

According to our findings and research, e-learning satisfaction has the greatest and strongest impact on e-learning students' loyalty to e-learning websites, followed by e-learning service quality, with predictive powers of 62.8 and 21.3%, respectively. Furthermore, e-learning service quality has the most significant indirect impact on student loyalty to using e-learning websites, followed by information quality and system quality, with predictive powers of 23, 18.7, and 13%, respectively.

Discussion

The findings confirm that e-learning service quality, information quality, and system quality all had a significant positive influence on students' satisfaction (Dangaiso *et al*., 2022; Long *et al*., 2019). The findings also confirm that e-learning students' satisfaction and service quality had a significant positive effect on students' loyalty (Dayanti & Ilham, 2022). Our results also supported earlier studies showing that the antecedents of e-learning students' satisfaction had an indirect positive effect on e-learning students' loyalty. This implies that the mediating role of e-learning satisfaction has occurred (Giao *et al*., 2020). The most important factor affecting e-learning students' satisfaction directly is e-learning service quality, followed by e-learning information quality and e-learning system quality. The most influential construct that directly affects e-learning students' loyalty is students' satisfaction, followed by service quality.

Given the direct and indirect positive effects of e-learning system quality on e-learning learner satisfaction and loyalty, our results suggest that UPSA's e-learning site produces the best connectivity, accessibility, integration, navigation, and convenience for downloading information. The e-learning site administrators should always upgrade the site to continue delivering fluid and rapid service to students without subjecting them to torturous sessions.

Given the direct and indirect positive effects of e-learning information quality on student satisfaction and loyalty, suggest how UPSA continuously improves the value of content downloaded from its e-learning site. This also suggests that the University has experienced lecturers who always analyze information quality aspects such as timeliness, understandability, accessibility, currency, relevance, and adequacy before uploading information on the e-learning site.

Given the direct and indirect positive effects of e-learning service quality on student satisfaction and loyalty, respectively, suggest how UPSA continuously improves the knowledge and skills of its IT professionals and faculty to assist learners online. It also suggests that UPSA understands the importance of quality service, thereby ensuring that its support service personnel are equipped with positive character traits such as empathy, courtesy, responsiveness, and kindness when serving learners.

Given the significant positive effects of both e-learning student satisfaction and service quality on student loyalty, suggest how UPSA's e-learning site's service quality has motivated and revamped learners' satisfaction while also building long-term e-learning student loyalty among learners.

Conclusion

The primary goal of the study was to extensively investigate the impact of e-learning service quality on e-learning students' loyalty, as well as the mediating effect of e-learning student satisfaction. As a result, an integrated model for e-learning student loyalty was proposed.

This study could be a good starting point for future research on student loyalty in an e-learning setting. Secondly, this study found that e-learning students' loyalty to using e-learning websites was mostly motivated by both e-learning service quality and e-learning students' satisfaction. Furthermore, the findings showed that e-learning service quality, e-learning information quality, and e-learning system quality all had an indirect impact on e-loyalty via e-learning student satisfaction. Thirdly, our study was consistent with previous research on e-learning students' loyalty to e-learning technology.

References

Al Mulhem, A. (2020). Investigating the effects of quality factors and organizational factors on university students' satisfaction with e-learning system quality. *Cogent Education*, *7*(1), 1787004.

Alexandra, Y., & Choirisa, S. F. (2021). Understanding college students-loyalty to online practicum courses in hospitality programmes during COVID-19. *Journal of Learning Development in Higher Education*, (21).

Dangaiso, P., Makudza, F., & Hogo, H. (2022). Modeling perceived e-learning service quality, student satisfaction and loyalty. A higher education perspective. *Cogent Education*, *9*(1), 2145805.

Dayanti, S. R., & Ilham, R. (2022). Influence of E-learning Service quality on E-learning Student Loyalty through E-learning Student Satisfaction at University in East Java. *Business and Finance Journal*, *7*(1), 105-115.

De Leeuw, R. A., Logger, D. N., Westerman, M., Bretschneider, J., Plomp, M., & Scheele, F. (2019). Influencing factors in the implementation of postgraduate medical e-learning: a thematic analysis. *BMC medical education*, *19*, 1-10.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*, *19*(4), 9-30.

Giao, H., Vuong, B., & Quan, T. (2020). The influence of website quality on consumer's e-loyalty through the mediating role of e-trust and e-satisfaction: An evidence from online shopping in Vietnam. *Uncertain supply chain management*, *8*(2), 351-370.

Ilham, R. (2018). Improve quality of e-loyalty in online food delivery services: a case of Indonesia. *Journal of Theoretical and Applied Information Technology*, *96*(15), 4760-4769.

Ilham, R., & Siregar, C. S. (2021). Can Instagram convince information to users. *Jurnal Manajemen Teknologi*, *20*(2), 117-133.

Lee, E. Y., & Jeon, Y. J. J. (2020). The difference of user satisfaction and net benefit of a mobile learning management system according to self-directed learning: An investigation of cyber university students in hospitality. *Sustainability*, *12*(7), 2672.

Long, P., Limbu, Y. B., Bui, T. K., Nguyen, H. T., & Pham, H. T. (2019). Does e-learning service quality influence e-learning student satisfaction and loyalty? Evidence from Vietnam. *International Journal of Educational Technology in Higher Education*, *16*(1), 1-26.

Lwoga, E. T., & Sife, A. S. (2018). Impacts of quality antecedents on faculty members' acceptance of electronic resources. *Library Hi Tech*, *36*(2), 289-305.

Martínez-Argüelles, M. J., & Batalla-Busquets, J. M. (2016). Perceived service quality and student loyalty in an online university. *International Review of Research in Open and Distributed Learning*, *17*(4), 264-279.

Md Noor, S., Rasoolimanesh, S. M., Jaafar, M., & Barghi, R. (2019). Inscription of a destination as a world heritage site and residents' perceptions. *Asia Pacific Journal of Tourism Research*, *24*(1), 14-30.

Onuma, N., & Ada, N. R. (2016). Evaluation of students' personnel services in colleges of education in Nigeria. *British Journal of Education*, *4*(7), 82-98.

Palos-Sanchez, P. R., Robina-Ramirez, R., & Velicia-Martin, F. (2019). What role does corporate governance play in the intention to use cloud computing technology?. *Symmetry*, *11*(10), 1253.

Pham, C., Vu, N., & Tran, G. (2020). The role of e-learning service quality and e-trust on e-loyalty. *Management Science Letters*, *10*(12), 2741-2750.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior research methods, instruments, & computers*, *36*, 717-731.

Sarstedt, M., Hair Jr, J. F., Cheah, J. H., Becker, J. M., & Ringle, C. M. (2019). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal*, *27*(3), 197-211.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 587-632). Cham: Springer International Publishing.

Sendurur, E. (2018). The pedagogical beliefs and instructional design practices: Pre-service IT teachers' case. *Eurasian Journal of Educational Research*, *18*(75), 59-80.

Shehzadi, S., Nisar, Q. A., Hussain, M. S., Basheer, M. F., Hameed, W. U., & Chaudhry, N. I. (2021). The role of digital learning toward students' satisfaction and university brand image at educational institutes of Pakistan: a post-effect of COVID-19. *Asian Education and Development Studies*, *10*(2), 276-294.

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J. H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: guidelines for using PLSpredict. *European journal of marketing*, *53*(11), 2322-2347.

Stodnick, M., & Rogers, P. (2008). Using SERVQUAL to measure the quality of the classroom experience. *Decision Sciences Journal of Innovative Education*, *6*(1), 115-133.